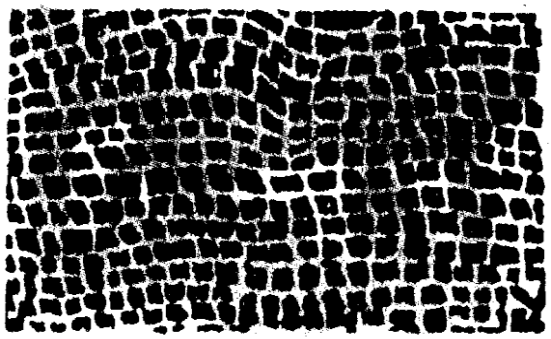
CH : 1 – THE FUNDAMENTAL UNIT OF LIFE

Cells were discovered by ***Robert Hooke***. It was a chance discovery; when he observed that a thin slice of cork (from bark of tree) contained number of small compartments resembling the structure of honey comb. He then called these compartments as *"**Cellulae**"*, which are now called as **Cells**.



What are living organisms made up of ?

- The bodies of all plants and animals are made up of cells i.e. all living beings show cellular organization. ***Cells are the fundamental structural units of living organisms and basic units of life.***
- There are some organisms like Amoeba, Paramoecium, bacteria, Chlamydomonas, etc., whose bodies are made up of single cell only. Such organisms are called **Unicellular organisms**.
- This single cell is able to perform all the life processes like obtaining of food, respiration, excretion, growth and reproduction.
- There are large number of other organisms also which are made up of million of cells. Such organisms are called as **Multicellular organisms.**
- All the cells of multicellular organism assume different shapes, sizes and get aggregated to produce tissues and organs to perform specialized functions, for e.g. Muscle cells bring about movement, nerve cells carry impulses from one part to another. This is referred to ***Division of Labour*** in cells.

Unicellular Organisms	**Multicellular Organisms**
1. It is represented by a single cell. 2. All activities of the organism are performed by a single cell. 3. There is no division of labour as the single cell has to perform all activities.	1. It consists of a large number of cells. 2 A single cell performs one or few activities of organism. 3. Cells are specialized to perform Different functions of body so that there is division of labour.

DISCOVERY OF CELL

- In 1665, ***Robert Hooke*** saw cells for the first time in a thin slice of cork with his primitive microscope.
- In 1674, ***Antony Van Leeuwenhoek*** studied living cells (bacteria, protozoa, RBC, etc.) for the first time. He was able to study them with the help of an improved microscope, which he himself had made.
- In 1831, ***Robert Brown*** discovered and named the nucleus in a cell.
- In 1839, ***J. E. Purkinje*** used the term protoplasm for the living substance present inside the cell.
- **Cell Theory** was formulated by ***M. J. Schleiden*** and ***T. Schwann*** in 1839. According to them, the cell is structural and functional unit of all living beings.
- In 1855, ***Rudolf Virchow*** established that all cells arise from pre-existing cells, which was stated by him in Latin as **"Omnis-cellula-e-cellula"**. He modified the cell theory by adding his generalization.
- ***Viruses are an exception to cell theory.***

INSTRUMENTS FOR STUDYING CELLS

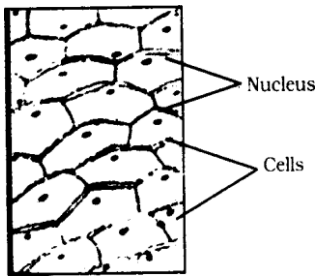
- ***Light or Compound Microscope***. It uses glass lenses and visible light for observation. Magnification is 100-1500.
- ***Electron Microscope***. It uses electromagnets instead of glass lenses and electron beam instead of light. It is used to study the structure of Plasma membrane.

ACTIVITY - 1

- Cut a small piece from an onion bulb, with the help of forceps remove peel from inner side.
- Place it immediately in watch glass containing water. Transfer a piece of onion peel into glass slide by means of a brush.
- Pour a drop of *safranine* over it. Iodine or Methylene blue could also be used to stain the cells.
- Place a coverslip over the slide and observe under microscope.

OBSERVATION

- The peel is found to have a number of similar elongated rectangular cells joined together. Each cell consists of an outer cell wall, cytoplasm with a covering of plasma membrane and containing a small oval nucleus.



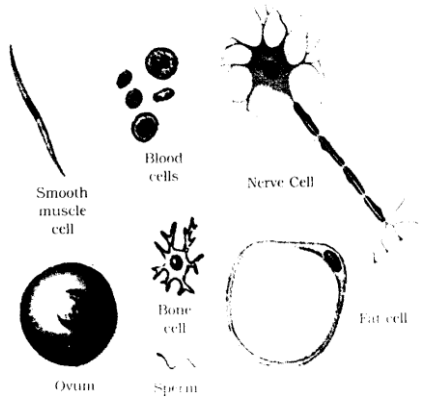
SHAPE AND SIZE OF CELLS

- The size and shape of cells vary considerably. Some cells can change their shape like Amoeba and white blood cells, while most of the plant cells and animal cells have almost fixed shapes.
- Human RBCs are biconcave disc shaped, nerve cells are elongatse thread like.
- In a multicellular organism, the shape of a cell depends mainly on the function it performs.

Smallest cell - PPLO (mycoplasma)

Largest cell - Ostrich egg

Largest animal cell - Nerve cell



What is a cell made up of ?

A typical cell is formed of three parts :-

1. Plasma membrane or Cell membrane
2. Nucleus
3. Cytoplasm

Plasma Membrane

- The outermost elastic membranous covering of the cell that separates its contents from the external environment is called ***Plasma membrane*** *or* ***Cell membrane***.
- The contents of the cell protected from direct contact with external environment by plasma membrane represent ***Protoplasm***.
- Protoplasm of cell consists of two parts, Cytoplasm and Nucleus.

Transport across the membrane

The membrane is said to be :-

(a) *Impermeable* if the substances do not pass through the membrane.

(b) *Permeable* if the substances, both solute (substance which is dissolved) and solvent (medium in which solute dissolves) can pass readily through the membrane.

(c) *Semi permeable* if the membrane is permeable to solvent but prevents the passage of solutes.

(d) *Selectively Permeable* if the membrane allows the entry and exit of some materials in and out of

the cells, but prevent movement of other materials.

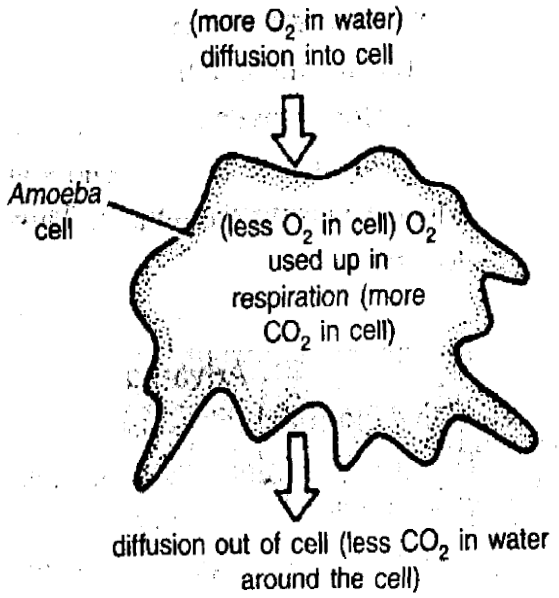
There are two types of transport mechanisms by which substances can pass across the membrane:-

1. Passive transport
2. Active transport

1. **Passive transport.** It is the passage of substances across the plasma membrane without expenditure of energy. It is of two types :-

(a) **Diffusion**

- The process of movement of a substance from a region of higher concentration to a region of lower concentration, to spread uniformly in the given space is called diffusion.
- CO_2 and O_2 move out and into the cells through diffusion. Respiration of cell produces Carbon dioxide. As the concentration of CO_2 increases inside the cell as compared to the outside, CO_2 diffuses out of the cell into external medium.
- Similarly, concentration of Oxygen is always higher in the external medium as compared to the cell where it is being consumed in respiration. Therefore O_2 diffuses from outside to the inside of cell.



(b) **Osmosis**

- Osmosis is defined as the diffusion of solvent or water across a semi-permeable membrane from a region of its higher concentration to the region of its lower concentration.
- Plasma membrane functions as selectively semi-permeable membrane.

Diffusion	Osmosis
(i) It is the movement of a substance from its area of higher concentration to the area of its lower concentration.	(i) It is the movement of water from its area of higher concentration to its area of lower concentration through semi - permeable membrane.
(ii) It does not involve semi-permeable membrane.	(ii) It involves semi-permeable membrane.
(iii) It can take place in solid, liquid and gases.	(iii) It takes place only in liquid.

- There are three types of Osmotic solutions :-

(i) ***Hypertonic solution.*** It is a dilute solution which has an osmotic concentration lower than that of other solution.

(ii) ***Isotonic solution***. The solution has an osmotic concentration similar to that of another solution.

(iii) ***Hypertonic solution***. It is a concentrated solution which has an osmotic concentration higher than that of another solution.

- Plant and animal cells behave in one of the following ways depending on the type of solution :-

(i) ***Hypotonic solution***. The external solution has a higher water concentration than the cell, meaning that the outside solution is dilute, the cell wall gain water by osmosis.
Water molecules are free to pass across the cell membrane in both directions, but more water will come into the cell than will leave. The net result is that water enters the cell. The cell is likely to swell up. **The phenomenon is called Endosmosis**.

(ii) ***Isotonic solution***. The external medium has exactly the same water concentration as the cell, there will be no net movement of water across the cell membrane.
Water crosses the cell membrane in both directions, but the amount going in is the same as the amount going out, so there is no overall movement of water. The cell will stay the same size.

(iii) ***Hypertonic solution***. The external medium has lower concentration the water than cell, meaning that it is very concentrated solution, the cell will lose water by osmosis.
Again, water crosses the cell membrane in both directions, but this time more water leaves the cell than enters it. Therefore, the cell will shrink. **The phenomenon is called Exosmosis.**

ACTIVITY – 2

- Dip two equal sized raw eggs in dilute hydrochloric acid for an hour or so. The shells that are made up of Calcium Carbonate get dissolved.
- Wash the two eggs with water 2-3 times. Each egg is now surrounded by semi-permeable membrane.

- Place one egg in water and the other in concentrated salt solution. Observe after 15-30 minutes.

OBSERVATION

- The egg placed in water swells up because of endosmosis. The egg place in salt solution shrinks due to exosmosis.

ACTIVITY – 3

- Put dry raisins or apricots in a petri dish having plain water. Observe after about 30 minutes.

OBSERVATION

- Raisins or Apricots swell up due to endosmosis. Some swollen raisins can be placed in concentrated sugar or salt solution. after 15 – 30 minutes, the raisins will shrink to previous form.

2. **ACTIVE TRANSPORT.** It is a type of transport across plasma membrane which requires the use of energy. It usually occurs against the concentration gradient. Glucose, amino acids and some ions pass through the plasma membrane by an active process.

   The plasma membrane is flexible and is made up of organic molecules called lipids and proteins. The flexibility of cell membrane also enables the cell to engulf in food and other material from its external environment. Such processes are known as **endocytosis**. *Amoeba* acquires its food through such processes.

CELL WALL

It is a rigid, semi-elastic protective covering present outside the plasma – membrane in plants cells, fungi, some protists and prokaryotes.

Plant cell wall is mainly composed of ***Cellulose***. Cellulose is a complex substance and provides structural strength to plants. It is most abundant organic molecule.

FUNCTIONS OF CELL WALL

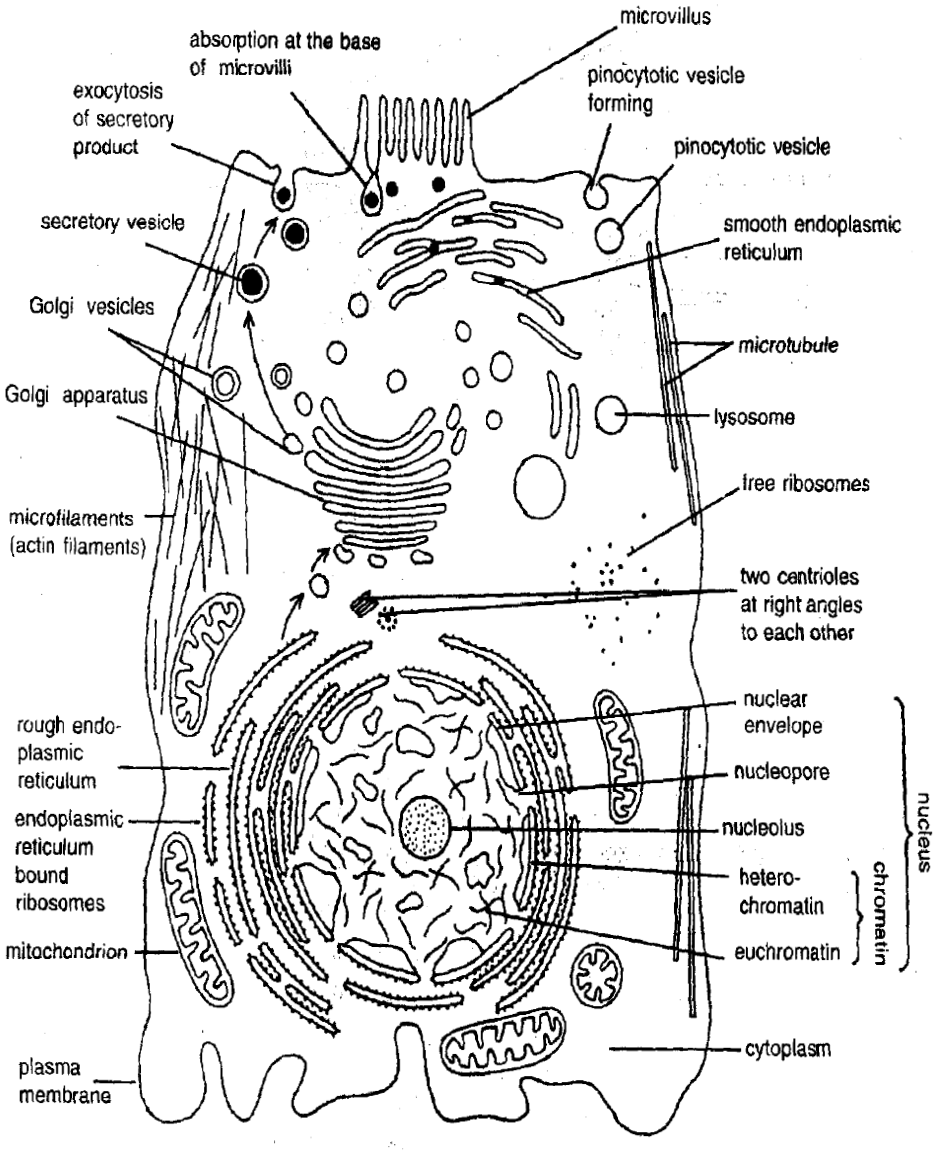
- Cell wall provides shape to the cells.
- It provides mechanical strength to plants.
- Cell wall protects the cells against pathogens and mechanical injury.
- Cell wall prevents bursting of cell on endosmosis. As water enters living cells, their protoplasm swells up and builds pressure against the cell wall. The cell wall exerts an equal and opposite pressure against the swelling protoplasm. As a result, after some endosmosis, further entry of water in cells is stopped.
- When a living plant cell loses water through osmosis there is shrinkage or contraction of the contents of the cell away from the cell wall. The phenomenon is known as **Plasmolysis**.

ACTIVITY – 4

- Prepare peels of Rheo leaves by twisting and tearing. Boil one peel for killing its cell, keep the other peel fresh.
- Mount the two peels on different slides in a drop of water. Observe the cells.
- They appear roughly similar in two slides having cytoplasm and coloured sap.
- Put drop of water with strong sugar or salt solution on mounted leaf on the slide, wait for a minute and observe it again.

OBSERVATION

- Protoplasm in the cells of fresh peel will contract from the cell wall. The phenomenon is called *Plasmolysis*. No such plamolysis occurs in dead cells of the other peel.



NUCLEUS

- Nucleus is a dense protoplasmic body that contains hereditary information for controlling cell activities as well as for transfer to next generation. Nucleus is made up of following parts :-

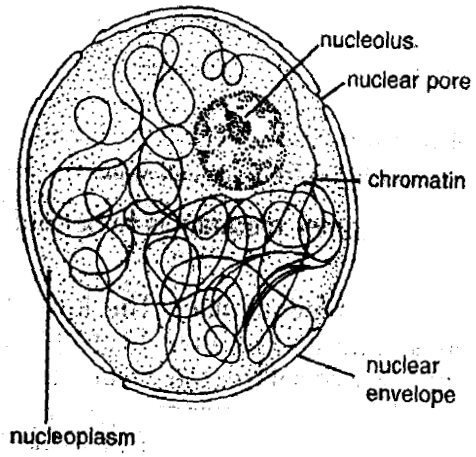
(a) *Nuclear envelope*. It is a double membrane, which separates the nucleus from cytoplasm. It is a discontinuous membrane, containing several nuclear pores.

(b) *Nucleoplasm.* It is the colourless, dense material within the nucleus in which chromatin and nucleolus are suspended.

(c) *Nucleolus.* It is a round structure found inside the nucleus. It is not bounded by a membrane. It is rich in RNA and protein.

(d) *Chromatin Material.* It is an entangled mass of thread like structures made of DNA (Deoxy ribo nucleic acid) and protein. During cell division, chromatin becomes highly condensed, thick rod like structures, known as **Chromosomes**.

- Chromosomes carry and help transfer information for inheritance of characters from parents to the next generation.
- Genetic information is actually contained in DNA. Segments of DNA function as genes. Genes are arranged in linear fashion over DNA or chromosome. They contain all information necessary for functioning, growth and reproduction of cell.



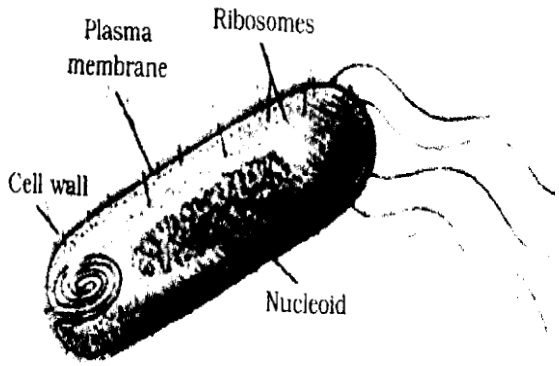
FUNCTIONS

- Nucleus contains all the genetic information not only for the cell but also the whole organism.
- The nucleus plays a central role in cellular reproduction, the process by which a single cell divides and forms two new cells.
- It helps in determining the way the cell will develop and what form it will exhibit at maturity, by directing the chemical activities of the cell.
- Division of nucleus is essential for cell division.

PROKARYOTES AND EUKARYOTES

- In some organisms like bacteria, the nuclear region of the cell may be poorly defined due to the absence of a nuclear membrane.
- Such an undefined nuclear region containing only nucleic acids is called a ***Nucleoid***. Such organisms, whose cells lack a nuclear membrane, are called ***Prokaryotes***.
- Organisms with cells having a nuclear membrane are called ***eukaryotes***.

Prokaryotic Cell	Eukaryotic Cell
(i) It is small in size. (ii) An organized nucleus is absent. (iii) Nucleolus is absent. (iv) Membrane bound cell organelles are absent (v) Vacuoles are absent. (vi) Examples : Bacteria, Cyano bacteria.	(i) It is larger in size. (ii) An organized nucleus is present. (iii) Nucleolus is present. (iv) Membrane bound cell organelles are present. (v) Vacuoles are present. (vi) Examples : Plants, Animals, Fungi

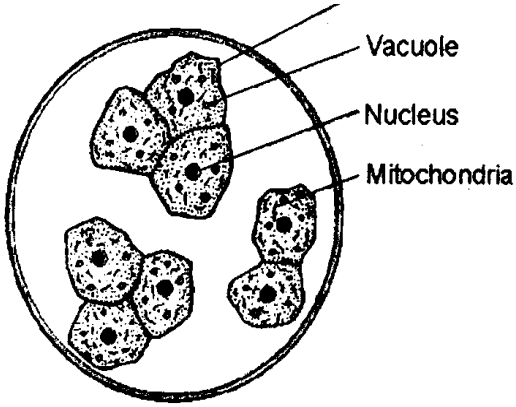


ACTIVITY – 5

- Scrap a piece of membrane from inside cheek lightly with the help of tooth pick or ice-cream spoon with the help of needle.
- Transfer this material and evenly spread into the glass slide.
- Put a drop of Methylene blue or safranin over it. Wait for two minutes. Put a coverslip gently over the membrane.
- Observe under microscope.

OBSERVATION

- A number of polygonal flat cells are found in the piece of membrane. Each cell has a plasma membrane, a central oval nucleus, many small dot like mitochondria, small vacuoles and cytoplasm.



CYTOPLASM

- The protoplasmic mass of cell excluding nucleus is called cytoplasm.
- It contains various molecules, such as water, amino acids, carbohydrates, lipids, proteins, etc. It also contains various Organelles.
- These organelles may be bounded by a membrane.
- Membrane bound organelles are absent in prokaryotic cell.
- Virus lack any membrane and hence do not show characteristic of life until they enter any living cell. They do not have their own metabolic machinery. So they utilize the metabolic machinery of the living cells to multiply.

CELL ORGANELLES

- Cells need a lot of chemical activities to support their complicated structure and function. To keep these activities of different kinds separate from each other, these cells use membrane bound little structures (or "organelles") within themselves. On the basis of covering, cell organelles are of three types :-

(i) ***Double membrane bound*** – Mitochondria, Plastids

(ii) ***Single membrane bound*** – *Endoplasmic reticulum, Golgi apparatus, Lysosomes, Vacuoles*

(iii) ***Membrane less*** – Ribosomes.

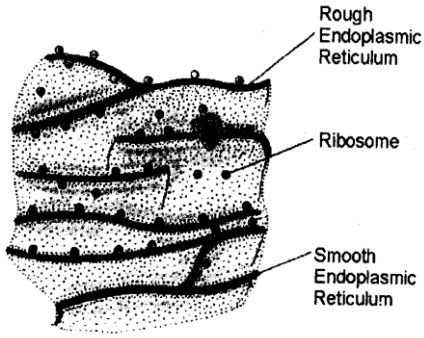
ENDOPLASMIC RETICULUM

- The endoplasmic reticulum (ER) is a large network of membrane – bound tubes and sheets. It looks like long tubes or round or oblong bags (vesicles). The ER membrane is similar in structure to the plasma membrane.

  There are two types of ER in cells:-

  (i) ***Rough ER***, which is characterized by the presence of ribosomes on its surface.

  (ii) ***Smooth ER***, which is devoid of ribosomes on its surface.



FUNCTIONS

(i) Rough ER is the site of ***protein synthesis***.

(ii) Smooth ER helps in ***lipid synthesis***.
Proteins and lipids synthesized in ER are used for making cell membrane or ***membrane biogenesis***.
Some proteins and lipids also function as enzymes and hormones.

(iii) It serves as channels for the transport of materials between various regions of the cytoplasm or between the cytoplasm and nucleus.

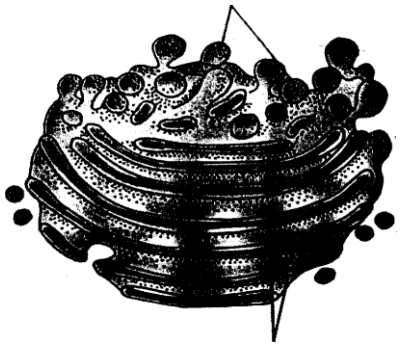
(iv) It provides a surface for some of the biochemical activities of the cell.

(v) S.E.R. in liver cells takes part in detoxifying many poisons and drugs.

SER	RER
(i) Ribosomes are absent. (ii) It is specialized to synthesize lipids and Steroids.	(i) Ribosomes occur over the surface of RER (ii) It is specialized to synthesize proteins

GOLGI APPARATUS

Golgi apparatus, first described by ***Camillo Golgi*** is an organelle of membrane bound sacs, tubules and vesicles arranged approximately parallel to each other in stacks called as ***Cisternae***. Membranes of golgi apparatus may develop connections with membranes of E.R. to form complex cellular membrane system.



FUNCTIONS

(i) Storage, modification and packaging of products in vesicles.

(ii) The material synthesized near the E. R. is packaged and dispatched to various targets inside and outside the cell through the Golgi apparatus.

(iii) Lysosomes are formed by golgi apparatus.

(iv) Complex and special sugars (e.g. galactose) are made by Golgi apparatus.

(v) It is involved in repair and synthesis of cell membranes.

LYSOSOMES (Suicide Bags)

Lysosomes are small spherical vesicles which contains digestive enzymes for intracellular digestion and waste disposal. Because of their function in intracellular digestion, lysosomes are called ***Digestive bags***.

In damaged cells, lysosomes burst to release enzymes for digestion of cellular components. Because of their ability to kill and digest cellular components, lysosomes are called ***Suicide bags***.

FUNCTIONS

(i) They help in destruction of foreign particles (bacteria and viruses) by breaking them into small pieces with the help of digestive enzymes.

(ii) They help in intracellular digestion of food particles.

(iii) They help in removing dead and worn out cellular organelles by digesting them.

Plant cells generally lack lysosomes.

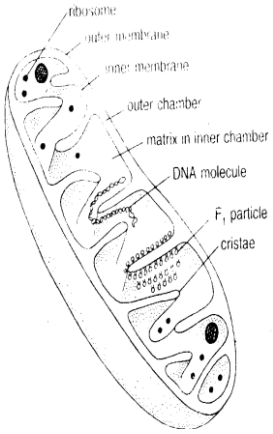
MITOCHONDRIA (Power House of a Cell)

Mitochondria are rod-shaped cell organelle of aerobic eukaryotes. They are commonly known as *'**Power house of the cell**'* because they contain enzymes necessary for the oxidation of food and for release of high amount of energy in the form of ATP (Adenosine triphosphate). The body uses energy stored in ATP for synthesis of new chemical compounds and for doing work. ATP is also known as ***energy currency of the cell***.

Each mitochondria is bounded by two membranes. The outer membrane is smooth and porous whereas the inner membrane is folded inwards to form ***Cristae***.

Cristae increase the surface area for ATP generating chemical reactions.

Mitochondria have DNA and ribosomes which make it *Semi-autonomous* as they are able to manufacture some of their own proteins and enzymes.



FUNCTIONS

- Mitochondria are sties where aerobic part of respiration take place.
- They provide energy in the form of ATP.
- They provide intermediates for synthesis of various chemicals like fatty acids, steroids, amino acids, chlorophyll, etc.

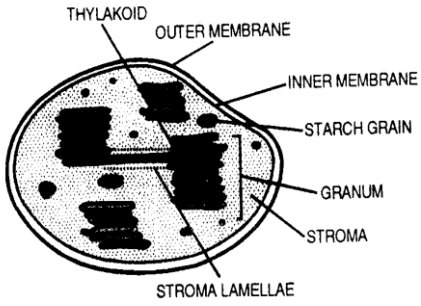
PLASTIDS

Plastids are the large cell organelles found only in plant cells which are sites of synthesis and storage of organic substances. Plastids are of following types :-

- ***Leucoplasts***. They are colourless plastids. They store the food of plant body in the form of starch, protein and fat.
- ***Chromoplasts***. They are coloured plastids. Chromoplasts are of two sub-types : -
  - *(a)* *Non-green chromoplasts* are coloured red, orange, yellow, etc. They are mostly present in flowers and fruits.
  - *(b)* *Chloroplasts* (***kitchen of the cell***). Chloroplasts are green coloured plastids because of presence of ***chlorophyll***. They trap the solar energy which is used for manufacturing food. So, they are the sites of photosynthesis.

The internal organization of plastids consist of numerous membrane layers called as ***grana*** (singular – *granum*) embedded in a material called ***stroma***.

Each granum consist of stack of flattened sacs called as ***Thylakoids***. Thylakoids contain chlorophyll.



FUNCTIONS

- Chromoplast provide colour to fruits and flowers.
- Leucoplast helps in storage of protein, starch and oil.
- Chloroplast trap solar energy to manufacture food through photosynthesis.
- Chloroplast maintain the balance of CO_2 and O_2 by absorbing carbon dioxide and releasing oxygen in photosynthesis.

RIBOSOMES

Ribosomes are extremely small, rounded bodies found either in free state in the cytoplasm or attached to the surface of E.R. They are made up of ***RNA (ribonucleic acid)*** and ***proteins***.

FUNCTION

Ribosomes are the site of protein synthesis in the cell.

VACUOLES

Vacuoles are storage sacs for solid or liquid contents. Vacuoles are small sized in animal cells while plant cells have very large vacuoles.

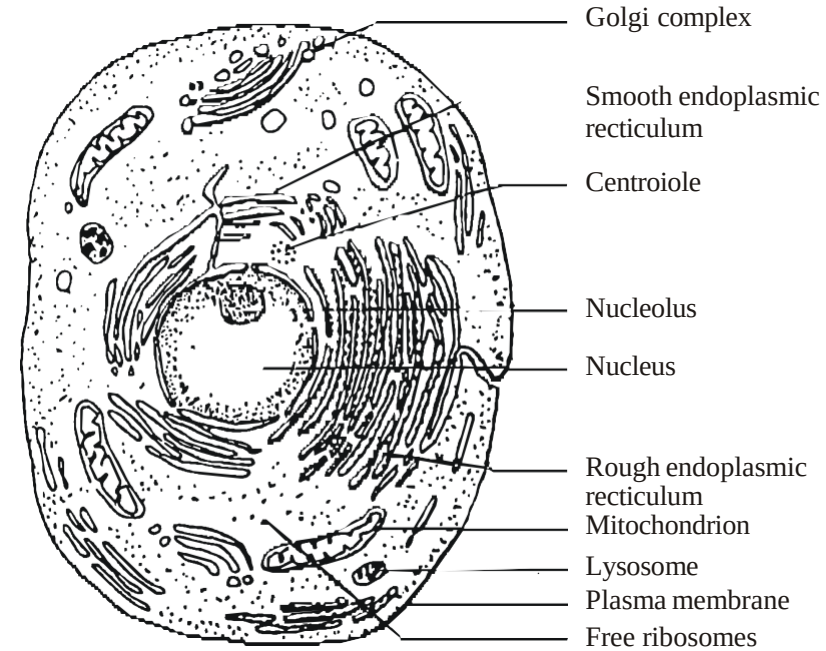
The central vacuole of some plant cell may occupy 50-90% of the cell volume. The plant cell vacuoles are full of sap and provide turgidity and rigidity to the cell.

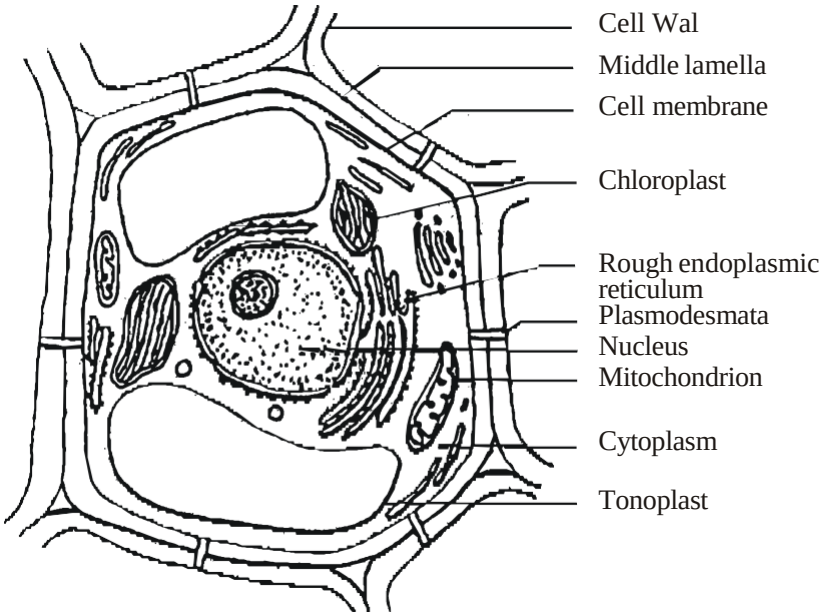
FUNCTIONS

- Many substances of importance in the life of the plant cell are stored in vacuoles. These include amino acids, sugars, various organic acid and some proteins.
- In single-celled organisms like *Amoeba*, the food vacuole contains the food items that the Amoeba has consumed.
- In some unicellular organisms, specialized vacuoles also play important roles in expelling excess water and some wastes from the cell.

DIFFERENCE BETWEEN PLANT AND ANIMAL CELL

Plant cell	Animals Cell
(a) Cell wall is present.	(a) Cell wall is absent.
(b) Plastids are present.	(b) Plastids are absent.
(c) Vacuoles are larger in size and less in number.	(c) Vacuoles are smaller in size and more in number.
(d) Nucleus lies on one side in the cytoplasm.	(d) Nucleus lies in the centre.
(e) Plant cells cannot change the shape.	(e) Animal cells can change their shape.





SOLVED NCERT QUESTIONS

Q1. **What discovered cells, and how ?**

Sol. Cells were discovered by **Robert Hooke** (1665) when he observed a thin slice of cork under his microscope . He saw honey comb like structures to whom he gave the name cell.

Q2. **Why is the cell called the structral and functional unit of life ?**

Sol. The cells are basis building unts of body. All organisms are made of cells. So the cell is the basic unit of life.

Q3. **How do substances like CO_2 and water move in and out of the cell ? Discuss.**

Sol. CO_2 can move across cell membrane by the process of diffusion. CO_2 is a cellular waste. In cells external environment, its concentration is how as compared to inside the cell. So it mores it.

Water obey the law of diffusion. Its movement by selectively permeable membrane is called osmosis.

Q4. **Why is the plasma membrane called a selectivity permeable membrane ?**

Sol. The plasma membrane is called a selectivity permeable membrane because it allows entry of some materials and the exist of some materials and not all the materials.

Q5. **Fill in the gaps in the following table illustrating differences between prokaryotic and eukaryotic.**

	Prokaryotic cell	**Eukaryotic cell**
1.	**Size : generally small (1-10μm) $1\mu m = 10^{-6}m$.**	**1. Size generallly large (5-100 μm)**
2.	**Nuclear region : _____ and known as _____**	**2. Nuclear region : well defined and surrounded by a nuclear membrane.**
3.	**Chromosome : single**	**3. More than one chromosome**
4.	**Membrane bound cell organelles absent.**	**4. _____**

Sol.

	Prokaryotic cell	**Eukaryotic cell**
1.	Size : generally small (1-10μm) $1\mu m = 10^{-6}m$.	1. Size generallly large (5-100 μm)
2.	Nuclear region : poorly defined due to absence of nuclear membrane and known as nucleoid.	2. Nuclear region : well defined and surrounded by a nuclear membrane.
3.	Chromosome : single	3. More than one chromosome
4.	Membrane bound cell organelles absent.	4. Membrane bound cell organelle present.

Q6. **Can you name the two organelles we have stuided that contain their own genetic material ?**

Sol. (i) Mitochondira (ii) Chloroplast.

Q7. **If the organization of a cell is destroyed due to some physical or chemical influence, what will happen ?**

Sol. The cell would die.

Q8. **Why are lysosomes known as suicide bags ?**

Sol. **Lysosomes :** Cell organelles that release hydrolytic enzymes are also called suicidal bags of the cell.

Q9. **Where are proteins synthesised inside the cell ?**

Sol. In ribosome that are known as the "protein factories."

Q10. **Make a comparison to write down ways in which plant cells are different from animal cells.**

Sol. Difference between animal and plant cell.

	Animal cell		**Plant cell**
1.	The cell is enclosed by a thin membrane called the **plasma membrane.**	**1.**	Plasma membrane is covered over by a thick cell wall made of **cellulose.**
2.	Plastids are absent.	**2.**	Present.
3.	Vacuoles are either absent or ov very small size.	**3.**	Vacuoles are large, central and prominent.
4.	Centrosome present with 2 centroiles.	**4.**	Centrosome absent. **Polar caps** present.
5.	Cell division takes place by the formation of a groove.	**5.**	Cell-division initiates by the formation of a cell plate.
6.	Golgi complex (Golgi body) presents near the nucleus of the cell.	**6.**	Glogi complex consisting of unconnected units is called the dictyo-somes.

Q11. **How is prokaryotic cell different from a eukaryotic cell ?**

Sol. Difference between a Prokaryotic cell and Eukaryotic cell :

	Prokaryotic cell		**Eukaryotic cell**
1.	A cell formed of amino sugars is present.	**1.**	A cell wall formed of cellulose is present in plant cells.
2.	Membrane bound organelles such as endoplasmic reticulum, Golgi complex mitochondria, lysosomes, vacuoles are absent.	**2.**	Membrane bound cell organelles are present in these cells.
3.	Chromosome is single and strand of DNA is present in the cytoplasm.	**3.**	Chromosome are more than one and formed of DNA. They are enclosed in the nuclear membrane.

4. Nucleoid is not enclosed in nuclear membrane.	**4.** Nuclear material enclosed in nuclear membrane.
5. Nucleoli and mitotic apparatus are absent.	**5.** Nuclear material enclosed in nuclear membrane.
6. These lack 9 + 2 axial filamnet structure.	**6.** These posses 9 + 2 axial filament structure.
7. Generally small sized : 1 – 10mm.	**7.** Gnerally big sized : 5-100 mm.
8. The celll divides by budding or by fission. Mitosis does not occur.	**8.** Cell divides by mitosis / meiosis cell division.
9. Ribosomes are of 70S type in these cells.	**9.** Ribosomes are of 80S (Swedberg) type in these cells.

Q12. **What could happen if plasma membrane ruptures or breaks down ?**

Sol. The whole contents of cell would come out and the cell would die.

Q13. **What would happen to the life of a cell if there was no Golgi apparatus ?**

Sol. If there are no Golgi apparatus in a cell then, the secretion would not have occurred. As golgi apparatus is involved in the formation of lysosomes, the foreign materials may accumulate in the cell and destroy it.

Q14. **Which organelle is known as the power house of the cell ? Why ?**

Sol. Power plant of the cell : They are mitochondria, the cell organelles. They have enzymes for cellular respiration. We call them power houses of cell also. They store energy as Adensoine Triphospate (ATP).

Structure and functions :

Mitochondira : They are extremely small cell (size from 0.5 to 2 micron) organelles which are present in large numbers in the cell. They are visible only through the electron microscope. The term mitochondria has been derived from two Greek owrds mitos meaning thread and chondrious meaning grain. Mito-chondria may be rod, thread, or globule shaped. Each mitochondrion is bounded by a double membrane of lipo-proten. The inner wall is thrown into many characteristic folds called cristae. The mitochondrai are considered as a seat of breakdown of food materials in the cells resulting in the release of energy during respiration that is why mitochondria are also known as "Power houses (powe plants) of the cell". Mitochondria also contain their own DNA.

Q15. **Where do the lipids and proteins constituting the cell membrane get synthesized ? Sol.**

These are get syntehsized in endoplasmic reticulum of the cells.

Q16. **How does an amoeba obtain its food ?**

Sol. Amoeba obtains its food by the process of endocytosis. It is due to the flexibility of cell membrane as it enables the cell to engulf food and other materials from its external environment.

Q17. **What is osmosis ?**

Sol. Osmosis : It is the diffusion of water through a semipermeable membrane. It takes place across the membrane until the equilirbium is reached. At equilirbium water potential is equal on both the sides. Water moves from a region of high chemical potential of water to a region of high chemical potential of water. It is necessary for absorption of water, expansion of plant cells and many other phenomena occurring in plants.

Q18. **Carry out the following osmosis experimentt :**

Take four pealed potato hales an dhollow each one out to make potato cups.One of these potatocups should be made from a boiled potoato. Put each potato cup in a trough contaiing water. Now

(a) keep cup A empty.

(b) put one teaspoon sugar in cup B.

(c) put one teaspoon salt in cup C.

(d) put one teaspoon sugar in boiled potato cup D.

Leaves this set up for two hours. Then observe the four potato cups and answer the following.

(a) Explain why water gathers in the hollowed portion of potato B and C.

(b) Why is potato A necessary in this experiment ?

(c) Explain why water does not gater in the hollowed out portions of A and D.

Sol. (a) Water gathers in hollowed portion of potato B and C because there is either sugar (Cup B) or salt (Cup C) but no water. The water moves into these cups due to osmosis.

(b) Potato A is necessary in this experiment because it is a control experiment.

(c) Water does not gather in the hollowed out portions of A and D because A is control experiment, but cup potato D is boiled. The cell membrane is inactive.

SOLVED IMPORTANT QUESTIONS

Q1. **Who discovered the cell ? Sol.**

Robert Hooke (1665)

Q2. **What are cell organelles ?**

Sol. In the cytoplasm of cell are present certain microsopic structures which perform certain vital functions for the cell.

Q3. **Name the cell organelle which is respon- sible for all the reactions of cellular respi- ration in a cell.**

Sol. Mitochondira.

Q4. **Name three most important parts of a cell.**

Sol. 1. Cell membrane 2. Cytoplasm 3. Nucleus.

Q5. **What is the store house of a all cellular information ?**

Sol. DNA

Q6. **Name the individual which is immortal.**

Sol. Amoeba.

Q7. **Name the granular organelles which are present only in plants.**

Sol. Plastids are found only in plant cells.

Q8. **What are the 'suicidal bags' of a plant cell ?**

Sol. Lysosomes.

Q9. **What for does ATP stand ?**

Sol. Adenosine Triphshate.

Q10. **Which chemical molecule carries heredity from parents to offspring ?**

Sol. DNA.

Q11. **Which do you understand by osmoregulation ?**

Sol. The process by which a cell or an organism controls the quantity of water in its body and the conc. of various solutes and ions in the body fouid.

Q12. **What is golgi complex ?**

Sol. Golgi complex consists of the following parts.

1. **Tubules :** They are flattened plate like net work found near the nucleus.
2. **Vesicles :** They are small droplet like sacs.
3. **Golgian vacules :** They are large spacious spherical structures.

Q13. **What is protoplasm ?**

Sol. It is called the living matter of the cell. It is called the physical basis of life.

Q14. **What is cell wall ?**

Sol. Covering outside the plasma membrane in plant, bacteria and fungal cells is called cell wall. It is made up of non-living cellulose cell wall is secreted by the protoplasm.

Q15. **Difference between plasma membrane and cell wall.**

Sol. **Plasma membrane**

1. Found in all cells.

2. It is made of protein.

Cell wall

1. Found in plant cells, bacteria and fungal cells.

2. It is made up of cellulose.

Q16. **Name the two nucleic acids present in the cell.**

Sol. DNA and RNA.

Q17. **What is the function of DNA ?**

Sol. It contains genes. Genes are responsible to store and transmit hereditary information to the offsprings.

Q18. **What is the function of RNA ?**

Sol. It helps in protein synthesis.

Q19. **Which organelle is the power plant of the cell?**

Sol. Mitochondria.

Q20. **What is the significance of osmosis ?**

Sol. 1. Plants absorb water from soil by osmosis.

2. It contorl the cell to diffusion of water.

3. It controls the turgidity of the cell.

Q21. **Give the role of a plant cell wall ?**

Sol. It is permeable to water.

1. It provides shape to the cell.
2. It makes tissues rigid and strong.
3. It helps in transport of various substance in and out of the cells.

Q22. **Write the functions of plasma membrane.**

Sol. 1. It provides shape to the cell.

2. It protects internal parts of the cell.

Q23. **What do you mean by Nucleoplasm ?**

Sol. It is the fluid having proteins, ribosomes, enzymes, nucleolus and chromatin threads in the nucleus of the cell.

Q24. **What are peroxisomes ?**

Sol. These are the microbodies which contain powerful oxidative enzymes for photorespiration. They help in the removal of toxic substances.

Q25. **Write the functions of nucleus.**

Sol. 1. It control all the cellular activities of a cell.

2. Takes part in cell division and reproduction.

3. It has chromatin threads which carry genetic inforamtion from one generation to the others.

Q26. **Which organelle controls most of the activites of a cell ?**

Sol. Nucleus.

PRACTICE EXERCISE – 1

Q1. Describe the structure of an animal cell in brief.

Q2. Why is the cell called "the unit of life" ?

Q3. Distinguish between osmosis and diffusion.

Q4. Describe the structure of a plant cell.

Q5. What are lysosomes ?

Q6. Distinguish between cell wall and cell membrane.

Q7. Write differences between eukaryotic and prokaryotic cells.

Q8. Give four difference between cytoplasm and nucleoplasm.

Q9. Distinguish between cell wall and cell membrane.

Q10. What do you know about plastids ?

Q11. Define protoplasm.

Q12. What will happen if you put an animal or plant cell into a solution of sugar ?

Q13. Write differences between exocytosis and endocytosis.

Q14. Justify the statement "Cell is the basic unit of life".

Q15. What does the term "Plasmolysed" mean.

Q16. What is a cell made up of ? What is the structural organisation of a cell ?

Q17. Define the following terms

1. Protoplasm
2. Gene
3. Nucleoid

Q18. Distinguish betweeen

a) Ribosome and centrosome

b) Cell membrane and cell wall

Q19. What is cell theory ? Who formulated it ?

Q20. Some organisms have cells of different kinds explain.

Q21. Give the functions of mitochondria, ribosomes and lysosomes.

Q22. Describe the structure and function of golgi appratus.

Q23. Why are mitochondri called power house of cells ?

Q24. Name the two nucleic acids present in the cell. What are their functions.

Q25. What are the major categories of plastids ?

Q26. Differentiate between exocytosis and endosytosis.

Q27. Write a brief note on plasma membrane.

Q28. Give well labelled diagram of animal and plant cell.

Q29. Define the terms

1) Protoplasm
2) Cytoplasm
3) Nucleoplasm.

Q30. Differentiate between

Chromatin and chromatid.

Q31. Describe the lysosomes. Why is it called digestive bag ?

Q32. Who discovered the cell and how ?

Q33. How do substances like CO_2 and water move in and out of the cell ?

Q34. Why is the plasma membrane called a selectively permeable membrane ?

Q35. How are proteins synthesised inside the cell?

Q36. Why are lysosomes known as suicide bags?

Q37. Differentiate between chromatin and chromosome.

Q38. What are gene s ? Write their importance.

Q39. Viruses can be crystallisaed like salt or sugar. State two reasons for considering them also as living.

Q40. What do you mean by chromosome number? Give diploid no. of any two animals.

EVALUATE YOURSELF

M.M. : 25 M.T. : 60 min. **M.M. : 25 M.T. : 60 min.**

TEST - 1

Q1. Who discovered the cell ? **1 M**

Q2. Why is the cell called the structural and functional unit of life ? **1 M**

Q3. Where are proteins synthesised inside the cell ? **1 M**

Q4. How do substance like CO2 and water move in and out of the cell ? **2 M**

Q5. Define the terms : **2 M**
a. Diffusion
b. Osmosis

Q6. What do you know about cell membrane ? **2 M**

Q7. Write the different functions of a cell ? **2 M**

Q8. Differentiate between prokaryotic and eukaryotic cell ? **2 M**

Q9. Define the terms : **3 M**
a. Protoplasm
b. Cytoplasm
c. Nucleoplasm

Q10. Differentiate between plant cell and animal cell ? **3 M**

Q11. Explain the structure and functions of plasma membrane ? **5 M**

TEST - 2

Q1. Name the three most important parts of a cell ? **1 M**

Q2. What is the store house of all cellular information ? **1 M**

Q3. What do you mean by ATP ? **1 M**

Q4. Name the two nucleic acids present in the cell ? What are their functions ? **2 M**

Q5. What is the significance of osmosis ? **2 M**

Q6. What are robosomes write their functions in a cell ? **2 M**

Q7. Explain the term : **2 M**
a. Nucleus
b. Nucleolus
c. Nucleoplasm

Q8. Differentiate between Plasmolysis and Deplasmolysis ? **2 M**

Q9. Give the functions of : **3 M**
a. Mitochondria
b. Ribosomes
c. Lysosomes

Q10. Explain the cell theory ? **3 M**

Q11. Describe the structure of a typical plant cell ? **5 M**

MULTIPLE CHOICE QUESTION'S

Q1. The term 'cell' was given by

(a) Leeuwenhoek (b) Robet Hooke

(c) Flemming (d) Robert Brown

Q2. Who proposed the cell theory?

(a) Schleiden and Schwann

(b) Watson and Crick

(c) Darwin and Wallace

(d) Mendel and Morgan

Q3. The longest cell in the human body is

(a) nerve cell (b) muscle cell

(c) liver cell (d) kidney cell

Q4. The number of lenses in compound light microscope is

(a) 2 (b) 3 (c) 4 (d) 1

Q5. The history of the cell began in 1665 with the publication of Micrographia in London by

(a) Robert Hooke (b) Robert Brown

(c) Straburger (d) Dujardin

Q6. The idea 'omins cellula e cellula' which means that all living cells arise from preexisting cells was given by

(a) Robert Brown (b) Purkinje

(c) Rudolf Virchow (d) Schleiden

Q7. Which of the following has an irregular or variable shape?

(a) Euglena (b) Paramecium

(c) Amoeba (d) Acetabularia

Q8. Genetic material of a eukaryotic cell is contained in

(a) nucleolus (b) nucleus

(c) nucleoplasm (d) nucleoid

Q9. Nucleolus is a seat of

(a) protein synthesis

(b) ribosome synthesis

(c) enzyme synthesis

(d) mRNA synthesis

Q10. Middle lamella is formed of:

(a) calcium pectate (b) cellulose

(c) hemicellulose (d) lignin

Q11. Plasma membrane is

(a) permeable

(b) selective permeable

(c) semipermeable

(d) impermeable

Q12. A cell placed in solution swells up. The solution is

(a) hypertonic (b) isotonic

(c) hypotonic (d) both (a) and (b)

Q13. A cell placed in hypotonic solution bursts up. It is

(a) animal cell (b) bacterial cell

(c) fingal cell (d) plant cell

Q14. Bulk transport occurs through

(a) endocytosis (b) exoctosis

(c) endosmosis (d) both (a) and (b)

Q15. Cytoplasm is

(a) unit mass of protoplasm

(b) protoplasm excluding plasma membrane

(c) protoplasm excluding plasma membrane and nucleus

(d) protoplasm excluding plasma membrane and cell or ganelles

Q16. Rough ER contains

(a) detoxification centres

(b) carbohydrate synthesizing machinery

(c) ribosomes

(d) lysosomes

Q17. Protein storing plastid is

(a) aleuroplast (b) amyloplast

(c) elaioplast (d) both (b) and (c)

Q18. Seat of photosynthesis is

(a) leucoplast (b) chloroplast

(c) chromoplast (d) both (a) and (c)

Q19. Mitochondria are seats of

(a) aerobic respiration

(b) Krebs cycle of aerobic respiration

(c) glycolysis of aerobic respiration

(d) anaerobic respiration

Q20. Golgi apparatus is involved in synthesis of

(a) new membranes

(b) new membranes and lysosomes

(c) cellulose

(d) glucose

Q21. Contractile vacuoles take part in

(a) absorption of water from outside

(b) osmoregulation

(c) excretion

(d) both (b) and (c)

Q22. Centrosome occurs in

(a) plant cells

(b) animal cells

(c) animal cells and some lower plant cells

(d) all the above

Q23. Human cheek cells are commly stained with

(a) safranin (b) methylene blue

(c) acetocarmine (d) eosine

Q24. Name the stain which is commly used to study plant cells

(a) safranin (b) cotton blue

(c) methylene (d) acetocarmine

Q25. Temporary mount of a tissue is made in

(a) wax (b) alcohol

(c) glycerine (d) xylene

Q26. Safranin is a reagent that is used to stain

(a) nucleus (b) cytoplasm

(c) cell wall (d) plasmodesmata

Q27. We generally mount the material in the slide

(a) in the centre

(b) on the left side of slide

(c) on the right side of slide

(d) both (b) and (c)

Q28. Coverslip is put on the mounted material on a slide very gently to

(a) avoid the crushing of mounted material

(b) avoid the entry of air bubble

(c) avoid oozing of stain

(d) avoid oozing of glycerine

Q29. Definite shape of cell is seen in case of

(a) plant cell

(b) animal cell

(c) both animal and plant cell

(d) neither animal nor plant cell

Q30. The outer most layer of human cheek cells is

(a) cytoplasm (b) plasma membrane

(c) cell wall (d) nuclear membrane

Q31. The outer most covering of a plant cell is

(a) plasma membrane

(b) cell wall

(c) vacuole membrane

(d) nuclear membrane

Q32. Nucleus was discovered by

(a) Robert Hooke (b) Robert Brown

(c) Virchow (d) Schleiden

Q33. In plant cells, nucleus is generally placed

(a) in the centre

(b) on one side of the cell

(c) attached to plasma membrane

(d) on one corner of the cell

Q34. In human cheek cells, nucleus is generally located

(a) near the plasma membrane

(b) on one side

(c) in the centre

(d) on border

Q35. In plant cells, cell wall is

(a) dynamic and live

(b) rigid and nonliving

(c) dynamic and non-living

(d) rigid and living

Q36. In plant cells, cell to cell contact is maintained through

(a) tight juctions (b) desmosomes

(c) interdigitation (d) plasmodesmata

Q37. In plant cells, nucleus is generally

(a) cylindrical (b) rounded

(c) discoidal (d) elliptical

Q38. Plant cells generally have

(a) big but less number of vacuoles

(b) small but large number of vacuoles

(c) no vacuole at all

(d) all equal sized vacuoles

Q39. The cells are first focussed in microscope un-

der

(a) 40 X (b) 10 X

(c) 100 X (d) any of these

Q40. The organelle not present in human cheek cells is

(a) nucleus (b) plasma membrane

(c) mitochondria (d) chloroplast

Q41. The cell wall of plant is made up of cellulose which is a

(a) lipid (b) protein

(c) polysaccharide (d) amino acid

Q42. Main difference between animal cell and plant cell is

(a) nutrition (b) growth

(c) movement (d) respiration

Q43. Animal cell lacking nuclei would also lack in

(a) chromosome (b) ribosome

(c) lysosome (d) endoplasmic reticulum

Q44. Plasmolysis occurs due to

(a) absorption (b) endosmosis

(c) osmosis (d) exosmosis

Q45. Solute concentration is higher in the external solution

(a) hypotonic (b) isotonic

(c) hypertonic (d) none of the above

Q46. A cell placed in hypotonic solution will

(a) shrink

(b) show plasmolysis

(c) swell up

(d) no change in shape or size

Q47. Which of the following is known as "physical basis of life"?

(a) gene (b) protoplasm

(c) nucleolus (d) mitochondria

Q48. Which of the following is incorrect pair?

(a) chloroplast - kitchen of the cell

(b) mitochondria - power house of the cell

(c) lysosome - secretory granules

(d) nucleus - brain of the cell

Q49. Photosynthetic pigments are located in

(a) stroma

(b) outer membrane of chloroplast

(c) grana

(d) inner membrane of chloroplast

Q50. Which of the following act as garbage disposal system of the cell?

(a) Golgi apparatus (b) lysosome

(c) vacuole (d) peroxisome

ANSWERS

1. (b)	**2.** (a)	**3.** (a)	**4.** (a)	**5.** (a)
6. (c)	**7.** (c)	**8.** (b)	**9.** (b)	**10.** (a)
11. (b)	**12.** (d)	**13.** (a)	**14.** (d)	**15.** (c)
16. (c)	**17.** (a)	**18.** (b)	**19.** (a)	**20.** (c)
21. (b)	**22.** (c)	**23.** (b)	**24.** (a)	**25.** (c)
26. (c)	**27.** (a)	**28.** (b)	**29.** (b)	**30.** (b)
31. (b)	**32.** (b)	**33.** (b)	**34.** (c)	**35.** (b)
36. (d)	**37.** (b)	**38.** (a)	**39.** (b)	**40.** (d)
41. (c)	**42.** (a)	**43.** (a)	**44.** (d)	**45.** (c)
46. (c)	**47.** (b)	**48.** (c)	**49.** (c)	**50.** (b)

CH : 2 – TISSUES

Cells specialising in one function are often grouped together in the body and are arranged and designed so as to give the highest possible efficiency of function.

Cluster of cells similar in structure and / or work together to perform a partcular function are known as tissue.

Blood, phleom and muscle are examples of tissues.

Importance of Tissue

- Formation of tissues has brought about divison of labour in multicellular organisms.
- Tissues become organised to form organs and organs into organ system.
- Work load of individual cells has decreased.
- Due to improved organisation and higher efficiency, multicellular organisms have higher survival.

ARE PLANTS & ANIMALS MADE OF SAME TYPES OF TISSUES

Both plants and animals have similar life processes. However, they do not have similar types of tissue because of the differences in their organisation, mode of living and life style.

1. **Mobility :** Plants are stationary or fixed. They require more of **supporting** tissues for obtaining structural strength. Most of their tissues are dead. The dead tissues provides more mechanical strength and require less maintenance.

   Animals move about in search of food, mate and shelter. Most of their tissues are living. The living tissues require more energy for their maintenance.

2. **Growth :** Plants continue to grow throughout their life. For continuing growth, plants possess meristematic tisuses in specific regions of the body. They have, therefore, two basic types of tissues, meristematic and permanent.

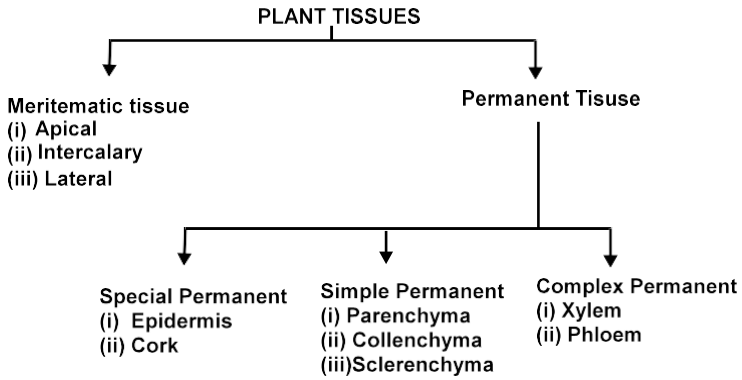
   Cell growth in animals is more uniform. So, there is no such demarcatioin of dividing and non-dividing regions in animals.

3. **Structural Organisation :** In having organ and organ systems, structural organisation of animal is far more specialised and localised as compared to plants. It is due to mobility and different feeding methods of animals.

Plant Tissue	Animal Tissue
They require less maintenance energy.	They require more maintenance energy.
There is differentiation of meristematic and permanent tissues.	Such a differentiation is absent.
It has simple structrual organisation.	Structural organisation is complex.
Dead supportive tissues are more common.	Living tissues are more common.

PLANT TISSUES

Plant tissues are of two types, meristematic and permanent



MERISTEMATIC TISSUE

- It is a plant tissue that have the potential to divide and form new cells. Meristematic tissue is also called **meristem.** Its cells are called **meristematic cells.**
- Region where meristem is present can act as growth region. New cells produced by a meristem are initially like meristematic cells. Slowly, they grow, differentiate and mature into components of various permanent tissues.
- The cells of meristematic tissue are similar in structure and have thin cellulose cell walls.
- They may be spherical, oval, polygonal or rectangular in shape.
- They are compactly arranged and do not contain any intercellular space between them.
- Each meristematic cell contains dense or abundant cytoplasm and a single large nucleus.
- They contain few vacuoles or no vacuoles at all.

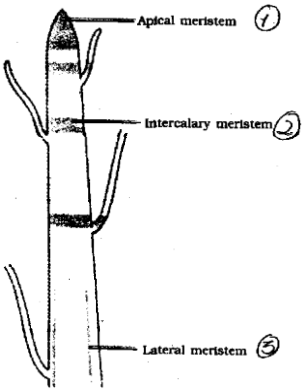
According to their position in the plant, meristem are of following types :

(i) **Apical meristem :** These are situated at the growing tip of stem and roots, i.e., at shoot apex and root

apex (or tip). They are also found at apices of the leaves. It brings about the elongation of the root and stem. It results in increase in the height of the plant, whcih is called **Primary growth.**

(ii) **Lateral meristem :** It occurs on the sides both in stem and root. It causes the organ (stem or root) to increase in diameter and girth. This is called **secondary growth.**

(iii) **Intercalary meristem :** They are located at the base of leaves or internode (on either side of node) on twigs. It produces an increase of length of organ.

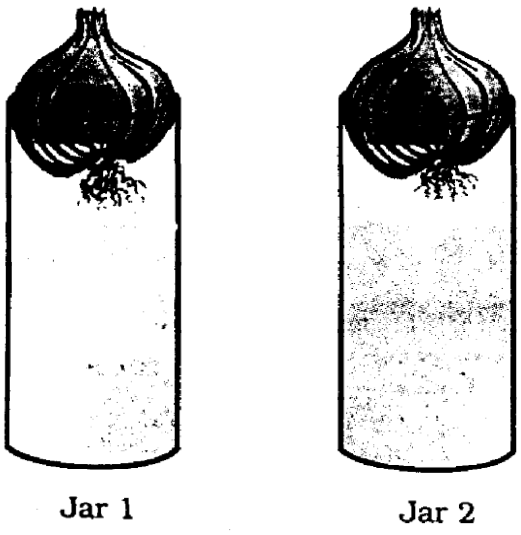


ACTIVITY - 1

Aim : Apical meristem causes growth in length.

Working

- Take two glass jars. Fill them with water
- Place an onion bulb over the mouth of each jar in such a way that stem base of the bulb dips in water observe daily.
- Roots develop from the base of the bulbs in both the jars. Measure the length of the roots daily.
- On fourth day, remove 1cm long apical portion of the roots of bulb 2. Measure the lengths of the roots in both the bulbs on fifth and sixth day.



Observation :

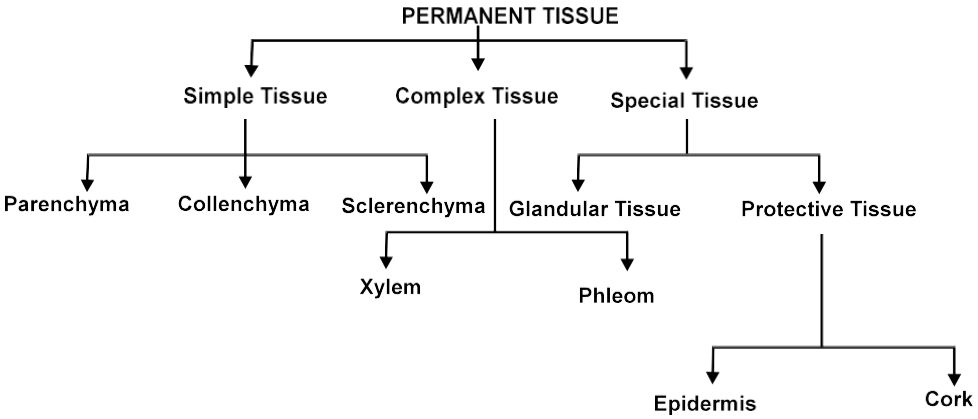
It is seen that roots of bulb 1 continue to grow on fifth and sixth day. They stop growing in case of bulb 2. The difference between the two jars is that in bulb 1, the root apical meristems are intact while in bulb 2, the root apical / meristems have been removed.

Conclusion :

Apical meristem is responsible for growth in length of the root.

PERMANENT TISSUE

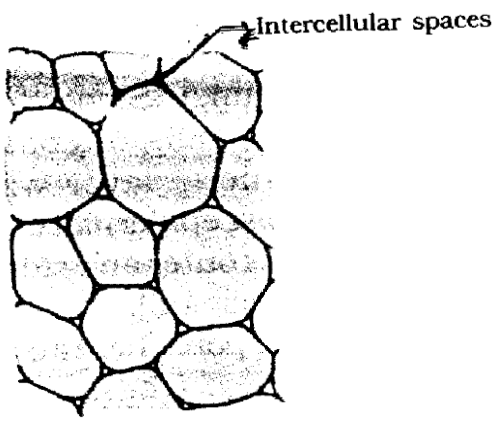
They are the plant where the cell have lost the ability to divide, and have assumed a permanent shape, size and function. They are derived from meristematic cells. The process of taking up a definite shape, size, structure and function is called **differentiation.** Different types of permanent tissues are formed due to differences in their specialisation. They are classified into three types (i) simple tissue (ii) complex tissue and (iii) special tissue.

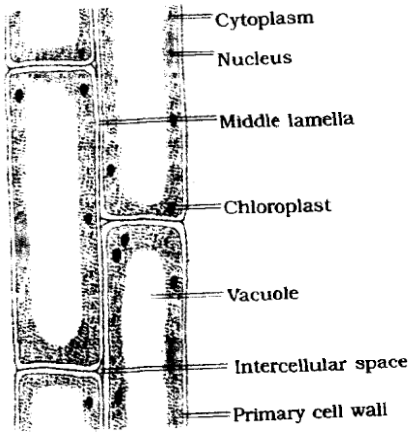


1. Simple Permanent Tissue

They are those permanent tissues in which the permanent cells are similar in structure, origin and function. Simple perrmanent tissues are of three types :

(a) **<u>Parenchyma</u>**





- Parenchyma cells are living and passes the power of their division.
- The parenchyma cells are oval, round, polygonal or elongated in shape.
- The cell wall is thin and encloses a dense cytoplasm which contains a small nucleus and surrounds a large central vacuole.
- Intercellular spaces are abundant (i.e., parenchyma has loosely packed cells)
- The parenchyma is widely distributed in plant body such as stem, roots, leaves, flowers and fruits.

Functions

(i) Parenchyma cells store food and water.

(ii) The cells of tisuse remain turgid and provide rigidity or support to softer parts.

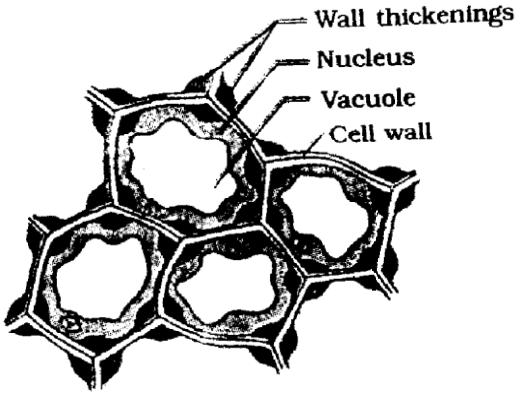
(iii) Parenchyma present in Xylem and Phloem takes part in slow sideways movement of materials.

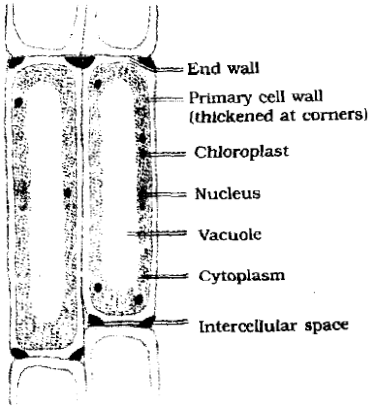
(iv) They store waste products like tannins, resins, guns etc.

(v) **Chlorenchyma :** Parenchyma containing chloroplasts is called chlorenchyma. It is present in leaf interior and on outer cortex of young stems. It is the seat of photosynthesis or manufacture of organic food.

(vi) **Aerenchyma :** It is modified parenchyma found in hydrophytes or aquatic plants. Aerenchyma consists of a network of parenchyma cells which enclose large air cavities. Air cavities store gases and provide buoyancy to aquatic plants.

(b) **Collenchyma**





- Collenchyma tissues also consists of living cells.
- It is characterised by the deposition of extra cellulose at the corners of the cell.
- In collenchyma, intercellular spaces are generally absent.
- Collenchyma cells are elongated in shape and often contain a few chloroplasts.
- Collenchyma occurs below the epidermis in leaf stalks, leaf midribs and herbraceous dicot stems. It is absent in monocots.

Functions

(i) It provides both mechanical strength as well as flexibility.

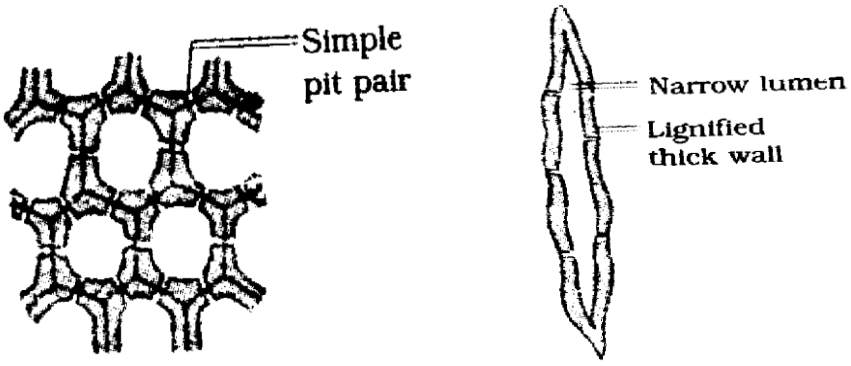
(ii) They allows growth and elongation of organs.

(iii) Being living tissue, collenchyma stores food.

(iv) It may contain chloroplast and take part in photosynthesis.

Parenchyma	Collenchyma
• Cells are rounded.	• Cells are elongated.
• Cell wall is thin.	• Cell wall is unevenly thickened generally over the corners.
• It is distributed in almost all the parts of plant body.	• It occurs mostly in the aerial parts of the plant.

(c) **Sclerenchyma**



- Sclerenchyma cells are dead cells and they are devoid of protoplasm.
- The walls with deposition of Lignin, a chemical substance which acts as cement and hardens them.
- Lignin makes the cell wall impermeable, so important substances are unable to pass through it. As a result, cells that are heavily lignified do not have lining content.
- Due to exercise thickening of the wall of sclerenchyma cell, its cell cavity or lumen becomes nearly absent.
- The cells of sclerenchyma are closely packed without intercelluar spaces.
- This tissue is present in stems around vascular bundles, in the veins of leaves and in the hard covering of seeds and nuts. **Husk of Coconut** is made up the tissue.

Function

(i) Sclerenchyma is the chief mechanical tissues of plants which provides them strength and enables them to bear various stresses.

(ii) It forms a protective covering around seeds and nuts.

(iii) Sclerenchyma fibres of some plants are commerically used eg. Hemp, Jute, coconut.

Collenchyma	Sclerenchyma
• It is living mechanical tissue.	• It is dead mechanical tissue.
• Wall thickening is uneven.	• Wall thickening is uniform.
• It provides flexibility as well as strength.	• It provides only mechanical strength.
• Cells cavity is wide	• Cell cavity is narrow.

ACTIVITY - 2

Aim : To study stem tissues

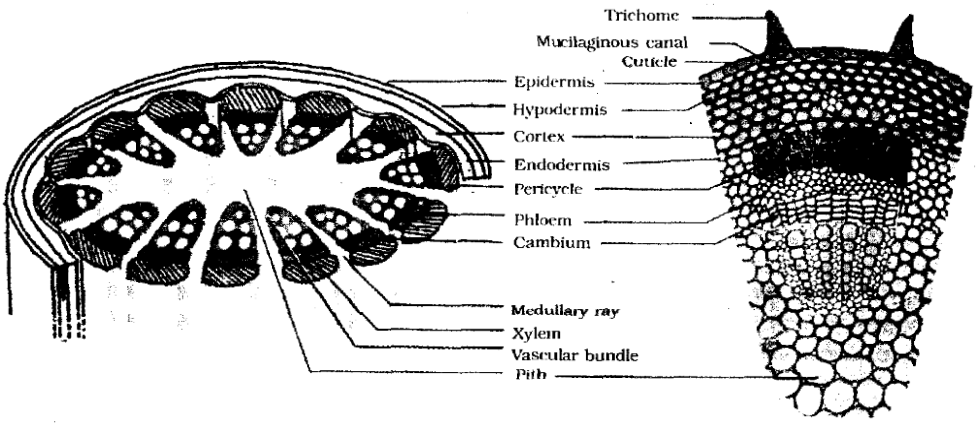
Working :

(i) Take a plant stem and cut it into very thing slices or sections.

(ii) Complete and fine sections are picked up with the help of fine brush and dipped in safranine dye for 2-3 minutes.

(iii) Place one neatly cut section on a slide and put a drop of glycerine.

(iv) Covers with coverslip and observe under microscope various types of cells and their arrangement.



Observations :

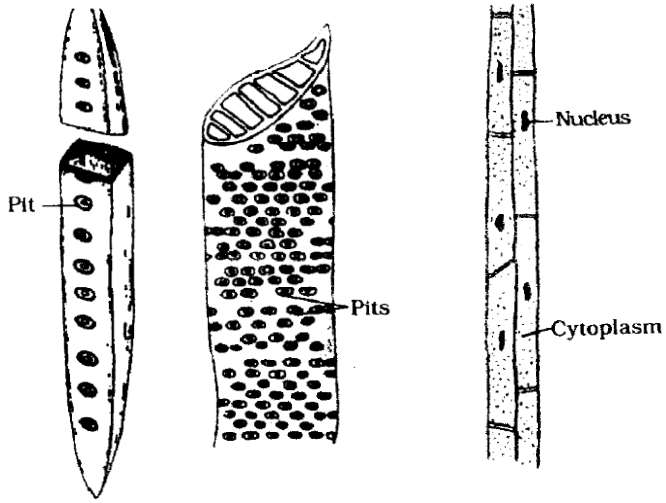
Section of stem of sunflower (Helianthus annus) have different types of cells in it. It has all 7 types of cells : namely epidermal cells, collenchyma, parenchyma, sclerenchyma, Xlyem, phloem and lateral meristematic cells. All of these cells perform. Different Functions : Such as conduction of water (Xylem), transport of food (Phloem), protection (epidermis), support (Collenchyma, sclerenchyma), food storage (parenchyma) and growth (Cambium).

Conclusion : Different groups of cells of tissues present in a plant organ help the organisms to perform different functions efficiently.

2. Complex Permanent Tissues

They are those permanent tissue which are made of more than one type of cells which work together to perform a particular function. Common complex permanent plant tissues are **Conduting or Vascular tissues,** of two types : **Xylem and Phloem.** They join together to produce vascular bundle. Vascular tissues have made possible the survival of plants in the terrestrial environment as they can carry materials to long distances inside the plants.

(a) **Xylem :** Xylem is a complex permanent plant tissue which takes part in **conduction of water and mineral** salts inside the plant. In Xylem, materials can move only in upward direction. Additionally, it provides **mechanical strength.**



It consists of four types of elements.

1. **Tracheids :** They are long, tubular dead cells with lignified walls and tapering ends. They help in movement of water and minerals.
2. **Vessels :** They are very long tubes which are formed by union of large number of dead empty cells. The walls are lignified and generally possess pits. They also help in transporting water and minerals.
3. **Xylem Fibres :** They are sclerenchyma fibres in Xylem.They provide mechanical strength.
4. **Xylem Parenchyma :** It consists of living cells, Cells of xylem parenchyma store food and also help in sideways conduction of water.

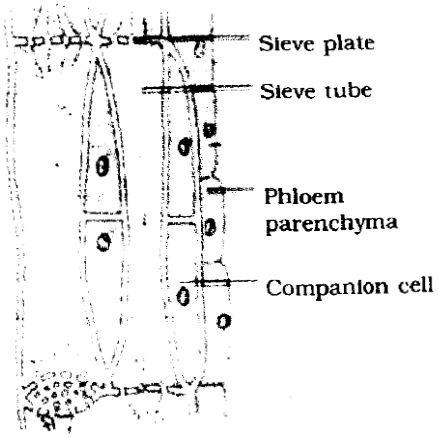
Functions :

1. The main function of xylem is to carry water and mineral salts upward from the root to different parts of shoots.
2. Since walls of tracheids, vessels and sclerenchyma of xylem are lignified, they give mechanical strength to the plant body.

Trachied	Vessel
• It is formed from a single cell.	• A vessel is formed by a large number of cells.
• Tracheial ends are tapering.	• Vessels ends are rounded.
• Wall is comparatively thick.	• Wall is comparatively less thicker.
• It is less efficient in conduction of water.	• It is more efficient in conduction of water.

(b) **Phloem**

It is a complex permanent plant tissue which takes part in conduction of organic food inside the plant. Phloem is called **living conducting tissue** as its transport channels are made of living cells.



Phloem is made of four types of elements.

(i) **Sieve tubes :** Sieve tubes are tube-like structures composed of elongated thin-walled cells, placed end to end. Their end walls are perforated by numerous pores and are called **sieve plates**. They help in conduction of food in both upward and downward direction.

(ii) **Companion cells :** They are thin-walled cells which lie on the sides of sieve tube cells. They help in proper conduction of food.

(iii) **Phloem Parenchyma :** Cells of phloem parenchyma are thin-walled by living. They have two function, storage and sideways conduction of food.

(iv) **Phloem fibres :** They are the only nonliving components of phloem. They provide mechanical strength to the tissue.

Functions :

Phloem transports photosynthetically prepared food materials from the leaves to the storage organs and later from storage organs to the growing regions of the plant body.

Xylem	Phloem
• It conducts water and minerals.	• It conducts organis solutes or food minerals.
• Conduction in mostly unidirectional.	• Conduction can be bidirectional.
• Conducting elements are trachieds and vessels.	• Conducting elements are sieve tubes.
• Xylem consists of vessels, trachieds, xylem fibres, and xylem parenchyma.	• Phloem consists of sieve tubes, companion cells, phloem fibres and phloem parenchyma.
• Only xylem parenchyma is living.	• Only Phloem fibres are dead.
• Xylem provides mechanical strength to the plant.	• They don't provide mechanical strength to plant.

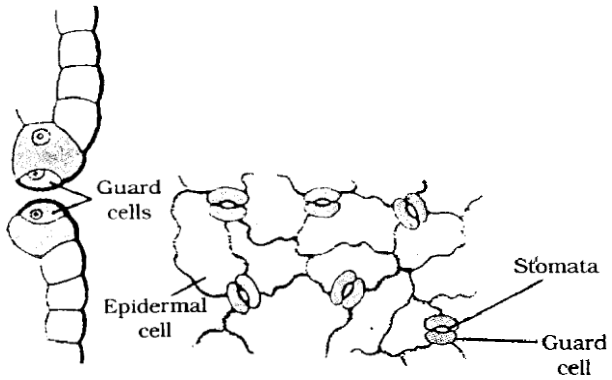
3. Protective Tissue

It is an outer layer of cells that covers plant parts (stem, root, leave, flowers, fruits, etc.) providing protection against adverse environmental factors and pathogens beside performing specialised functions like exchange of gases.

Protective tissue is of two types :

(a) **Epidermis**

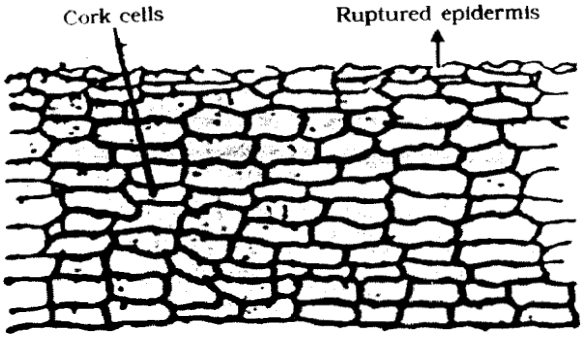
- The epidermis is usually made of a single layer of cells. In some plants living in very dry habitats, the epidermis may be thicker since protection against water loss is critical.
- The entire surface of a plant has this outer covering of epidermis. It protects all the parts of the plant.
- Cells of epidermis are elongated and closely packed. Inter-cellular spaces do not occur between them.
- Epidermal cells on the aerial parts of the plant often secrete a waxy, water-resistant layer called **cuticle** on their outer surface.
- In some plants like desert plants, epidermis has a thick waxy coating of cutin (chemical susbtance with waterproof quality) on its outer surface.
- Most epidermal cells are relatively flat. Often their order and side walls are thicker than the inner wall.



- At places the aerial parts bear minute pores called stomata. Each **stomata** is enclosed by a pair of specialised epidermal cells called **Guard cells.** Guard cells are kidney-shaped.
- They are necessary for exchanging gases with the atmosphere. **Transpiration** (loss of water in the form of water vapour) also takes place through stomata.
- Epidermal cells of the roots, whose function is water absorption, commonly bear long hair-like parts that greatly increase the total absorptive surface area.

(b) **Cork**

- As plants grow older, the outer protective tissue (i.e., epidermis) undergoes certain changes.
- The epidermis of stem is replaced by a strip of secondary meristem called **cork cambium.**
- Cork Cambium gives off new cells on its both sides, thus, forming cork (phellem) on the outer side and the **secondary cortex** on the inner side.
- The layer of cells which is cut by cork cambium on the outer side ultimately becomes several layered thick **cork** of trees.
- Cells of cork are dead and compactly arranged without intercellular spaces.
- The walls of cork cells are heavily thicknened by the deposition of any organic substance called **suberin.**
- Suberin makes these cells impermeable to water and gases.



- Cork prevents loss of water by evaporation.
- It provides protection against mechanical injury, extremes of temperature, fire, etc.
- It is used in manufacture of stoppers for bottles, sport goods, shock absorbers, etc.

ACTIVITY - 3

Aims : To study epidermis

Working :

- Take a freshly plucked leaf of Rhoeo.
- Stretch and break it by applying pressure.
- While breaking it, keep it stretched gently so that some peel or skin projects out from the cut.
- Remove this peel and put it in a petridish filled with water.

- Add a few drops of safranin.
- Wait for a couple of minutes and then transfer it onto a slide. Gently place a coverslip over it.
- Observe under microscope.

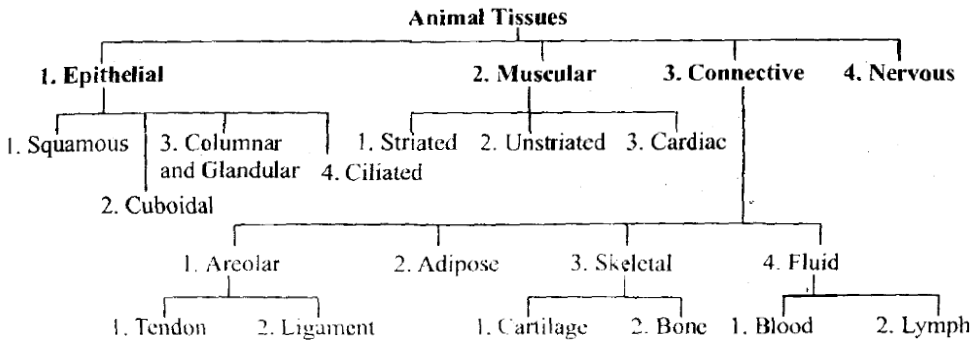
Observation

The peel contains many large parenchymatous cells. They are epidermal cells. At places the strip contains oval structures called **stomata.** Each stomata contains two small kidney shaped guard cells. Stomata are seats of gaseous exchange and transpiration.

Meristematic tissue	Permanent tissue
• The cells are small rounded and un-differentiated.	• The cells are large differentiated with different shapes.
• Cell wass is thin.	• Cell wall is thin or thick.
• Vacuoles are absent.	• Large central vacuole occurs in living permanent cells.
• Intercellular spaces are absent.	• Intercellular spaces are often present.
• It is a simple tissue.	• It can be simple, complex or special.
• The cells undergo regular divisions.	• The cells do not normally divide.

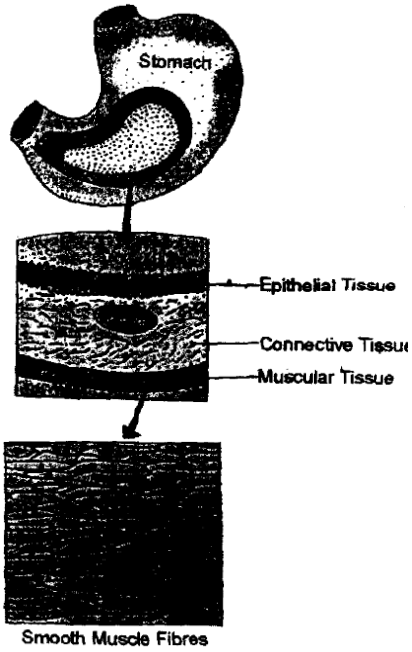
ANIMAL TISSUES

- The working of an animal body is controlled by tissue and organs formed from them. For example, breathing is due to contraction and relaxation of certain muscles.
- In breathing inhalation provies oxygen to blood inside lungs. Carbon dioxide contained in blood passes into air to be exhaled.
- Blood carries oxygen and food to all cells. Waste products produced by cells are picked up by blood to be disposed by liver and kidneys.
- Blood is a component of connective tissue while muscles constitute muscular tissue. On the basis of their structure and functions, Animals have four principal types of tissue – epithelial, connective muscular and nervous .



1. Epithelial Tissue or Epithelium

- It is fundamental animal tissue which forms a continuous sheet of closely pakced cells that covers all external and internal surfaces of the animal body.
- The epithelial cells have small amount of cementing materials between them and intercellular spaces are absent.
- All epitheliums are usually separated from the underlying tissue by an extra-cellular fibrous basement membrane.
- Epithelium forms a barrier for separating the different body systems. Anything entering the body must cross atleast one layer of epithelium.
- Permeability of cells of various epithelia determine passage of subsances between different body parts and between body and external environment.
- Epithelial tissue occurs over the skin, lining of respiratory tract, nasal membrane, kidney tubules, urinary tract, blood vessels and different types of glands.



Functions :

1. The cells of body surface form the outer layer of skin. These cells protect the underlying cells from drying, injury and chemical effects. They also protect the body from viral or bacterial infection.
2. They help in absoption of water and nutrients.
3. They help in elimination of waste products.
4. They perform secretory function. They secrete a variety of substance such as sweat, saliva, enzymes,etc.

Types of Epithelial Tissue

Depending upon the shape and function of the cells the epithelial tissues are classified as follows :

(i) Squamous epithelium

(ii) Cuboidal epithelium

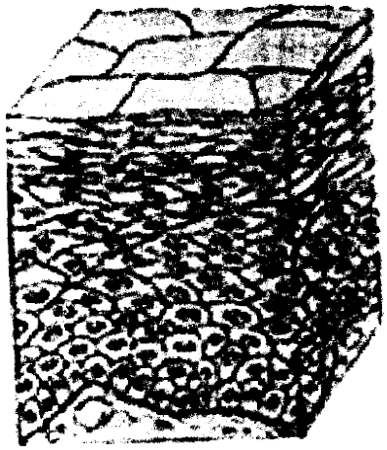
(iii) Columnar epithelium

(iv) Cilitated epithelium

(i) **Squamous epithelium**

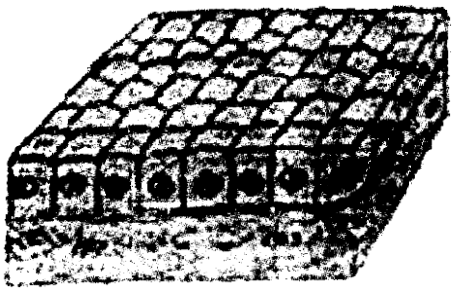
- It is made up of thin, flat, irregular-shaped cells which fit together like floor tiles to form a compact tissue.
- It forms the delicate lining of cavities (mouth, oesophagus, nose, alvedi, etc.) and of blood vessels and covering of the tongue and skin.
- It protects the underlying parts of body from mechanical injury, entry of germs, chemicals and drying. It also forms a selectively permeable surface through which filteration occurs.

Stratified squamous epithermium : This is found in skin and covers the external dry surface of the skin. Cells of this tissue are arranged in many layers. Cells forming different layers of this epithelium are not similar. This epithelium is water-proof and highly resistant to mechanical injury.



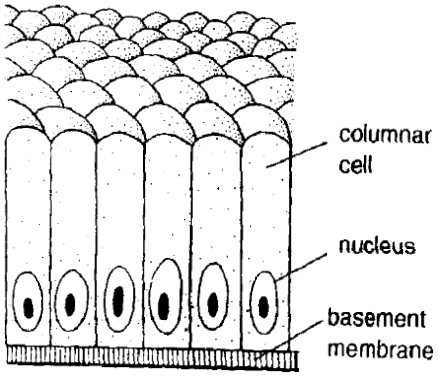
(ii) **Cuboidal epithelium**

- It consists of cube-like (cubical) cells which are square in section.
- It is found in kidney tubules, thyroid vessels and in glands (eg. salivary glands, sweat glands and exocrine pancreas).
- It helps in absorption, excretion and secretion. It also provides mechanical support.



(iii) **Columnar epithelium**

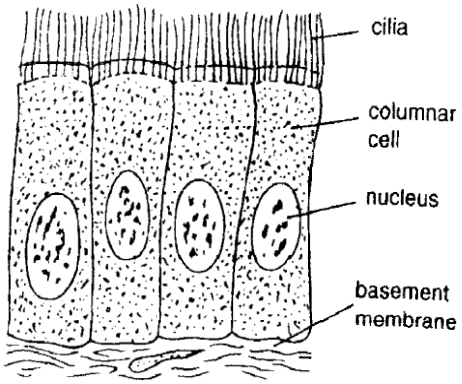
- It consists of cells which are taller than broad (i.e., pillar-like). The nuclei are towards the base and sometimes the free ends of cells has a brush border containing microvilli.
- It forms lining of stomach, small intestine and colon. If facilitates movement across the cells.
- Its main function include absorption (e.g. stomach, intestine) and secretion.



(iv) **Glandular epithelium**

- Epithelial cells often acquire additional specialisation as gland cells, which can secrete substances at the epithelial surface.
- Sometimes a portion of the epithelial tissue folds inward, and a multicellular gland is formed. This is called glandular epithelium.

(v) **Ciliated epithelium**

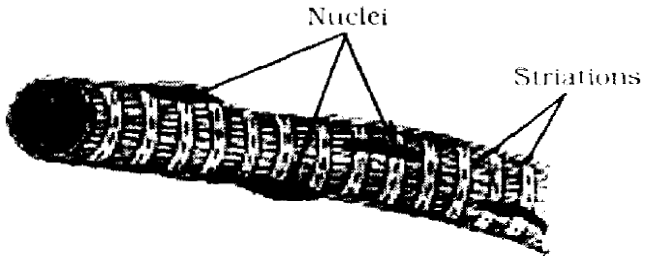


- Certain cuboidal columnar cells have hair like projections called Cilia. Such cells form the ciliated epithellium.
- The cilicated columnar epithelium lines the respiratory tract, kindley tubules and oviducts.
- The rhythmic beating of the cilia moves solid particles in one direction through the ducts.

2. MUSCLE TISSUE (or MUSCULAR TISSUES)

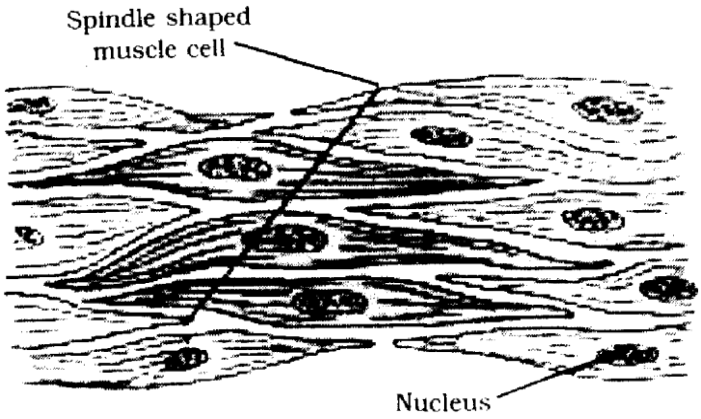
- The muscle tissues or muscles of the body form the contractile tissue and are made up of muscle cells.
- The movements of the body or limbs are brought about by contraction and the relaxation of contractile proteins which are present in muscle cells.
- On the basis of their location structure and function, there are following three types of muscle fibres.
  - (i) Striated muscles
  - (ii) Smooth muscles
  - (iii) Cardiac muscles

(i) **Striated muscles**



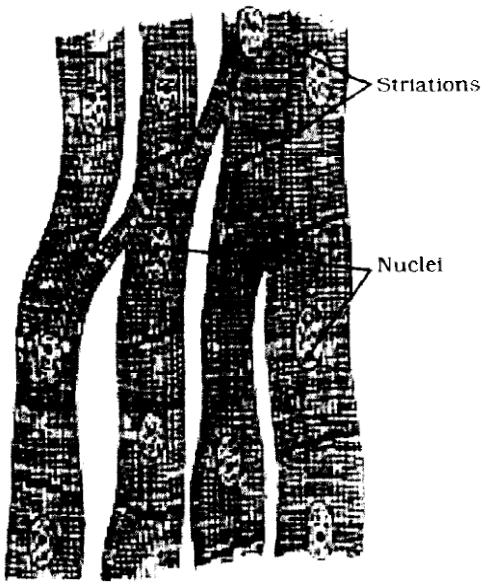
- These muscles are also known as **striped, skeletal or voluntary muscles.**
- Since the entire muscle fibres show alternate dark and light stripes (bands), they are called **striped muscles or striated muscles.**
- Since they are attached to bones and are responsible for body movements, they are called skeletal muscles.
- Since these muscles work according to our will, they are also called **voluntary muscles**.
- The striated muscle fibres (cells) are long, cylindrical, unbranched and multinucleate (having many nuclei).
- They occur in muscles of limbs, body wall, face, neck, etc. They are also present in tongue, pharynx, diaphragm and upper part of oesophagus.
- These muscles are powerful and undergo rapid contraction. These muscles can be tired and need rest.
- Striated muscles provide the force for locomotion and all other voluntary movement of the body.

(ii) **Smooth Muscle**



- These are also known as unstriated or involuntary muscles.
- Smooth muscles occur as bundles or sheets of spindle-shaped (pointed at both ends) cells or fibres. These are held together by loose connective tissue.
- Each muscle cell is enclosed in a plasma membrane. There is a single centrally located nucleus in the centre of cytoplasm.
- These fibrils do not bear any bands, stripes or striations across the muscles hence, called smooth or unstraited muscles.
- The occur in the wall of alimentary canal and internal organs, ducts of glands, blood vessels. Smooth muscles are found in stomach, intestine, water, iris of eye, etc.
- Smooth muscles do not work according to our will, so they are all also called **involuntary muscles.**

(iii) **Cardiac Muscles**



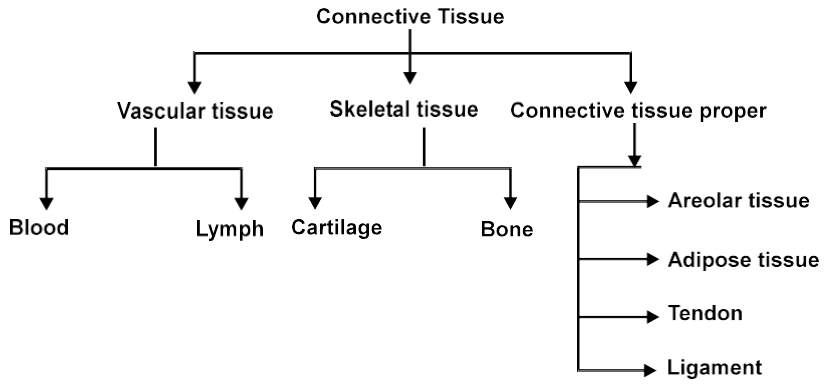
- Cardiac or heart muscle cells are cylindrical, branched and uninucleate.
- Cardiac muscles have stripes or light and dark bands. In addition, these muscles fibres show densely stained cross-bands called **Intercalated discs**.
- The cardiac muscles occur in the heart (i.e., in the walls of heart).
- Cardiac muscles contract and relax rapidly, rhythmically and tire lessly throughout life. They contract endlessly from early embryonic stage until death.
- The contraction and relaxation of heart muscles help to pump and distribute blood to various parts of body.

Smooth muscle	**Skeletal muscle**	**Cardiac muscle**
Not striated	Striated	Striated
Spindle-shaped	Cylindrical	Cylindrical
No discs	No discs	Intercalated discs
Involuntary	Voluntary	Involuntary
Nucleus-central	Nuclei-peripheral	Nuclei-Central
Not-Branched	Not-Branched	Branched.

3. CONNECTIVE TISSUE

Connective tissue binds different structures of the body eg., bone with bone, muscles with skin.

- It forms the packing material in different organs.
- Various organs of the body are covered by protective sheaths of connective tissue.
- Connective tissue are classifed on the basis of nature of matrix ~ Connective tissue proper (matrix jelly like), skeletal tissue (matrix solid) and vascular tissue (matrix fluid).
- Skeletal connective tissue (bone, cartilage) forms supportive framework of the body.
- Vascular tissue forms an internal transport system of the body.
- Fat is stored in connective tissue called tissue.

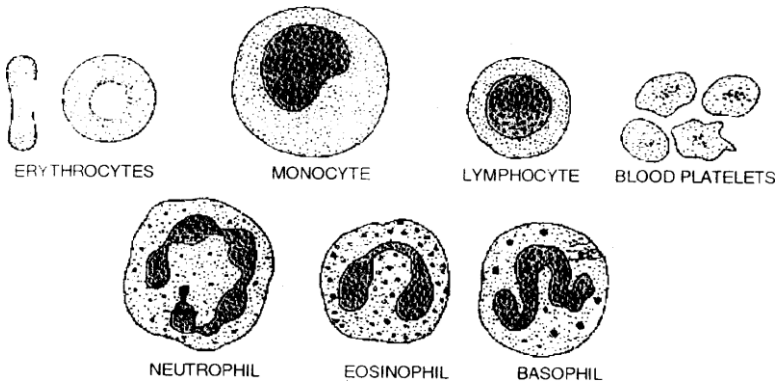


(A) VASCULAR CONNNECTION TISSUE

Vascular connective tissue links the different parts of body and maintains a continuity in the body. It includes **Blood and lymph.**

(i) Blood

- Blood is a fluid connective tissue. In this tissue cells move in a fluid or liquid matrix or medium called **Blood Plasma.**
- In Plasma, white Blood cells, Red Blood cells and platelets are suspended. Plasma conains proteins, salts and hormones.
- Blood occurs in blood vessels called Arteries, veins and capillaries which are connective together to form the circulatory system.
- Blood transports nutrients, hormones and vitamins to the tissues and transports excretory products from the tissues to the liver and kidney.
- The Red blood cells (RBCs) carry oxygen to the tissues for the oxidation of food stuff.
- The white blood cells (WBCs) fight disease either by engulfing and destroying foreign bodies.
- Blood Platelets help in the clotting of blood.



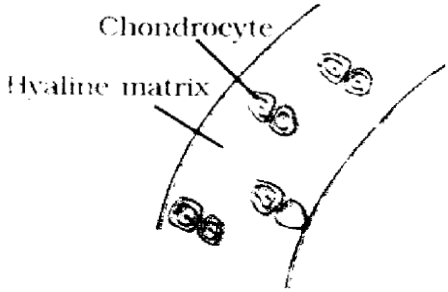
(ii) Lymph

- Lymph is a colourless fluid. Its composition is similar to that of blood except that red blood cells and some blood proteins are absent in it.
- Lymph transports the nutrients (oxygen, glucose) that may have filtered out of the blood capillaries back into the heart.
- The Lymph protects the body against infection.

(B) SKELETAL TISSUE

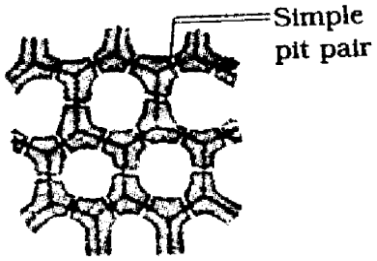
- It is a connective tissue in which matrix is solid.
- The skeletal on supporting tissue includes cartilage and bone.

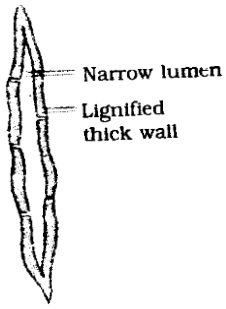
(i) **Cartilage**



- The cartilage is a specialised connective tissue which is compact and less vascular. It has widely spaced cells.
- Its solid matrix is composed of proteins and sugars and is slightly hardened by Calcium salts.
- The matrix of cartilage have a delicate network of collagen fibres and living cells, chondrocytes.
- Cartilage is located in the folloiwng body parts : ear, nose tip, trachea and larynx.
- It provides support and flexibility to the body parts. It smoothens surface at joints.

(ii) **Bone**





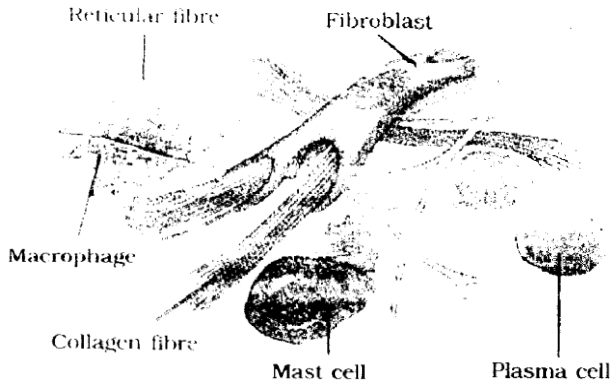
- Bone is a very strong & non-flexible tissue.
- Bone is porous, highly vascular, mineralised hard and rigid.
- Bone cells called as Osteoblasts are embedded in the hard matrix that is composed of proteins, calcium and phosphorus compounds.
- These minerals are responsible for the hardness of the bone.
- It serves the following functions :
  - (i) It provides shape to the body.
  - (ii) It provides skeletal support to body
  - (iii) It protects vital body organs such as brain, lungs, etc.
  - (iv) It serves as strong site of calcium and phosphate.
  - (v) It anchors the muscle.

Bone	Cartilage
• Blood vessels present.	• Blood vessels absent
• Hard and inflexible	• Flexible
• Porous	• Non-porous
• Matrix made up of protein and mineral salts (e.g. calcium & phosphate)	• Matrix made up of protein.

(c) **Connective tissue proper**

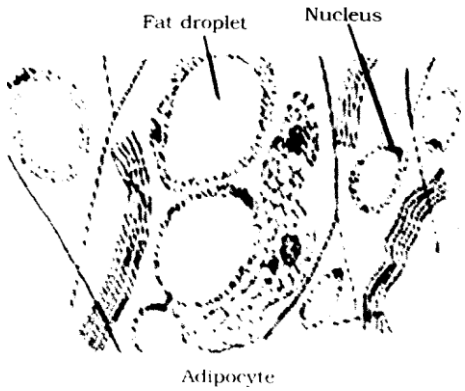
It is connective tissue having felly like matrix. Different types of connective tissue proper are :

(i) **Areolar tissue**



- Its matrix consist of collagen and Reticular fibre. Also, scattered in matrix are several kinds of irregular cells like fibroblast, MAST cell, macrophages, etc.
- It is the simplest and most widely distributed connective tissue. It joins skin to muscle, fills spaces inside organs, is found around muscles, blood vessels and nerves.
- It acts as a supporting and packing tissue between organs lying in the body cavity.
- It fixes skin to underlying muscles.

(ii) **Adipose tissue**



- It is a connective tissue which is specialised to store fat.
- The cells of the tissue also called as Adipocytes are filled with fat globules.
- It is found below the skin and between internal organs.
- It serves as a fat reservoir.
- Storage of fat also lets it act as an insulator.

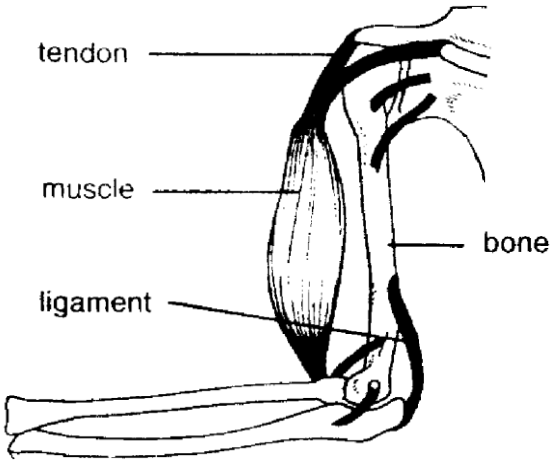
(iii) **Tendon**

Tendons are cord-like, strong inelastic structures that join skeletal muscles to bones. Thus, a tendon is a white fibrous tissue. It has great strength but its flexibility is limited.

(iv) **Ligaments**

They are elastic structures which connect bones to bones. A ligament is highly elastic and has great strength but contains very little matrix.

Ligaments strengthen then the joint and they permit normal movement but prevent over-extension.



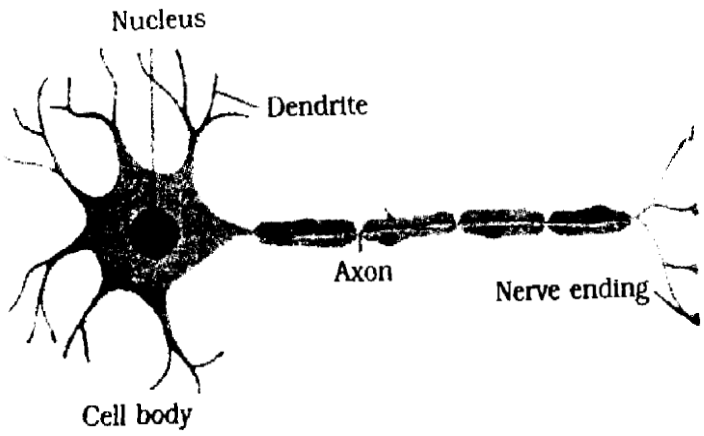
Tendon	**Ligament**
• Inelastic	• Elastic
• Join muscle to bone	• Connect bones to bones

4. NERVOUS TISSUE

- A tissue which is specialised to transmit message in our body is nervous tissue.

  Brain, spinal card and nerves are all composed of nervous tissue.

- Nervous tissue contains highly specialised unit cells called **nerve cells or neurons**. Neurons have the ability to receive stimuli from within or outside the body and conduct (send) impulses (signals) to different parts of the body. The impulse travels from one to another neuron.



Each neuron has following three parts :

1. **The cyton or cell body** which contains a central nucleus and cytoplasm.
2. The **Dendrites** are many short, branched projection arising from cell body.
3. The **Axon** is the longest dendrite arising from cell body.

Many nerve fibres bound together by connective tissue to make a nerve. Through then, nerve impulses travels, which allow us to move our muscles when we want to.

SOLVED NCERT QUESTIONS

Q1. **What is a tissue ?**

Sol. Tissue is a group of cells are similar in structure and or work together to achieve a particular function.

Q2. **What is the utility of tissues in multicellular organisms ?**

Sol. Tissues provide protection, mechanical strength and give highest possible efficiency of function to the organisms.

Q3. **Name types of simple tissues.**

Sol. (i) Parenchyma
(ii) Collenchyma and
(iii) Sclerenchyma

Q4. **Where is apical meristem found ?**

Sol. At the growing tips of root and stem in the plants.

Q5. **Which tissue makes up the husk of coconut ?**

Sol. Sclerenchyma tissue.

Q6. **What are the constituents of phleom ?**

Sol. The phloem is composed of four types of elements ;
(i) Sieve tubes,
(ii) companion cells
(iii) phleom fibres and
(iv) phloem parenchyma.

Sieve tubes are tubular cells having perforated walls. They transport food from leaves to other parts of plant body. Expect for phloem fibres, all pholem cells are living.

Q7. **Name the tissue responsible for the movement in our body.**

Sol. Muscular tissue.

Q8. **What does a neuron look like ?**

Sol. Neuron is the structural and functional unit of nerve tissue. Hair like parts arise from it.

Q9. **Give three features of cardiac muscles.**

Sol. Three features of Cardiac muscules :
1. They are involuntary in action.
2. They occur in heart only.
3. They have intercalated discs and donot feel fatigue.

Q10. **What are the functions of areolar tissue ?**

Sol. The functions Areolar (loose) tissue :
1. Acts as supporting and packaging tissue.
2. It helps in repair of tissues after the injury.
3. it fixes skin to underlying muscles.
4. Helps in combating foreign toxins.

Q11. **Define the term "tissue".**

Sol. Term "tissue" is defined as "a group of cells which have common origin and structure and they

perform similar functions."

Q12. **How many types of elements together make xylem tissue ? Name them.**

Sol. **Xylem :** It is complex tissue. It is made up of different types of cells which are as follows :

1. **Vessels :** They are narrow having annular and spiral thickenings in proto-xylem. They are dead.
2. **Tracheids :** They are elongated tube like structures. They do not have perforations or openings at their ends. They are dead.
3. **Xylem parenchyma :** They are living cells and are called wood parenchyma.
4. **Xylem fibres :** They are long, slender and pointed dead sclerenechymatous cells. They are called wood fibres. They have small pits and thickened walls.

Q13. **How are simple tissues different from complex tissues in plants ?**

Sol. Difference between simple and complex tissues :

Simple Tissues :

1. They are made up of one types of cells with uniform mass.
2. Their cells are similar in structure and fun ctions.
3. Examples are parenchyma, sclerenchyma.

Complex Tissues :

1. These are composed of more than one type of cells.
2. Their cells are different in structure and functions.
3. Examples are xylem as well as the phleom.

Q14. **What are the functions of stomata ?**

Sol. Functions of stomata :

1. Gaseous exchange (O_2 and CO_2 in plants).
2. Transpiration takes place by means of stomata found in leaves.

Q15. **What is the specific function of cardiac muscle ?**

Sol. Specific functions of Cardiac Muscle : It forms myocardium of the heart. Its main functions is rhythmic contraction and relaxation throughout life without fatigue under the normal conditions.

Q16. **Name the following :**

(a) Tissue that formsinner lining of our mouth.

(b) Tissue that connects muscle to bone in humans.

(c) Tissue that transports food in plants.

(d) Tissue that stores fat in our body.

(e) Connective present in the brain.

Sol. (a) Epithelial tissue

(b) Squamous epithelium- Epithelial tissue

(c) Phleom

(d) Adipose tissue

(e) Fluid connective tissue – Blood and Lymph

(f) Nervous tissue

Q17. **Identify the types of tissue in the following : skin, bark of tree, bone, lining of kidney tubule, vascular bundle.**

Sol. 1. **Skin :** Protective tissue in animals.

2. **Bark of tree :** Protection tissue in animals
3. **Bone :** Connective tissue
4. **Lining of kidney tubule :** Cuboidal epithelium.
5. **Vascular bundle :** Complex permanent tissue in plants.

Q18. **Name the regions in which parenchyma tissue is present.**

Sol. The cortex in stem, mesophyll of leaf, aerenchyma is aquatic plants.

Q19. **What is the role of epidermis in plants ?**

Sol. Role of Epidermis in Plants :

(a) It plays protective role.

(b) It forms the entire covering of a plant.

(c) It possesses stomata for gaseous exchange and transpiration.

Q20. **How does cork act as a protective tissue?**

Sol. The cells of cork are dead. These are compactly arranged. They have no intercellular spaces. They possess a deposition of suberin on the walls and it makes impervious to gases as well as the water.

SOLVED IMPORTANT QUESTIONS

Q1. **What is a tissue ?**

Sol. "A group of cells having same origin, sturcture and function" is called a tissue.

Q2. **Where do you find meristematic tissues in plants ?**

Sol. Meristematic tissues in plants occur in the growing regions of the plants e.g. shoot apex and root apex and the lateral regions.

Q3. **A certain plant tissue is characterised by cells having thin walls,prominent nucleus and small vauoles. Name the tissue and its three locations.**

Sol. Parenchyma : Root, steam and leaves.

Q4. **Define a tissue.**

Sol. Tissue is defined as "a group of cells of similar structure and function."

Q5. **What is calyptrogen ?**

Sol. Meristematic zone with produces root cap or calyptra.

Q6. **What kind of tissue is present on shoot tip and root tip ?**

Sol. Meristematic tissue.

Q7. **What are two special types of parenchyma?**

Sol. (i) Aerenchyma and
(ii) Collenchyma

Q8. **Name two specialized kinds of parenchyma.**

Sol. (i) Aerenchyma
(ii) Collenchyma.

Q9. **Which one of the following is a tissue : liver, bone, testis, ovary ?**

Sol. Bone is a tissue.

Q10. **Name the type of wood where vessels are absent.**

Sol. Soft wood of gymnosperm like pinus.

Q11. **What is the function of phleom parenchyma?**

Sol. Storage of food and slow conduction of food.

Q12. **Name three kinds of meristem.**

Sol. Apical, intercalary7 and lateral meristems.

Q13. **What are sieve elements ?**

Sol. Sieve elemnts are the parts of phloem.

Q14. **What are tracheids ?**

Sol. Elongated tube-like structures in xylem.

Q15. **Give the function of xylem fibres.**

Sol. They give strength and support to the plant.

Q16. **What are companion cells ?**

Sol. Specilized parenchyma cells associated with the sieve-tube members.

Q17. **Write two types of plant tissues.**

Sol. The plant tissues are of two main tyeps

(i) meristematic tissue and

(ii) permanent tissues.

Q18. **What is meristematic tissue ?**

Sol. The meristematic tissue is the dividing tissue present at the growing regions of plant.

Q19. **What are permanent tissues ? Give their two types.**

Sol. The permanent tissues are derived from meristematic tissue when they lose the ability to divide. Permanent tissues are classified as simple and complex tissues.

Q20. **What is ligament ?**

Sol. A connective tissues that joins bones to bones.

Q21. **Name the tissue that connects muscles to a bone.**

Sol. Tendon.

Q22. **Name the kind of tissue which forms inner lining of the blood vessels.**

Sol. Squamous epithelium.

Q23. **Which chemical is released at the synapse?**

Sol. Acetylcholine.

Q24. **Define organ.**

Sol. A number of tissues together form an organs.

Q25. **Which type of animal tissue covers the external surfaces of body ?**

Sol. Epithelial tissue.

Q26. **Name two kinds of epithelial tissues.**

Sol. (i) Simple epithelum and

(ii) Compound epithelum.

Q27. **State the main difference between tendon and ligament.**

Sol. Tendon connects the muscle to a bone while ligament joins bone together.

Q28. **Name the eipthelium that lines inner surface of urinary bladder.**

Sol. Transitional epithelium.

Q29. **Where does aerolar tissue occur ?**

Sol. Beneath the epithelia of hollow visceral organs, skin and on the walls of veins and arteries.

Q30. **What are the three types of cells found in areolar tissue ?**

Sol. Mast cells, macrophage and fibroblasts.

Q31. **Where do you find hyaline cartilage ?**

Sol. At the extremity of larynx, trachea and long bones.

Q32. **Whch tissue stores fat globules ?**

Sol. Adipose tissue.

Q33. **Which two types of cells make myelin sheath ?**

Sol. (i) Schwarn cells and

(ii) Neuroglia cells.

Q34. **"Muscle cells are called muscle fibres." Why ?**

Sol. Muscle cells are thin and elongated into thread-like structures.

Q35. **Name the term used for plasma membrane of muscle cell.**

Sol. Sarcolemma.

Q36. **Name the different types of element found in the xylem.**

Sol. The different elements of xylem are :

(i) Vessels

(ii) Tracheids

(iii) Xylem parenchyma

(iv) Wood fibres.

Q37. **Differentiate between root apex and shoot apex.**

Sol. Differences between root and apex and shoot apex.

Root apex :

1. The root apex is subterminal.
2. The root apex does not have any lateral appendages.

Shoot apex

1. The shoot apex is terminal.
2. The shoot apex has lateral appendages in the form of leaf primordia.

Q38. **How many tyeps of elemntls are present in the phloem ?**

Sol. There are four types of elements in the phloem. They are

(i) Sieve tubes

(ii) Companion cells.

(iii) Phloem parenchyma

(iv) Phloem fibres.

Q39. **What is the function of phleom ?**

Sol. Function of phloem : Conduction of prepared food from the leaves to different parts of plant body.

Q40. **What is the function of xylem ?**

Sol. Function of Xylem : Conduction of water and mineral salts from the roots to the leaves and giving mechanical strength to the plant.

Q41. **What are sieve elements ?**

Sol. Seive elements : They are parts of the phloem. They are of two types.

(i) Sieve cells and (ii) Sieve tubes

Sieve cells occur in gymnospherms and pteridiophyes. The cell wass are perforated. They have cell plates. In angiospherms, sieve tubes occur. They are meant for translocation and conduction of food material.

Q42. **Give the types of simple tissue and complex tissue.**

Sol. The parenchyma, collenchyma and seclerenchyma are thre types of simple tissues. The xylem and phloem are two types of complex tissues.

Q43. **Write the main feautres of protective tissue.**

Sol. Protective Tissue : Protective tissues are found in the outermost layer of plant body e.g. roots, stems, leaves and flowers.

(i) Thye are one-called thick.

(ii) They are convered by cutin.

(iii) They protect the inner tissue in plant body.

When roots and stems grow old, the peripheral tissue forms cork cells (phellem). Cork cells are dead and have no intercelluar spaces. their wall sare thickened due to deposition of suberin. Hence they prevent loss of water from the internal tissue.

Q44. **Mention the function of different types of cells of xylem. Sol.**

Functions of xylem-cell types :

(i) **Tracheids and vessels :** They conduct water and minerals from the roots to the upper parts of the plants.

(ii) **Xylem parenchyma :** They help in food storage and lateral transport of substances.

(iii) **Xylem fibres :** They provide strength and support to the plants.

Q45. **What is the collenchyma ?**

Sol. Collenchyma : It is composed of oval or polygonal and living cells having deposition of cellulose and pectin at their corners. It occurs below epidermia in the herbaceous plants. It provides elasticity and mechanical strength to the growing regions. They cells which have chloroplast help in photoysnthesis.

Q46. **What ar the different types of tissues in animals ?**

Sol. Different types of tissues in animals : They are four types of tissues in animal; — epithelium, connective, muscular and nervous.

Q47. **What is the function of bone, cartilage, ligament and tendon ? Sol.**

Function of bone, cartilage, ligament and tendon :

Bone : It forms framwork of body.

Cartilage : It forms endoskeleton in cartilaginous fishes.

Ligament : It joins bones to bones.

Tendon : It joins muscles to the bones.

Q48. **Different between ligaments and tendon.**

Sol. **Ligament :** It joins bones to bones.

Tondon : It joins muscles to the bones.

Q49. **Give two differences between bone and cartilge.**

Sol. **Bone**

1. Matrix is hard and strong.
2. Matrix made up of ossein.

Cartilage

1. The matrix is soft and elastic.
2. The matrix is made of chondrin.

Q50. **Give two differences between striated and unstriated muscles.**

Sol. Two differences between striated and unstriated muscles :

Striated muslces :

1. They are called skeletal muscles. They are voluntary in action.
2. They are uninucled.

Unstraited muscles :

1. They are called smooth muscles are involuntary in action.
2. They are multinucteatd.

Q51. **Enlist the main features of collenchyma.**

Sol. Main features of Collenchyma : Flexiblity in plants is due to collenchyma. It is a permanent tissue that permits easy bending in various parts of a plant. Such as the leaf, stem without actually breaking it. It also gives mechanical support to the plants. It is present in leaf stalks below the epidermis.

The cells of it are living, elongated and thickened due to pectin at the corners. They have no intercellular spaces between them.

Q52. **Name a permanent tissue and write its functions.**

Sol. Permanent tissue : Sclerenchyma : The permanent tissue, sclerenchyma is a tissue that hardens the plants. The husk of coconut is made of sclerenchymatous tissue. The cells of it are dead, long, narrow. The walls of it are thickened due to lignin (a chemical that acts as cement and hardens them). It is found in stems, around vascular bundle, the veins of leaves and hard covering of seeds as well as the nuts. Sclerenchyma provides strength and flexibility to plant parts.

Q53. **Write two functions of the mast cells.**

Sol. Functions of Mast Cells :

1. They relased histamine.
2. They release heparin, an anticoagulant which prevents blood clotting.

Q54. **Give three difference between cartilage and ligament. Sol.**

Differences betweeen cartilage and ligament.

Cartilage

1. It is tough and flexible connective tissue.
2. It is covered by perichondrium and its matrix has no lamellae.
3. Chondrocytes and lacunae are scattered in network of elastic fibres.

Ligament

1. It is does fibrous tissue.
2. Ligament is made of elastic and collagen fibres.
3. Dense and strong binding two bones together.

Q55. **Write a short note on fibrous cartilage.**

Sol. **Fibrous cartilage :** It is found in the regions such as in between the vertebrate in public symphsis. This type of cartilage has chondrocytes arranged in rows between bundles of collagen fibres.

Q56. **What is meristem ?**

Sol. Meristem is a group of cells that are in a continuous state of division. It is of three types

(i) **Apical meristem :** Present at root and shoot apex.

(ii) **Intercalary meristem :** They are intercalated between the permanent tissues.

(iii) **Lateral meristem :** Present along the side of the stem e.g., cambium and cork cambium.

Q57. **Write the function of collenchyma, parenchyma and sclerenchyma.**

Sol. Functions of collenchyma : Mechanical as well as vital functions.

Function of parenchyma : Storage of food material.

Function of Sclerenchyma : Mechanical support to the plant.

Q58. **What is the difference between parenchyma and collenchyma ?**

Sol. **Parenchyma**

1. It cells are thin and isodiametric.
2. No thickening on cell walls.
3. Intercellular spaces present.

Collenchyma :

1. Its cells are thick-walled and elongated
2. Thickening of pectin on cells walls.
3. Intercellular spaces absent in between cells.

Q59. **What are simple permanent tissues ?**

Sol. Simple permanent tissues : It is made of parenchyma cells which are similar in origin, structure and function. It is of three types

(i) Parenchyma

(ii) Collenchyma and

(iii) Sclerenchyma.

(i) **Parenchyma :** It occurs in the soft parts of the plants abundantly. The cells of this tissue are isodiametric and living. It takes part in the storage of food and slow conduction as well as trigitidy. It may be modified into chlorenchyma (parenchyma having chloroplast). Chlorochyma of leaf mesophyll may be palisade parenchyma and spngy parenchyma; aerenchyma (parenchyma cells with large air ciavities) e.g. petiole of banana and canna. prosenchyma is elongated firbe-like parenchyma.

(ii) **Collenchyma :** Simple permanent tissue made up of elongated, isodiametric cells having unevenly thickened pectin and cellulose walls. It gives mechanical strength as well as elasticity e.g., climbing stems.

(iii) **Sclerenchyma :** Spindle-shaped, elongated, thick-walled cells with pointed or oblique and walls are called fibres e.g., phloem and xylem. Sclereids are broad sclerenchyma cells of rounded, oval, spherical or cylindrical shape. They may be single or in groups.

Q60. **What is the difference between sceleren-chyma and collenchyma ? Sol.**

Difference between scelerenchyma and collenchyma.

Sclerenchyma

1. Thick-walled cells having lignified hard walls.
2. They are dead at maturity.
3. They consists of two types of cells scelereids and fibres.

Collenchyma

1. The cells having soft, piable primary walls and are unevenly thick.
2. They are living cells.
3. It is composed of one type of cells only.

Q61. **List the various components of xylem tissue and explain their main features.**

Sol. The xylem is made of tracheids, vessels, xylem parenchyma and xylem fibres. The cells are thick-walled and often dead. The tracheids and vessels are tubular vessels. They are arranged in the form of a tube. It helps them transport water and minerals. Xylem parenchyma stores food and helps in lateral mainly supportive in function. They are also known as the wood fibres.

Q62. **Differentiate between the function of aerenchyma and collenchyma.**

Sol. Difference between the function of collenchyma and aerenchyma ;

Collenchyma :

1. It provides mechnical support to the herbaceous plants.
2. It provides tensile strength to the growing organs.

Aerenchyma :

1. It is a part of parenchyma.
2. It provides buoyancy in aquatic plants.

Q63. **Write short note on stone cells.**

Sol. Stone cells (scleride) : They are nearly as long as broad. Due to lignin deposition cell contents become reduced. They occur in seed coats hard walls of nuts and pulp of guava, pear fruits.

Q64. **Differentiate between epithelial and connective tissues.**

Sol. Difference between epithelial and connective tissues.

Epithelial tissue

1. They are composed of same type of cells in a particular subtype.
2. No intercellular spaces between the cells.
3. Their functions are covering, protection secretion and sensory etc.

Connective tissue

1. They are made of different types of cell e.g. mast, adipocytes etc.
2. Intercellular spaces between the cells.
3. Inter-communication of various tissues.

Q65. **Give differences between carti-lage and bone.**

Sol. Difference between cartilage and bone :

Cartilage

1. The matrix is soft and elastic.
2. The matrix is made of chondrin.
3. It is caused by perichondrium.
4. Haversian system is absent.

Bone :

1. The matrix is hard and strong due to the deposition of inorganic salts.
2. The matrix is made of ossein.
3. It is covered by periosteum.

Q66. **What are stomata ?**

Sol. New Sciency and Technology for Ninth Class:

Stomata : The epidermis of a leaf is not continuous at some place due to the presence of small pores, termed as the stomata. Each stoma is enclosed by two specilised epidermal calls called guard cells. Concave sides of the guard cells face each other; have a space forming stomatal opening. The guard cells are only epidermal cells that have chloroplasts, the rest being colourless. Stoma permits gaseous exhange during photosynthesis and respiration. During the process of transpiration, water vapour escapes through stomata.

***Q67.* How many types of tissues are found in animals ?**

Sol. Four types of tissues are found in the animals. They are :

(i) Epitheilial tissue : It forms a protective covering on body.

(ii) Connective tissue : It binds, support and packs various organs in body.

(iii) Muscular tissue : Muscle are made up of muscle cells and help in movement.

(iv) Nervous tissue : It is composed of neurons or the nerve cells to conduct impulses.

***Q68.* Write the three types of muscles.**

Sol. Three types of Muscles are :

(i) Cardiac muscles : Involuntary, found in the heart only.

(ii) Striped muscles : Cylindrical and voluntary; they are attached to skeleton system. Hence, they are caleld skeletal muscles.

(iii) Unstriped muscles : They are involuntary and found in hollow organs such as alimentary canal, urinary bladder and genital ducts etc. They are spindle-shaped and uni-nucleated.

***Q69.* Differentiate between tendon and ligament.**

Sol. Difference between tendon and ligament.

Tendon

1. It is tough and non-flexible (inelastic).
2. It joins muscles to bones.
3. It is formed of white fibroublasts are arranged in rows.

Ligament

1. It is elastic and flexible.
2. It joins bones to bones.'
3. It is formed of yellow fibrous tissue and fibroblasts are scattered in matrix.

PRACTICE EXERCISE – 1

Q1. What is a tissue ?

Q2. Which tissue makes up the husk of coconut ?

Q3. Name the tissue present in brain.

Q4. What are two special types of parenchyma ?

Q5. Name any two types of simple tissue.

Q6. What are companion cells ?

Q7. What is meristomatic tissue ?

Q8. What is ligament ?

Q9. Name the tissue that connects muscle to a bone.

Q10. State the main difference between tendon and ligament .

Q11. Which tissue stores fat glabules ?

Q12. Where are Cardiac muscles found ?

Q13. Name the different types of elements found in Xylem.

Q14. Give one word equivalent for the following :

(a) A tissue that consists of cells which continue to divide to produce more cells.

(b) The meristematic tissue responsible for the increase in thickness of the stem of a tree.

(c) The kind of plant tissues which consists of all similar cells.

(d) The categories of plant tissues in which the cells not divide.

Q15. Differentiate between ligament and tendon.

Q16. Give two differences between bone and cartilage.

Q17. Differentiate betweej Unstraited and straited muscles.

Q18. Enlist the main features of collenchyma.

Q19. Draw a neat and labelled diagram of a neuron.

Q20. Give differences between cartilage and ligament.

Q21. What is meristem ? Give its types ?

Q22. What are simple permanent tissues ?

Q23. List the various components of xylem tissue and explain their main features.

Q24. Draw the diagram of columnor epithelium. Write its occurence, features and functions.

Q25. Blood is a type of connective tissue. Why ?

Q26. Give a brief account of chief types of tissues in plants.

Q27. Describe structure and various functions of connective tissues.

Q28. With the help of diagram, explain structure and functions of various types of Muscular tissue.

EVALUATE YOURSELF

M.M. : 25 **M.T. : 60 min.** **M.M. : 25** **M.T. : 60 min.**

TEST - 1

1. What is a tissue ? **1**

2. Why does the growth of plants occur only in certain specific regions ? **1**

3. Name the tisuse which transports water and dissolved minerals from roots to various parts of plant. **1**

4. Whiere is epithelial tissue present ? **1**

5. What is the single long part of each neuron called ? **1**

6. What the features of meristematic cells ? **2**

7. Write the functions of epidermis tissue ? **2**

8. Draw the diagram of cork cells. Write their features ? **3**

9. What is epithelial tissue ? What are the main functions of epithelial tissue ? **3**

10. Draw straited muscle tissue and mention its occurence, features and function. **5**

TEST - 2

1. Which of the following is a tissue-liver, bone, testis, ovary ? **1**

2. What is chlorenchyma ? **1**

3. Name the tissue which transports food from leaves to other parts of the plant. **1**

4. Name the tissue which is responsible for movement in our body. **1**

5. Name two peculiar features of cardiac muscle fibres ? **1**

6. Write two differences between meristematic cells and permanent cells. **2**

7. Write the functions of parenchyma, collenchyma and sclerenchyma. **2**

8. What is xylem ? Name the structures of which xylem is made of . Write the funtions of Xylem. **3**

9. Draw different types of connective tissues. **3**

10. Give a brief account of Plant tissues. **5**

EVALUATE YOURSELF

M.M. : 25 **M.T. : 60 min.**

TEST - 3

1. What is meristematic tissue. **1**

2. What do you mean by epidermis. **1**

3. Give two examples of tissues found in human body. **1**

4. Name the two proteins of muscle cells. **1**

5. What are stomata ? **1**

6. Write the differences between vessel and sieve tubes. **2**

7. Draw a labelled diagram of neuron. **2**

8. Draw cardic mucles and mention its occurence features and functions. **3**

9. What is simple tissue ? Name the simple tissues found in plants. **3**

10. Explain the structure and function of connective tissue. **5**

M.M. : 25 **M.T. : 60 min.**

TEST - 4

1. Which plant tissue is responsible for multiplication of cells and growth. **1**

2. Name two animals tissues and two plant tissues which help to suport and provide strength to the parts of body. **1**

3. Cells which are thick at corners are called parenchyma or collenchyma ? **1**

4. What is the function of scelerenchyma ? **1**

5. Name plant tissue concerned with conduction of water and minerals. **1**

6. Distinguish between skeletal and cardiac muscles. **2**

7. Give four important functions of epithelial tissue. **2**

8. Write short noteson

(a) Squamous epithelium

(b) Columnar epithelium **3**

9. Describe briefly the components of blood. **3**

10. Give a brief account of meristematic tissue with the help of an example. **5**

MULTIPLE CHOICE QUESTION'S

Q1. A group of cells alike in form, function and origin are called _____.

(a) tissue (b) organ

(c) organelle (d) none of these

Q2. The nuclei of meristematic cell are

(a) small (b) large

(c) medium sized (d) none of these

Q3. Parenchyma which contains chlorophyll is called :

(a) collenchyma (b) selerenchyma

(c) chlorenchyma (d) none of these

Q4. Parenchyma : Simple : Pholem : _____

(a) simple (b) collenchyma

(c) complex (d) xylem

Q5. Collenchyma mainly forms _____.

(a) hypodermis (b) epidermis

(c) phloem (d) inner cortex

Q6. Tissue that is absent in monocots is

(a) chlorenchyma (b) sclerenchyma

(c) arenchyma (d) collenchyma

Q7. Which one is made of dead cells ?

(a) sclerenchyma (b) tracheids

(c) vessel (d) all of the above

Q8. Pholem is made of

(a) sieve tubes (b) companion cells

(c) both of these (d) none of these

Q9. Which of the following components of xylem is living

(a) tracheids

(b) vessels

(c) xylem parenchyma

(d) xylem sclerencyma

Q10. Which of the following components of pholem is non-living.

(a) sieve Tubes (b) companion cells

(c) bast Fibres (c) phloem parenchyma

Q11. Father of histology is

(a) Malpighi (b) Bichat

(c) Mayer (d) none of them

Q12. The efferent part of neuron is

(a) axon (b) dendrite

(c) cyton (d) both (a) and (b)

Q13. Cuboidal tissue takes part in

(a) absorption (b) secretion

(c) excretion (d) all of the above

Q14. Simple tissue are these

(a) parenchyma, xylem and collenchyma

(b) parenchyma, collenchyma and sclerencyma

(c) parenchyma, xylem and sclerenchyma

(d) parenchyma, xylem and phloem

Q15. Collenchyma mainly forms

(a) hypodermis (b) epidermis

(c) phloem (d) inner cortex

Q16. Lignified elongated dead cells are

(a) parenchyma (b) collenchyma

(c) sclerenchyma (d) none of the above

Q17. Pavement epithelium is the name of

(a) squamous epithelium

(b) cuboidal epithelium

(c) ciliated epithelium

(d) columnar epithelium

Q18. Phloem in the plants perform the function of

(a) conduction of food

(b) conduction of water

(c) providing support

(d) photosynthesis

Q19. Smooth muscles occur in

(a) uterus (b) artery

(c) vein (d) all the above

Q20. The end of a long bone is connected to another bone by

(a) ligament (b) tendon

(c) cartilage (d) connective tissue

Q21. Haversian canals are present in

(a) cartilage (b) ligament

(c) bone (d) tendon

Q22. Plant length is increased by

(a) apical meristems (b) lateral meristems

(c) periblem (d) parenchyma

Q23. Active divisions take place in the cells of

(a) xylem (b) phloem

(c) sclerenchyma (d) cambium

Q24. Which one of the following tissue gives mechanical support to young dicotyledonous stem ?

(a) parenchyma (b) collenchyma

(c) sclerenchyma (d) chlorenchyma

Q25. Husk of coconut is made of

(a) Sclerenchymatous tissue

(b) Parenchyma

(c) Collenchyma

(d) Chlorenchyma

Q26. White fibres of connective tissue are made up of

(a) Elastin (b) Reticular fibre

(c) Collagen (d) Myosin

Q27. Meristematic tissues in plants are

(a) growing in volume

(b) localised and permanent

(c) localised and dividing cells

(d) not limited in certain regions

Q28. Find out incorrect sentence

(a) parenchymatous tissues have intercellular spaces

(b) collenchymatous tissues are irregularly thickened at corners

(c) apical and intercalary meristems are permanent tissues

(d) meristematic tissues, in its early stage, lack vacuoles

Q29. Parenchyma cells are

(a) relatively unspecified and thin walled

(b) lignified

(c) thick-walled and specialised

(d) none of these

Q30. The dead elements present in the pholem is

(a) companion cells

(b) phloem fibres

(c) phloem parenchyma

(d) sieve tube cells

Q31. Which of the following does not lose their nucleus at maturity ?

(a) vessel (b) companion cells

(c) red blood cells (d) sieve tube cells

Q32. Intestine absorbs the digested food materials. What type of epithelial cells are responsible for that ?

(a) stratified squamous epithelium

(b) columnar epithelium

(c) spinal fibres

(d) cuboidal epithelium

Q33. Which muscles act involuntarily ?

(i) striated muscles (ii) smooth muscles

(iii) cardiac muscles (iv) skeletal muscles

(a) (i) and (ii) (b) (ii) and (iii)

(c) (iii) and (iv) (d) (i) and (iv)

Q34. While doing work and running, you move your organs such as hands, legs, etc., which among the following is correct ?

(a) smooth muscles contract and pull the ligament to move the bones

(b) smooth muscles contract and pull the tendons to move the bones

(c) skeletal muscles contract and pull the ligament to move the bones

(d) skeletal muscles contract and pull the tendon to move the bones.

Q35. A person met with an accident in which two long bones of hand were dislocated. Which among the following may be possible reason ?

(a) tendon break

(b) break of skeletal muscles tissue

(c) ligament break

(d) areolar tissue break

Q36. Bone matrix is rich in

(a) fluoride and calcium

(b) calcium and phosphorus

(c) phosphorus and potassium

(d) calcium and potassium

Q37. Which of the following helps in repair of tissue and fills up the space inside the organ ?

(a) tendon (b) adipose tissue

(c) areolar (d) cartilage

Q38. Cartilage is not found in

(a) nose (b) ear

(c) kidney (d) larynx

Q39. Nerve cell does not contain

(a) axon (b) nerve endings

(c) tendons (d) dendrites

Q40. In desert plants, rate of water loss gets reduced due to the presence of

(a) cuticle (b) stomata

(c) lignin (d) suberin

Q41. Flexibility in plants is due to

(a) collenchyma (b) sclerenchyma

(c) parenchyma (d) chlorenchyma

Q42. A nail is inserted in the trunk of a tree at a height of 1 metre from the ground level. After 3 years the nail will

(a) move downwards

(b) move upwards

(c) remain at the same position

(d) move sideways

Q43. Blood is a/an

(a) Epithelial tissue (b) Muscular tissue

(c) Connective tissue (d) Nervous tissue

Q44. Cells have long projections in

(a) Epithelial tissue (b) Muscular tissue

(c) Connective tissue (d) Nervous tissue

Q45. Pores are present in

(a) Ground tissue

(b) Epidermal tissue

(c) Vascular tissue

(d) Meristematic tissue

Q46. Tubular and living cells are present in

(a) Phloem (b) Xylem

(c) Vascular tissue (d) All the above

Q47. Heart is made of

(a) Connective tissue (b) Muscular tissue

(c) Nervous tissue

(d) None of the above.

Q48. The unicellular organism is

(a) Hydra (b) Amoeba

(c) Fish (d) Man

Q49. Brain mostly contains

(a) muscular tissue (b) connective tissue

(c) nervous tissue (d) all the above

Q50. Dentrites are found in

(a) muscular tissue (b) nervous tissue

(c) connective tissue

(d) None of the above

ANSWERS

1. (a)	**2.** (b)	**3.** (c)	**4.** (c)	**5.** (a)
6. (d)	**7.** (d)	**8.** (c)	**9.** (c)	**10.** (c)
11. (b)	**12.** (a)	**13.** (d)	**14.** (b)	**15.** (a)
16. (c)	**17.** (a)	**18.** (a)	**19.** (d)	**20.** (a)
21. (c)	**22.** (a)	**23.** (d)	**24.** (b)	**25.** (a)
26. (c)	**27.** (c)	**28.** (c)	**29.** (a)	**30.** (b)
31. (b)	**32.** (b)	**33.** (b)	**34.** (d)	**35.** (c)
36. (b)	**37.** (c)	**38.** (c)	**39.** (c)	**40.** (a)
41. (a)	**42.** (c)	**43.** (c)	**44.** (d)	**45.** (c)
46. (d)	**47.** (b)	**48.** (b)	**49.** (c)	**50.** (b)

CH : 3 – DIVERSITY IN LIVING ORGANISMS

- Every organism of the living world, whether it is a plant, an animal or a micro-organims (viruses, bacteria) is unique in itself. This uniqueness of individuals is the basic of the **Diversity** that is shown by the living organisms.
- Diversity is the occurence of different forms of living beings which differ from one another in external appearance, size, colour pattern, internal structure, nutrition, behaviour habitat, etc.
- There are 1.7-1.8 million organisms, all of which are different from one another. They range in size from microscopic bacteria (few mm in size), to Blue whale (30m in length) and Redwood trees of califormia (100m in height).
- Similarly, some pine trees (e.g. Pinus) live for thousands of years while many insects like mosquitoes have a life span of a few days.
- The diversity is not only present amongst different organisms but also individuals of the same organism.

  For example, you and your classmates will be having some differences like height, eye colour, etc.
- But, when we compare ourselves and our friends, with a monkey, we find that we and our friends have a lot of similarity and are quite different from monkey.

ACTIVITY - 1

AIM : ***To differentiate between a "desi" cow and a "Jersey" cow.***

PROCEDURE :

The objective of this activity is to find out the specific characteristics by which we can distinguish the two closely related organisms like Desi Cow and Jersey Cow, which are two separate varieties of cows showing distinct characters.

OBSERVATION :

- One of the common, high milk yielding breed is Jersey.
- They are easily distinguished by its small size, broad short face with large eyes, welge shaped body with straight top line of trunk.
- They vary in size and colour from Desi cow and has weight of 900 pounds.
- These characteristics of Jersey makes it different from Desi cows.

BIODIVERSITY

- Biodiversity means the diversity of life forms. It is a word commonly used to refer to the variety of life forms found in a particular region.

- Diversity of communites is dependent upon characteristics of land , water, climate , human interference and pollution.
- Rough estimates state that there are about 10 million species on the planet, although we know actually only one or two millions of them.
- The major area which is rich in biodiversity is the **warm and humid tropical region** that lies between tropic of cancer and tropic of capricorn. The areas of the world which are extermely rich is species are called **Megadiveristy centres.**
- Twelve magadiversity centres have been recognised in the world-Brazil, Columbia, Peru, Mexico, Ecuodor, Zaire, Madagascar, Australia, China, Indonesia, Malaysia and India. They contain more than half the biodiversity of world.
- India contains 8% of speices present on the earth.

TAXONOMY

- The science dealing with identification, nomenclature and classification of organisms is called **taxonomy** or **systematics**.
- **Carolus Linnaeous** is called father of taxonomy. He introduced the system of Binomial nomenclature in his book **Philosophica Botanica** (1751)
- He also described 4326 species of animals in his book systema Natural and 5900 species of plant in book **species plantarum.**
- In **Binomial Nomenclature,** every organism is given two proper names. The first name is the name of **Genus** to which the organism belongs. The organism shares this name with other members of its genus. The organism's second name is the name of **species** to which it belongs. This name is possessed by only one kind of organisms, it does share it with any other organism in the genus.
- The scientific names are unique, understood and followed all over the world. They are guided by a set of rules stated in the **International code of Biological Nomenclature**.
- Certain conventions are followed while writing the scientific names :
  1. The name of the genus begins with a capital letter.
  2. The name of the species begins with a small letter.
  3. When printed, the scientific names are given in italics.
  4. When written by hand the genus name and the species name have to be underlined separately.

  FOR EXAMPLE :

  Tiger : *Panthera tigris*

  Lion : *Panthera leo*

  Potato : *Solanuim tuberosum*

  Mango : *Magnefera indica*

  Frog : *Rana tigrina*

  House-fly : *Musca domestics*

- Since this system of naming involves giving organisms two names, it is known as the Binomial nomenclature.

GROUPS AND SUB-GROUPS :

- Being very large in number, individuals life forms cannot be studied. They are divided into groups and sub-groups on the basis of similarities and dissimilarities.
- Certain characteristics which create fundamental difference amongst organisms are picked up to create major or broad groups of organisms eg. prokaryotic and eukaryotic cells, unicellular or multicelllular nature, etc.
- Within each broad or major groups, subgroups are formed on the basis of less important characteristics.

WHAT IS THE BASIS OF CLASSIFICATION ?

- Classification is the arrangement of organisms into groups and subgroups on the basis of their similarities and dissimilarities of fundamental characteristics and placing them in a hieracrchy that brings out their relationships.
- Characteristics are particular forms or functions found in large number of organisms.
- Characteristics which create fundamental differences amongst life forms are used as the basis for making the broadest divisions.
- A new set of traits of lesser fundamental nature are then used to produce small groups and their sub-groups.
- There are two major systems of classification Artificial and natural.

ARTIFICIAL SYSTEM OF CLASSIFICATION

- They are systems of classification based on one or a few morphological characters (external features) that are helpful in easy identification of organisms.
- Aristotle (father of biology) used habitat of organisms land, water and air as a characteristic in their classification.
- This brought corals, octopus, starfish, shark and whale were similarly placed in one category of aquatic animals though all of them have different forms and structure.
- The major draw-back of this system of classification is that different types of organisms get grouped together (e.g. birds, bats, insects) while related organisms get separated (eg. Bat, Whale and Rat).

NATURAL SYSTEM OF CLASSIFICATION

- They are those systems of classification which use a large number of characters to find out natural relationships based on their similarities and dissimilarities.
- It produces a hierarchial classification.
- Example of characters that are used for hierarhial classification are :
    1. **Complexity of cell structure** (Prokaryotes & Eukaryotes). In eukaryotic cells, membrane bound cell organelle as well as a nucleus are present. Whereas, in Prokaryotes membrane bound

organelles and a demarcated nucleus is absent. Due to this, biochemical pathways of the two types of cells are organised in different ways. Their mode of cell division and ability to form multicellular structures are also different.

2. **Complexity of Body structure** (Unicellular or multicellular). Multicellular organisms show division of labour by forming tissues, organs and organ systems. These distinctions make basic differences in body design. As a result, an Amoeba and a worm are very different in thier body design.

3. **Modes of Nutrition** (Autotrophs and Heterotrophs)

   Autotrophs can manufacture their own food. Heterotorphs obtain their food from outside. Depending on the mode of obtaining food, organisms have different body designs.

NEED FOR CLASSIFICATION

Organisms should be classified because of the following reasons :

1. It is not possible to study every organism. Study of one or two organisms of a group can give information about the essential features of the group.
2. There is no way to identify organisms without a proper system of classification.
3. It gives an idea of diversity found in living organisms.
4. It provides information about interrelationships between different categories of organisms.
5. All biological sciences depend upon a system of classification for study of organisms e.g. ecology, pathology, forestry, zoology, botany etc.

CLASSIFICATION & EVOLUTION

- Living things are identified and categorised on the basis of their body design in relation to their form and function. Some characteristics are likey to make more wide ranging changes in body design than the others. There is a role of time (for evolution) in this as well.
- Once a change in design comes into existence, it will occur in all descendants with or without further changes. The early changes would be more basic than the subsequent changes.
- The idea that all present day forms have been developed due to accumulation of change in body design is contained in the concept of evolution as proposed by **Charles Darwin** (1859) in his book **"Origin of Species".**
- When the idea of evolution is connected to classification it becomes apparent that some groups or organisms which have ancient body designs, have not changed very much. They are commonly referred to as **"primitive"** or **"lower"** organisms.
- There are other groups of organisms that have evolved their particular designs relatively recently. They are called **"Advanced"** or **"higher"** organisms.
- In other words, it can be said that older organisms are simpler, while younger organisms are more complex.

HIERARCHY OF CLASSIFICATION

- Taxonomic categories are group of organisms developed in any system of clasfication on the basis of their fundamental similarities and dissimilarities.
- A system of arranging taxonomic categories in a descending order on the basis of their relative dimensions is called hierarchy of classification. It was introduced by Linnaneus.

As we go from the lowest rank (the species) towards the kingdom; the number of similar character decreases.

1. **Species :** It is a basic unit for understanding taxonomy as well as evolution. Species includes all morphologically similar organisms that are similar enough to breed and perpedate and is genetically distinct and reproductively isolated from others.

   for e.g.

   Tiger and Lion belong to same genera (Panthera) but both have different species, i.e., Tiger – *Panthera tigris* and Lion – *Panthera lio.*
2. **Genus :** It is a group of species which are related and have less characters in common as compared to species. Members of a genus have identical reproductive organs.
3. **Family :** It is represented by a group of related genera that are more similar to each other than with the genera of other families.
4. **Order :** It is an assemblage of families resembling one another in a few characters.
5. **Class :** It represents organisms of related orders.
6. **Phylum :** It includes all organisms belonging to different classes having a few common characters.
7. **Kingdom :** It includes all organisms that share a set of distinguishing common characters e.g. Plant kingdom, Animal kingdom.

TWO KINGDOM CLASSIFICATION

This system of classification was given by Linnaeus. He divided the living organisms into two kingdoms in 1758.

KINGDOME PLANTAE

All the plants constitute kingdom plantae. This kingdom includes Bacteria, fungi, algae, bryophytes, pteridophytes, Gymnospherms and Angiospherms.

KINGDOM ANIMALIA

All the Animals constitute kingdom Animalia. The kingdom Animalia includes protozoans, sponges, hydra, worms, insects, spiders, star fishes, frogs, lizards, snakes, birds mammals etc.

DRAWBACKS OF 2 KINGDOM CLASSIFICATION

With the passage of time, it become clear that certain organisms did not strictly fit either under plant or animal kingdom. for example, viruses belong to neither plant kingdom nor the Animal kingdom because they share characteristics of both living and non living organisms. Eugleno has both Autotrophic and neutrotrophic mode of nutrition. So, it is dissult to plate it in either of the 2 kingdoms.

Plants	Animals
• The growth is unlimited and continues till death.	• The growth is limited and stops at a certain age.
• Plants are fixed and cannot perform locomotion.	• They are mobile.
• They have Autotrophic made of nutrition.	• They have heterotrophic mode of nutrition.
• Their reserve food is starch and oil.	• Their reserve food is glycogen and fat.
• Sense organs and nervous system are absent.	• Sense organs and nervous system are present.
• Response to external stimali is slow.	• Response to external stimuli is quick.
• Excretory organs are absent.	• Excretory organs are absent.
• Cell wall is present.	• Cell wall is absent.
• Vacuoles are larger in size.	• Vacuoles are smaller in size.
• Plastids are present.	• Plastids are absent.
• Centrosome is absent.	• Centrosome is present.

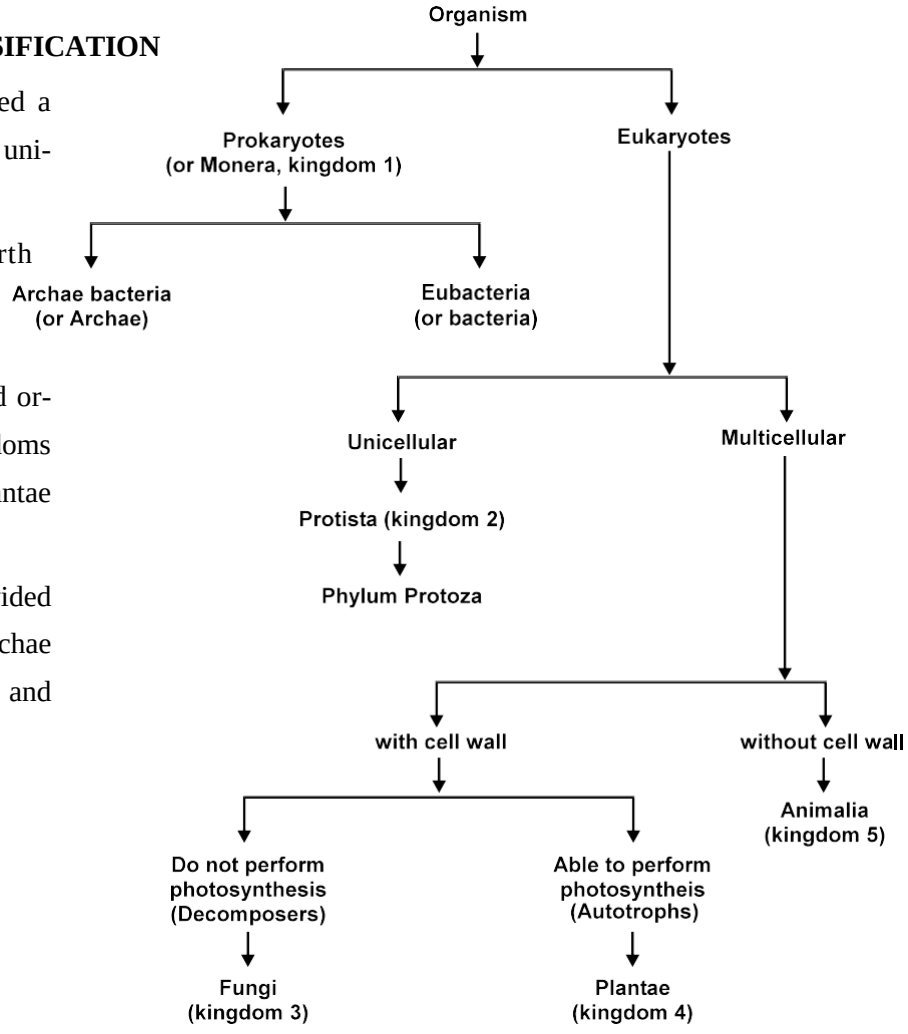
FIVE KINGDOM CLASSIFICATION

Ernst Haeckel (1894) raised a third kingdom of protista for unicellular organisms.

Copleand created the fourth kingdom of monera for prokaryotic organisms.

Whittaker (1959) classified organisms into five kingdoms monera, protista, fungi, plantae and Animalia.

Carl Woese (1977) has divided the kingdom monera into archae bacteria (or Archae) and eubacteria (or bacteria)

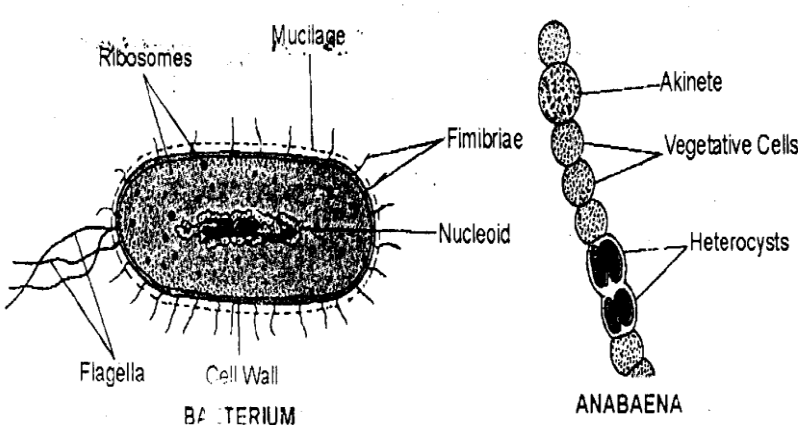


KINGDOM MONERA

It is a kingdom of prokaryotes. Monera is, therefore, also called prokaryota.

CHARACTERISTICS

- The genetic material is not organised into a nucleus. It lies directly inside the cytoplasm and is called nucleoid.
- Membrane bound cell organelles like mitochondria, Golgi apparatus, plastids, lysosomes, etc. are absent.
- Monerans are basically unicellular.
- They are motile and contain one or more **flagella**. the flagella are made of a protein called flagellin and tend to rotate like a propeller of ship.
- Some bateria also contain short appendages on cell surface called as pilli. They help in sexual reproduction of bacteria.
- Cell wall is absent in some (eg. *Mycoplasma*) and present in others (e.g. bacteria, cynanobacteria). Basic structure of cell-wall is made of peptidoglycan. On the basis of cell wall. bacteria are classified



as Gram-positive and gram-negative bacteria.

- Both Autotorphic and heterotrophic modes of nutrition are found.

  Example : Mycoplasma, bacteria (*Vibrio cholerae, Eschericha coli, Clostridum botulinum*) and blue-green algae or Cyanobacteria (eg. *Anabaena, Nostoc*)

KINGDOM PROTISTA

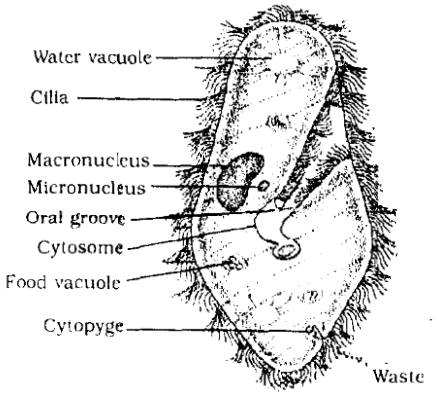
It is the kingdom of unicellular algae, protozoa.

Characteristic

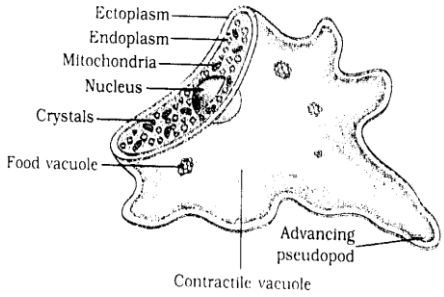
- Unicellular (one-celled) mostly aquatic (fresh water or marine) animals.
- Body is naked or covered by pellicle or hard shells.
- Body shape may be irregular, spherical, oval elongated or flattened.
- Cytoplasm differentiated into outer ectoplasm and inner endoplasm.

- Uninucleate, binucleate or multinucleate.
- Locomotion is by finger-like psuedopodia, flagella or cilia.
- Nutrition can be autotrophic (e.g. *diatoms*, unicellular algae) or heterotrophic (eg. *Paramecium, Amoeba*)
- Asexual reproduction by binary fission, multiple fission and sexual reproduction by conjugation.

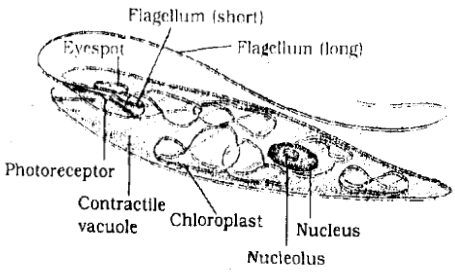
Example : Unicellular algae, *diatoms, euglena* and protozoans (*Amoeba, paramecium*)



Paramecium



Amoeba



Euglena

KINGDOM FUNGI

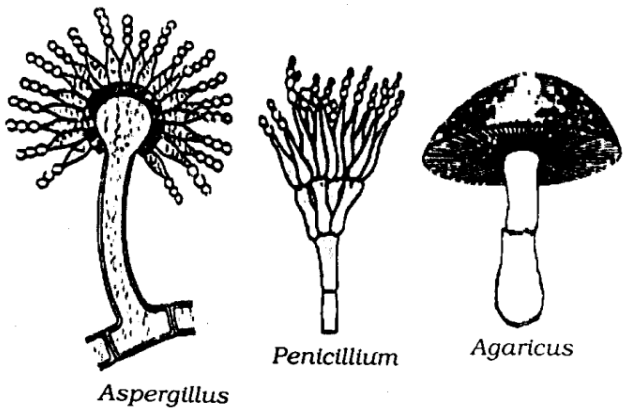
Fungi are achlorophyllous heterotrophic, spore producing cell wall containing eukaryoties having chitin in their cell wall and glycogen as reserve food.

Characteristics

- The body of fungi is called *mycelium*. It is made of a number of fine threads called hyphae.
- Fungi are basically multicellular. *Yeast* is an exception in being unicellular.
- It contains a cell wall made of chitin or fungus cellulose.
- They are heterotrophic. Some fungi, such as *Puccinia, Ustilago*, etc are parasites, drawing their nutrients from the living cells of their host-plnts. Some fungi such as *Agaricus, Pencillium, Rhizopus* are saprophytes, deriving their nourishment from the dead remains of plants and animals.

- Their reserve food is glycogen.

  Examples : *Rhizopus, Pencillium* (Brewer's yeast), mushroom (*Agaricus*), *Aspergillus, Ustilago, Puccinia,* etc.



Lichens : They are dual organisms which have been formed by permanent symbiotic association between an algae (generally blue-green algae or cyano bacteria) and a fungus. The algae prepares food for itself and fungus, provides protection to algae and also help in fixation and absorption of water and minerals.

- Lichens can tolerate extreme conditions of temperature.
- They occurs in barren rocks, walls, tree-trunks, etc. where they can be seen as slow growing large coloured patches.

  Examples : *Usnea, Litmus, Cladonia, Orchil,* etc.

KINGDOM PLANTAE

- Multicellular eukaryotes
- Cellulose cell wall
- Autotrophs and use chlorophyll for photosynthesis.

KINGDOM ANIMALIA

- Multicellular eukaryotes.
- Without cellulose cell wall
- Heterotrophs

KINGDOM PLANTAE

It is a kingdom of multicellular photosynthetic organisms having cellulose cell walls. **Eichler (1883)** divided the kingdom plantae into 2 sub-kingdom – Cryptogamae and phanerogamae.

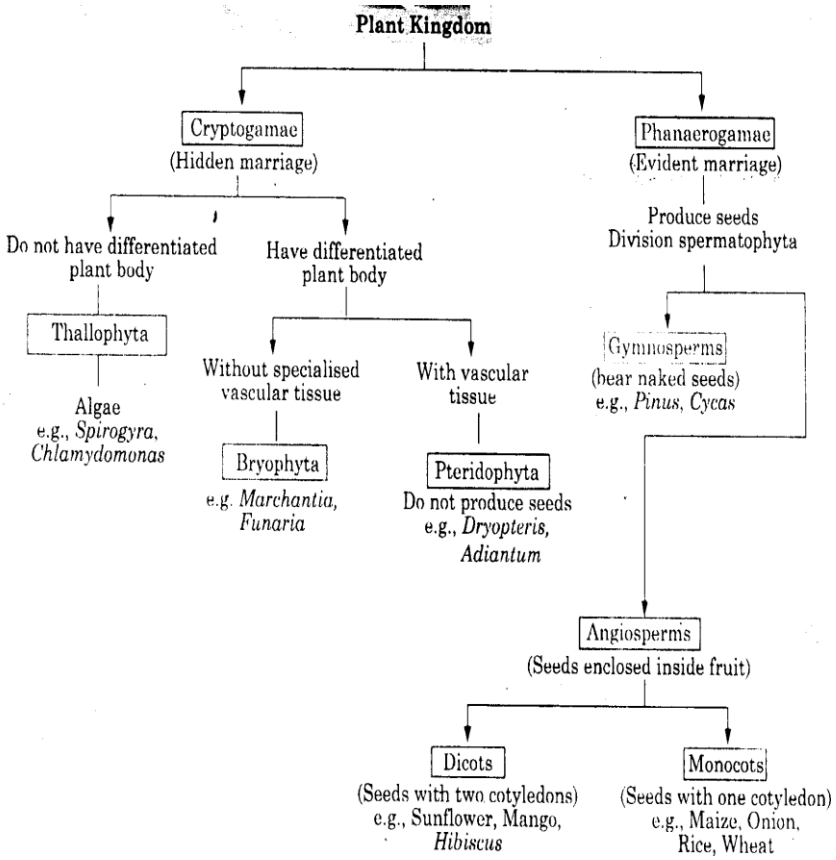
1. **Sub kingdome cryptogamae** (Crypto-hidden, gamous-marriage)
   - This subkingdom include those plants which to not produce external flowers or seed.s Thus they are considered to bear hidden reproductive organs.
   - The common means of reproduction of cryptogram is by spores. The crytograms are therefore, also known as **flowerless plants, seedless plants or lower plants.**

- This subkingdom is further divided into 3 divisions : Thallophyta, Bryophyta and Pteridophyta.
- The divisions Thallophyta is divided into 3 distinct sub-divisions algae (including cyanobacteria), fungi and Lichens.

2. Subkingdom Phane rogamae (Phaneros-visible, gamos-marriage)

- Phanerogamae includes higher plants that bear flower and seeds. Seeds are the result of the reproductive process. They consist of the embryo along with stored food, which serves for the initial growth of the embryo during germination.
- The plant body is divided into root, stem and leaves.
- Vascular system (xylem & phloem) are well developed.
- Sex organs are multicellular.
- An embryo develops from fertilized egg.
- This group is further classified, based on whether the seeds are naked or enclosed in fruits, giving us two divisions Gymnoperm & Angiosperms.

Cyptogamae	**Phanaerogamae**
• It contains seedless plants.	• It contains seed plants.
• It has both vascular and non-vascular plants.	• It possesses only vascular plants.



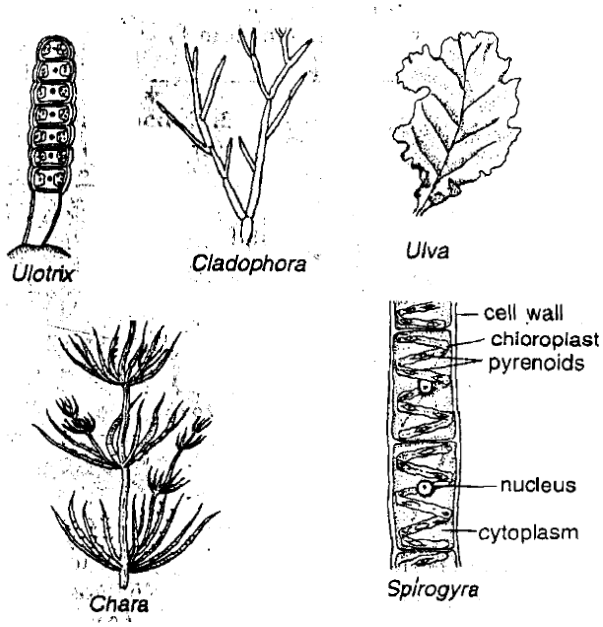
DIVISION THALLOPHYTA

It is a division of kingdom plantae, in which the plants do not have a well differentiated body design. The sub-division Algae is studied in detail.

CHARACTERISTICS

- Most primitive and simple plants. The plant body is not differentiated into stem, root and leaves, but it is in the form of an undivided **Thallus**.
- Most Alage are water-growing or aquatic, some are terrestrial.
- Usually contain green pigment for photosynthesis; some algae have other photosynthetic pigments such as red, brown and purple.
- They are Autotrophic i.e., manufacture their own food. Reserve food is generally starch.
- They have a cellulose cell wall around their cells.
- Vascular tissues are absent.
- Sex-organs are simple, single-celled and there is no embryo formation after fertilisation.
- In thier life-cycle, gametophytic phase is dominant. The sporophyte, does not remain attached to the gametophyte.

Examples : *Ulothrix, Cladophora, Spirogyra, Ulva and Chara*.



Algae	Fungi
• They are autotorphic.	• They are heterotrophic.
• Most of Algae are aquatic.	• Most of the fungi are terrestrial.
• The cell wall is made up of cellulose.	• The cell wall is made of chitin.
• Algae contain starch as a stored food material.	• Fungi contain glycogen and oil as a stored food material.

Gametophyte : It is a haploid plant structure which produces gametes directly.

Sporophyte : It is diploid plant structure which produces hyploid spores, through the process of meiosis.

Embryopbytes : Plants having embryo stage in their life cycle-bryophytes, pteridophytes, phanerogamae.

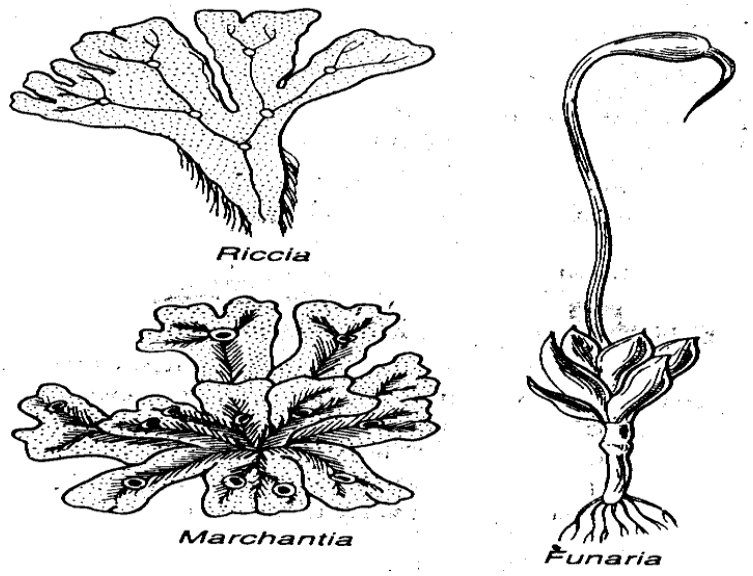
DIVISION BRYOPHYTA

Bryophgta is a division of nonvascular plants having an embryo stage in their life cycle.

CHARACTRISTICS

- Bryophytes are the simplest land plants.
- They are called Amphibians of plant kingdom as they live in moist areas.
- Vascular tissues for conduction of water and food are absent.
- Roots are absent. Plants are fixed by means of hair-like Rhizoids.
- Body may be thallus-like or differentiated into structures resembling stems and leaves.
- Plant body of bryophytes is gametophygte. Sporophyte lives as a parasite over it.
- Sex-organs are multicellular.
- An embryo is formed upon fertilization.

Example : *Riccia, Marchantia, Funaria* (moss) *Anthoceros*, etc.



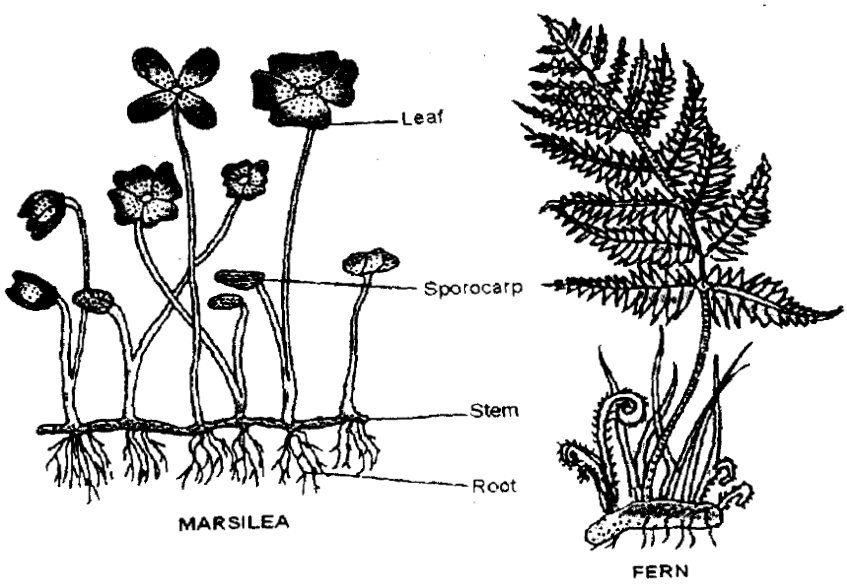
DIVISION PTERIDOPHYTA

It is a division of seedless vascular plants which are commonly called **Vascular cryptograms.** Ptreidophy ta represents the highest group of cryptogramae.

CHARACTRISTICS

- They are found mainly in shady or damp places.
- The plant body is made up of root, stem and leaves.
- They have well developed vascular systems (xylem & phloem) for conduction of water and other substances from one part of the plant body to another.
- These plants have no flower and do not produce seeds.
- Sex-organs are multicellular.
- Fertilised egg develops into embryo.

Example : *Selaginella* (club mass), *Equisetum* (horse-tail), *Marsilea* (water-fern), *Adiantum* (walking fern), *Dryopteris, Pteris,* etc.



Bryophyta

- Plant body is not differentiated into Root, stem and leaves
- The main plant body is gametophytic.
- Vascular system is absent.

Pteridophytes

- They are seed less plants.
- Gametophyte is independent.
- Reproductive organs are inconspicuous (i.e. hidden)

Pteridophyta

- Plant body is divided into root, stem and leaves.
- The main plant body is sporophytic.
- Vascular system is present.

Phanaerogams

- They are seed bearing plants.
- Gametophyte is nutritionally dependent upon sporophyte.
- Reproductive orgains are quite conspicuous (i.e. not hidden)

DIVISION GYMNOSPERMAE (gymno-naked, sperma-seed

CHARACTRISTICS :

- They are most primitive and simple seed plants.
- The seeds produced by these plants are naked and are not enclosed within fruits.
- They are usually perennial, evergreen and woody plants.
- Its xylem lacks vessels, while phloem is devoid of companioin cells.

Example : Cycas, Pinus (pine), Cedrus (Deodar)

DIVISION ANGIOSPERMAE

CHARACTRISTICS :

- Angiosperms are highly evolved plants and they produce seeds in an organ which is modified to become a fruit.
- The reproductive organs are aggregated in a flower. Since, these plants have flowers, they are called flowering plants.
- Plant embryos in seeds have structrures called **Cotyledons**. Cotyledons are called 'seed leaves' because in many cases they emerge and become green when the seed germinates. Thus, cotyledons represent a bit of pre-designed plant in the seed.
- On the basis of the number of cotyledons, the angiosperms are divided into two classes.

CLASS DICOTYLEDONEAE (DICOTS)

- It is a class of Angiosperms in which seeds possess two cotyledons.

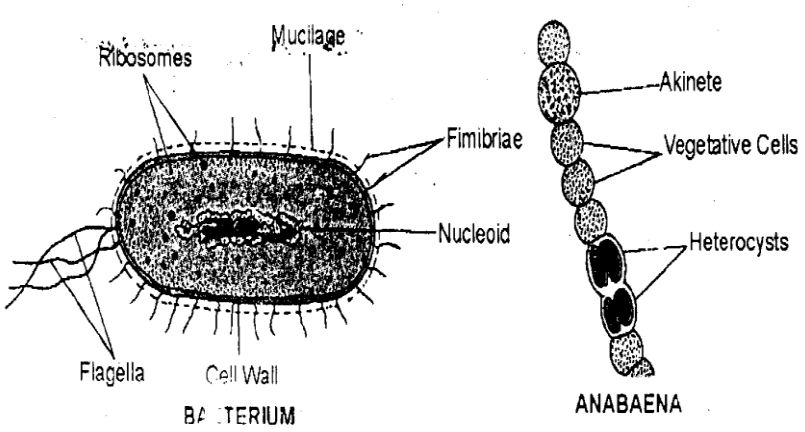
Examples : Mustard, Pea, Green gram, Mango, Rose, *Ipomoea*

CLASS MONOCOTYLEDONEAE (MONOCOTS)

- The members of this class are characteristised by the occurence of a single cotyledon in their seeds.

Examples : Lily, cocunut, wheat, maize, grass, bamboo, *Pophiopedium*

Dicots	**Monocots**
• In the seeds, the embryo bears two cotyledons.	• In the seeds, the embryo bears one cotyledons.
• Leaves show reticulate venation.	• Leaves show parallel venation.
• Plants have tap root system.	• flowers are trimerous.
• Flowers are pentamerous.	



ACTIVITY - 2

AIM : ***To differentiate Dicots and Monocots.***

WORKING :

- Place seeds of Green gram, wheat, maize, pea and tamarind over moist saw dust.
- Sprinkle water from time to time. As the seeds become tender, try to break one seed of each type into two parts.
- Allow the remaining seeds to grow and form seedling.
- Place the seedling in pots and study their growth upto flowering.

OBSERVATIONS :

- All seeds do not split into two parts. Only some seeds do so. These seeds possess two cotyledons, and, therefore, are Dicot (green gram, Pea, Tamarind)
- Others have single cotylendon (wheat and Maize) and are hence monocots.
- Seedlings of wheat and maize have fibrous root system and parallel-veined leaves.
- Those of green-gram, pea and tamarind have top root system and reticulate veined leaves.
- Study of flowers indicates that dicots have pentamerous flowers while monocots have trimerous flowers.

KINGDOM-ANIMALIA

It is a kingdom of wall-less eukaryotic, multicellular & heterotrophic organisms having holozoic (= ingestive) nutrition.

Kingdom Animalia is divided into 2 sub-kingdoms.

Parazoa and Eumetazoa : Parazoa posses sedentary animals having cellular level of organization. It contains phylum of porifera. **Eumetazoa** has animals with at least tissue level of organization.

IMPORTANT TERMS

ORGANISATION

1. **Cellular organisation:** Cells are not differentiated into tissue. Different types of cells mayoccur. e.g. Porifera.
2. **Tissue level organisation :** Cells are organized into tissues but organs are obsent eg. Coelenterata.
3. **Organ level organisation :** Cells are organized into tissues and tissue into organs. Organ system are absent e.g. planty helminthes.
4. **Organ system level organisation :** Cells are organised into tissues, tissues into organs & organs into organ systems. e.g. Nematoda and higher organisms.

BODY SYMMETRY

1. **Radial symmetry :** The body in which similar parts occur all around the central axis. Any vertical plane passing through the central axis will divide the body into 2 equal halves e.g. many sponges, coelenterates and Echinodermates.
2. **Bilateral symmetry :** It means the left and right halves of the body have same design. Body is divisible into 2 equal halves, by only one plane eg. Platyhelminthes, nemotoda, Annelida, Mollusca, Arthropoda and chordata.

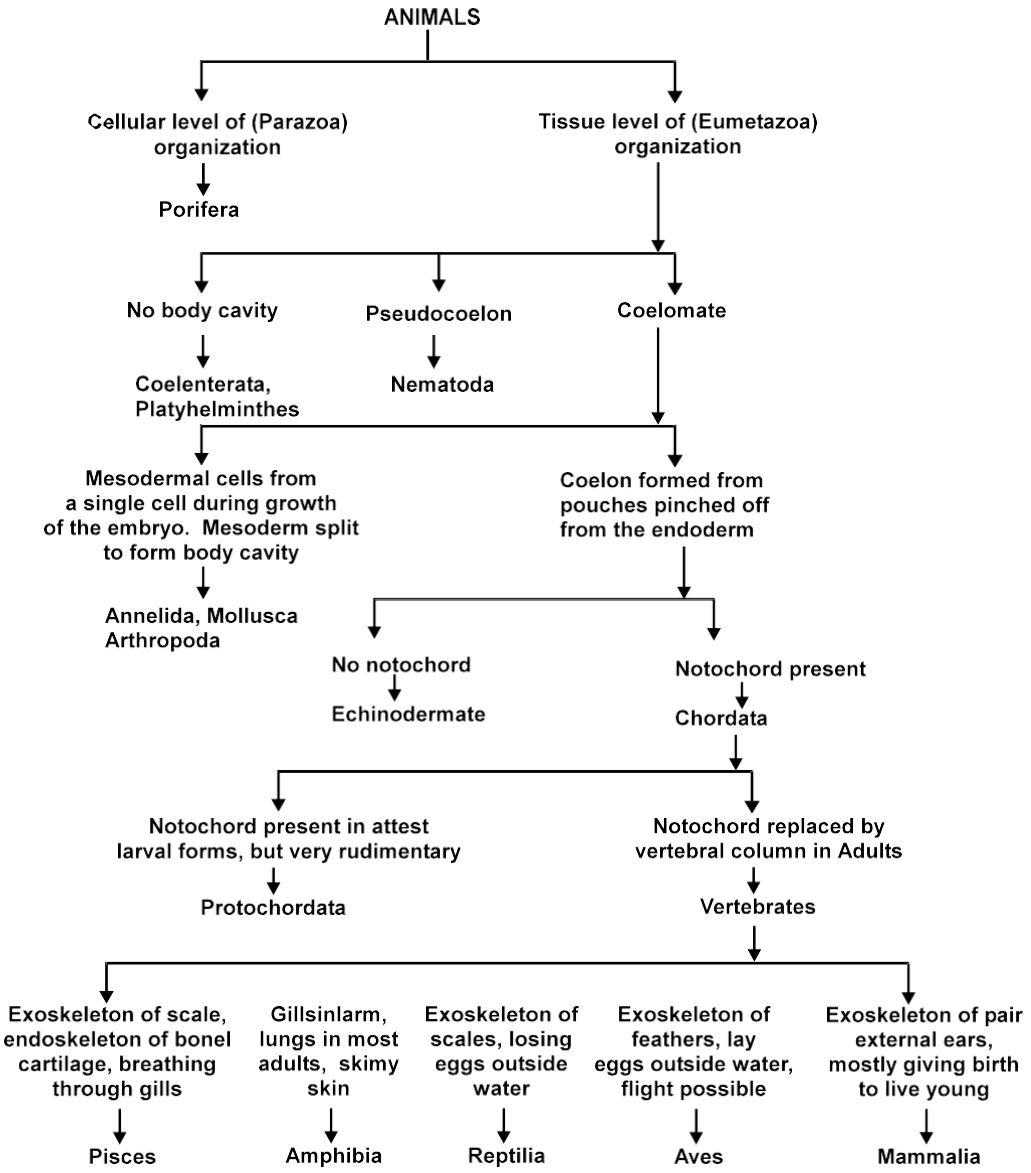
GERM LAYER

They are the primary layers that differentiate in the embryo. Tissues and organs of the Animal body develop from them.

1. **Diploblastic Animals :** Animals having 2 germ layers, outer ectoderm and inner endoderm e.g. porifera, coelenterata.
2. **Triploblastic Animals :** Animals having three germ layers, outer ecotoderm, middle mesoderm and inner endoderm. eg. platyhelminthes to chordata.

COELOM (BODY CAVITY)

1. **Acoelomate :** Coelom is absent eg. porifera, Coelenterata, platyhelminthes.
2. **Pseudocoelomate :** A body cavity is present, but is not lined by mesoderm. e.g. Nematoda.
3. **Coelemate :** A true body cavity lined by mesoderm is present. It is of two types :
   (a) **Schizocoelom :** Mesoderm splits to form a body cavity.
   eg. Annelida, mollusca, Arthropoda.
   (b) **Enterocoelom :** Coelom develops from pouches pinched off from endoderm lining.
   eg. echinodermata Chordata.



PHYLUM PORIFERA (Porifera means holes)

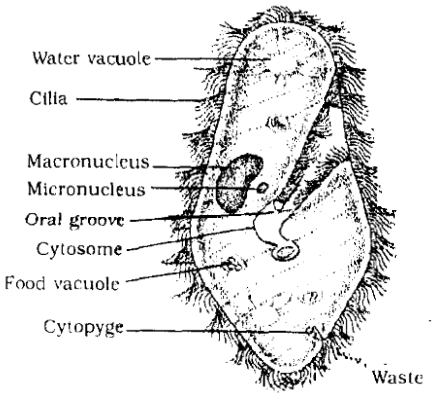
It is a phylum of diploblastic, acoelemate, animals having cell level organization.

CHARACTERISTICS :

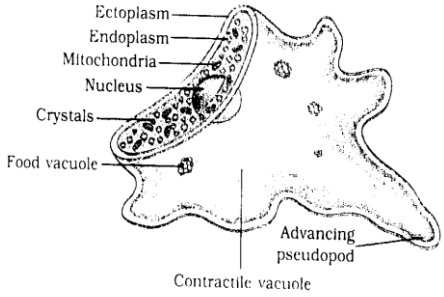
- Mostly found in marine habitats, but few are also found in fresh water (eg. ***Spongilla*)**.
- They are non-motile animals attached to some solid support.
- There are holes or **"pores"** all over the body. These leads to a canal system that helps in circulating water throughout the body to bring in food and oxygen.
- These animals are covered with a hard outside layer or **skeleton.**
- The body possesses many cells, but there are not organised into tissues.

- They are radially symmetrical.
- Reproduction both Asexual by budding and sexual through fertilization.
- They possess power of regeneration.
- They are also called as sponges.

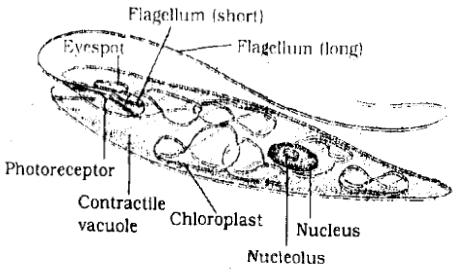
Examples : *Euplectela, Sycon, Spongilla, Cliona, Euspongia* (bath sponge)



Paramecium



Amoeba



Euglena

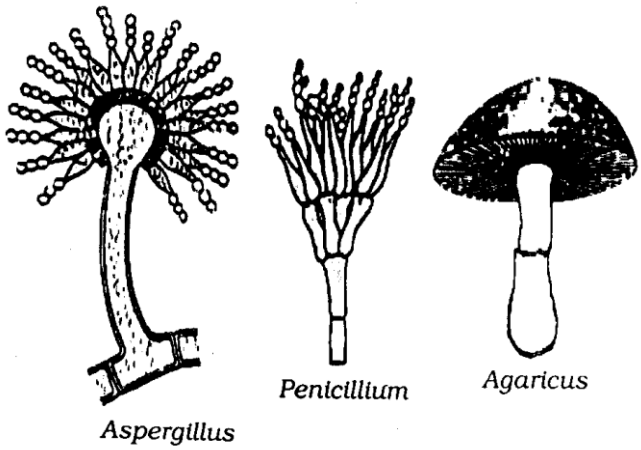
PHYLUM COELENTERATA or CNIDARIA

Coelenterates are diploblastic, acoelomate animals, having tissue level organisation and a central cavity.

CHARACTERISTICS

- All are aquatic and are mostly marine, except **hydra** which is fresh water.
- They have a central cavity called **COELENTERON**.
- They are multicellular, diploplastic animals, e.g. body is made of two layers of cells, ECOTODERM (makes up cells on the outside of body) and endoderm (makes up inner lining of cells).
- They possess specialized stinging cells called **Cnidoblasts.**
- Reproduction both Asexual by budding and sexual reproduction by gametes.
- Some of them live in colonies, while others are Solitary.

Examples : *Hydra, Sea-anemone,* Jelly fish, ***Physalia,*** etc.



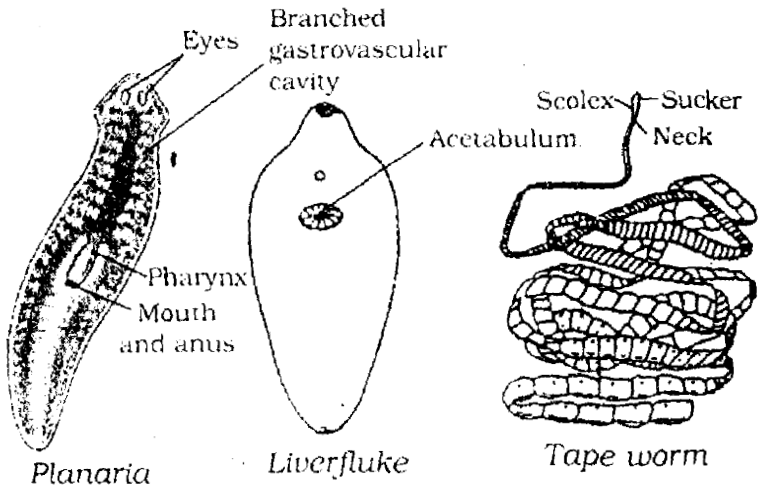
PHYLLUM PLATYHELMINTHES

It is a phylum of flat worms where body is dorsoventrally flattened, triplo blastic but coelomate with organ level of organisation and bilateral symmetry.

CHARACTRISTICS :

- They are bilaterally symmetrical and dorsoventrally flattened animals (i.e. from top to bottom), which is why they are called **Flatworms.**
- They are triploblasitc, which means they have three layers of cells; ectoderm, mesoderm and endoderm. These layers allow formation of inner and outside body linings and organs.
- They are without a body cavity or coelom, in which well developed organs can accomodate.
- Most of them have both male and female reproductive organs.
- They are either free-living (eg. *Planaria*) or parastic (eg. Liver flukes).

  Examples : *Planaria*, tapeworm, Liver fluke, blood fluke.



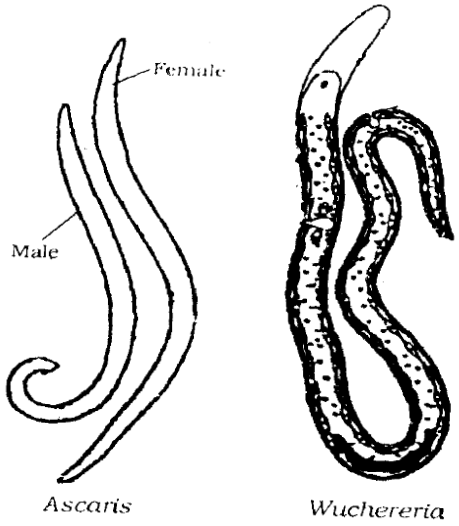
PHYLUM MEMOTODA (or Aschelminthes)

CHARACTERISTICS

- Their body is bilateraly symmetrical.
- They are triploblastic, i.e., have three germ layers.
- Their body is not segmented.
- A false cavity or *pseudocoelom* is present.
- Body is cylindrical and elongated or worm-like. They are also called **Round worms** because they appear circular in cross-section.
- Some round worms are free-living in soil. But, most of them are parastic.
- Parastic Nematodes produce diseases in hosts.

  For ex.g Elephantiasis is caused due to ***Wuchereria bancrofti*;** As cariasis is caused due to ***Ascaris*** and enterobiasis is caused due to ***Enterobics*.**
- It has both mouth and Anus.
- Sexes are sepate (unisexual).

  Examples : *Ascaris, Wuchereria, Enterobias, Ancyclostoma.*



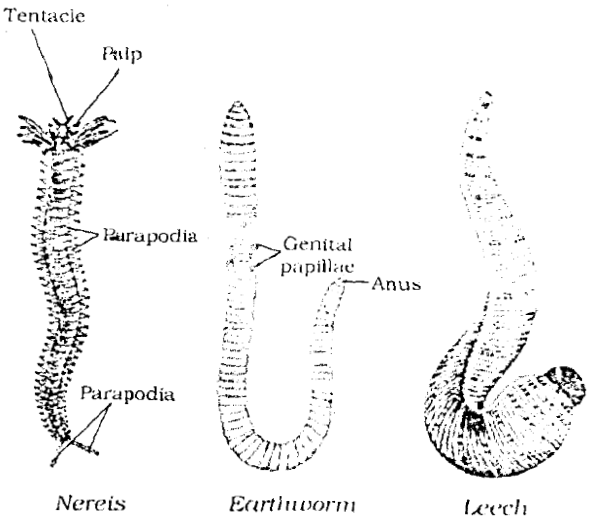
PHYLUM ANNELIDA

Characteristics

- They live in variety of halritads. Mostly aquatic, some are terrestrial, burrowing in tubes, some free living and some are parasitic (e.g. leech).
- They are triploblastic.
- Body is bilaterally symmetrical.
- Their body is segmented both externally and internally **(metameric segmentation)**.

- They have true body cavity are coelom **(Schizocoelom)**
- They have closed blood vascular system, i.e. blood flows inside blood vessels.
- Sexes may be separate (unisexual) or united (hermaphrodite).

Example : *Nereis, Hirudinaria* (Leech), *Pheretima posthuma* (earth-worm).



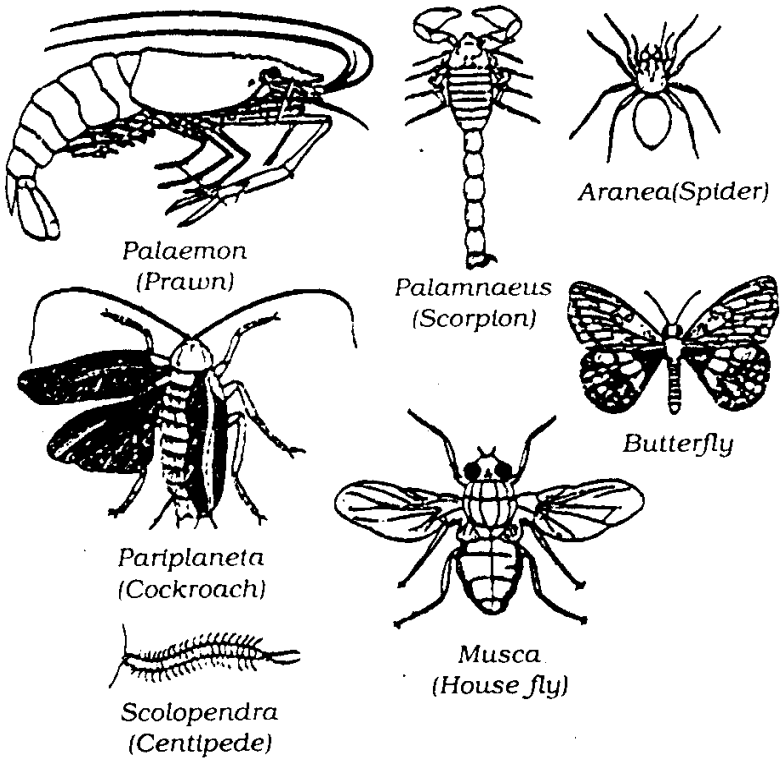
PHYLUM ARTHROPODA (Arthropoda means jointed legs).

CHARACTERISTICS

- They are triplo blastic.
- Body is segmented and bilaterally symmetrical.
- Each body segment bears jointed legs.
- Their Body cavity is filled with blood **(haemocoel)**.
- There is an open circulatory sytem, and so the blood does not flow in well-defined blood vessels.
- Body is divided into 3 regions-head, thoras and abdomen.
- This phylum includes the largest number of animals. They are found in variety of habitats like land, moist soil, in fresh water, in sea water or live as a parasite on other animals.
- They have a exoskeleton made up of protein, lipid, chitin and often calcium carbonte.
- Sexes are seperate (unisexual).

Example :

Paloemon (Prawn), *Palamnaeus* (scorpion), *Aranea* (spider), *Pariplaneta* (cockroch), *Musca domestic* (house-fly), *Scolopendra* (centipede), Butterfly, etc.

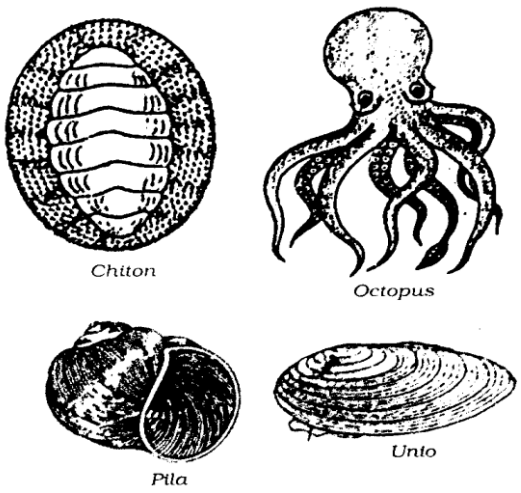


PHYLUM MOLLUSCA

CHARACTERISTICS

- They have bilateral symmetry.
- They are triploblastic and has little segmentation.
- Coelomic cavity is reduced & filled with blood (haemocoel).
- They have an open circulatory system.
- They have kidney-like organs for excretion.
- They have a foot that is used for moving around.,
- Sexes are usually separate.
- Aquatic, mostly marine, few fresh water and some terrestrial forms.
- They have a protective **shell** made up of calcium carbonate

  Example : *Chiton, Pila* (Apple snail), *Unio,* Octopus, *Sepia, Loligo* etc.



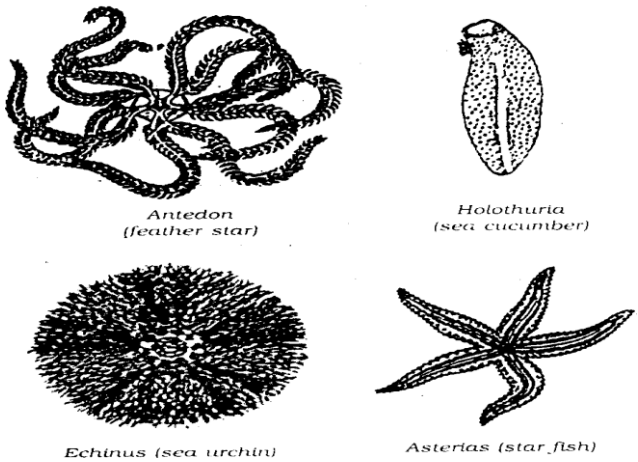
PHYLUM ECHINO DERMATA

"echinos" means "hedge uog", and "derma" means skin. Thus, these are simply skinned organisms.

Characteristics.

- Simple organisms may be star-like, spherical or elongated.
- Body is triploblastic, coelomate, unsegmented.
- They are radially symmetrical.
- These are exclusively free-living marine animals.
- They also have a peculiar water-driven tube system that they use for moving around.
- They have a hard exoskelton made up of Calcium carbonate.
- Reproduction sexual, asexual or by regeneration. Sexes are separate.
- Excretory organs are absent.

Examples : *Antedon* (feather star), *Holothuria* (sea cucumber), *Echinus* (sea urchin), *Asterias* (star fish).



PHYLUM CHORDATA

Chordata is a phylum of triploblastic bilaterally symmetrical enterocoelomate animals.

CHARACTERISTICS :

1. **Notochord :** (noton = back, chord = string)

   It is a long rod- like support structure that runs along the back of the animal separating the nervous tissue from the gut.

   In higher chordates, notochord is transformed into Cranium and vertebal column.

   It provides a place for muscles to attach for ease of movements.

2. **Dorsal nerve chord**

   It ocurs above the notochord. In higher chordates it get transformed into brain and spinal cord.

3. **Paired Gill Pouches**

   They are respiratory structures which remain functional throughout life in fishes and some amphibians. In others they occur only in embryo.

4. **Post Anal tail**

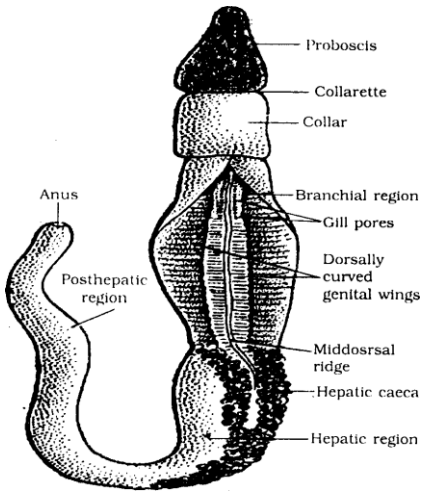
   It occurs in most chordates for balancing, protection of genital and anal regions. Phylum Chordata is divided into two group ; Protochordata and Vertebrata.

PROTOCHORDATA

CHARACTERISTICS

- They are triploblastic, bilaterally symmetrical and have a coelom.
- They have a notochord, at least at some stages during their lives. Protochordates may not have a proper notochord present at all stages in their lives or for the entire length of the animals.
- They are marine animals.
- They have Dorsal nerve cord, gill pouches, Urochordata, and Cephalo chordata.

  Example : *Balanoglossus, Herdmania, Amphioxus,* etc.



VERTEBRATA

- These animals have notochord, that has been replaced by internal skeleton of vertebral column, allowing a completely different distribution of muscle attachment points to be used for movement.
- They are bilaterally symmetrical, triploblastic, coelomic and segmented with complex differentiation of body tissues and organs.
- They have a dorsal nerve cord, and paired gill pouches.
- They are coelomata.
- They are divided into 5 classes.
    1. Pisces
    2. Amphibia
    3. Reptilia
    4. Aves
    5. Mammalia

CLASS PISCES

CHARACTERISTICS

- These are fishes and are exclusively aquatic animals.
- Their skin is covered with scales or plates.
- They obtain oxygen dissolved in water by using gills.
- The body is streamlined, and a muscular tail is used for movement.
- They are cold-blooded (i.e., body temperature changes according to environment)
- Their hearts have only 2 chambers.
- They lay eggs except far sharks.
- Some of them have skeletons made entirely of cartilage, such as sharks; and some with as skeleton made of both bone and cartilage, such as tuna or rohu. The formal is called **Chondrich thyes** and latter is called Osteichtheyes.

  Examples : *Synchirophs splendidvs* (mandarian fish), *Pterois volitans* (Lion fish), *Callophyrne jordani* (Angler fish); electric ray (*Torpedo*), *Trygon* (sting ray), *Scoliodon* (Dog fish), etc.

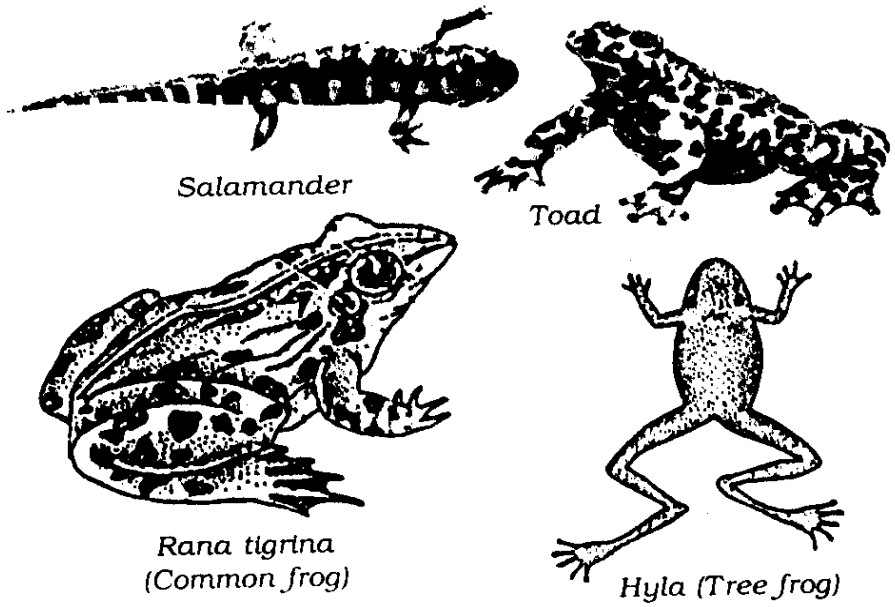
CLASS AMPHIBIA

CHARACTRISTICS

- The animals are amphibious in nature, i.e., they can live on land as well as in water.
- They are cold-blooded animals.
- They lay eggs (i.e. they are oviparous animals) in water.
- Skin is smooth and without scales.
- It has large number of mucous glands in skin.
- They have three-chambered heart.

- Respiration is either through gills or lungs.

  Example : (Salamander) *Salamandara, Rana tigrina* (frog), *Bufo* (toad), *Hyla* (tree-frog) etc.



CLASS REPTILIA

CHARACTERISTICS

- They are cold-blooded.
- Their body is covered with scales.
- They breathe through lungs.
- Most of them have a three chambered heart. Only crocodile has four-chambered heat.
- They lay eggs with tough coverings and do not need to lay their eggs in water.
- They are terrestrial animals and they creep and borrow.

  Examples : Turtle, Chameleon, King Cobra (*Naja naja*), Crocodile (*Crocodylus*), Flying Lizard (*Draco*), House wall lizard (*Hemi dactyles*)

CLASS AVES

CHARACTERISTICS

- This class includes birds.
- They are warms blooded animals.
- They have four chambered heart.
- They breath through lungs.
- They lay eggs (oviparous) that is covered with hard shell.
- They have an outside covering of feathers, and two forelimbs are modified into wings for flight. Hindlimbs have four-clawed digits for walking, runnning etc.

- They are very light because of air spaces.

  Example : White stock (*Ciconoa ciconia*), Ostrich (*Struthia cameluis*), Male Tufted Duck (*Agthya fuligule*), Pigeon, Sparrow, Crow.

CLASS MAMMALIA

- They are warm blooded animals with four chambered heart.
- Their skin has hairs as well as sweat and oil glands.
- They have mammary glands or milk producing glands, for production of milk to nourish their young ones.
- Most mammals give birth to the young ones; however; few of them, like the platypus and echidna lay eggs, and some, like kangaroos give birth to poorly developed young ones.

  Examples : Rat (*Felis*), Dog (*Canis*), Lion (*Panthera leo*), Tiger (*Panthera tigris*), Human beings (*Homo sapiens*), Rat (*Rattus*), Elephant, Platypus, *Echidna*, Kangroos, Bat, whale, Monkey, elephant etc.

SOLVED NCERT QUESTIONS

Q1. **(a) Which organisms are called primitive and how are they different from the so-called advanced organisms ?**

(b) Will advanced organisms be the same as complex organisms ? Why ?

Ans. (a) Organism which have ancient body desings that have not changed very much are referred to as primitive organism. Those organisms that have acquired their particular body plan recently are referred to as advanced organisms.

(b) The complexity of body design will incresae over evolutionary time we can say that older organisms (primitive) are simple and younger organisms (advanced) are more complex.

Q2. **How do poriferan animals differ from coelenterate animals ? Ans.**

Difference between poriferans and coelenterates.

	Poriferans		**Coelenterates**
(i)	There are holes all over the body.	**(i)**	have tentacles around mouth.
(ii)	Have canal system.	**(ii)**	Have a cavity coelenteron.
(iii)	Body design have minimal differentiation and division into tissues. Eg. Sycon	**(iii)**	More body design differentiation. Body made up of two layers. Eg. Hydra

Q3. **How do annelied animals differ from arthropods?**

Ans.

	Annelids		**Arthropds**
(i)	Closed circulatory system	**(i)**	Open circulatory system.
(ii)	Bisexual	**(ii)**	Unisexual.
(iii)	Do not have jointed legs. Eg. Leech	**(iii)**	Have jointed legs. Eg. Crab, Scorpion

Q4. **What are differences between amphibians and reptiles ?**

Ans.

	Amphibians		**Reptiles**
(i)	Scales absent from skin.	**(i)**	Scales present on skin.
(ii)	Lay eggs without shell in water.	**(ii)**	Lay shelled eggs on land.
(iii)	Respiration either through gills or lungs.	**(iii)**	Respiration through lungs.
(iv)	Fertilisation external. Eg. Frog, Toad	**(iv)**	Fertilisation internal Eg. Lizards, Snakes

Q5. **What are the differences between animals belonging to the Aves group and those in the Mammalia groups ?**

Ans.

	Aves		**Mammals**
(i)	Lay eggs.	**(i)**	Give birth to young ones except platypus and the echidna.
(ii)	Mammary glands absent.	**(ii)**	Mannary glands are present.
(iii)	Body covered with feathers.	**(iii)**	Body covered with hair.
(iv)	Sweat and sebaceglands are not present in the skin.	**(iv)**	Sweat and sebaousceous glands are present in the skin.

Q6. **What are the advantages of classifying organisms?**

Ans. (i) By classifying organisms we place them in groups that reflect their most significant features and relationship.

(ii) Organism can be named, remembered and easily studied.

Q7. **How would you choose between two characteristics to be used for developing a hierarchy in classification.**

Ans. Nature of the cell will be considered first and then the complexity of body characteristic such as wheather single celled or multicellular. Example, Prokaryote will be kept in lower hierarchical group as compared to eukaryotes.

Q8. **(a) Why do we classify orgnaisms ?**

(b) Give three examples of the range of variations that you see in life-forms around you.

Ans. (a) The purpose of classifying organisms is to organise the vast number of known plants and animals into categories that could be named, remembered and studied.

(b) (i) Microscopic bacteria and protist.

(ii) Tall trees like giant red wood and giant animal like whale.

(iii) Animals and plants having unorganised body like Sponges and Moss.

Q9. **(i) Which do you think is a more basic characteristics of classfying organisms ?**

(a) the place where they live.

(b) the kind of cells they are made of. Why?

(ii) What is the primary characteristics on which the first division of organisms is made ?

(iii) On what basis are plants and animals put into different categories ?

Ans. (i) Basic characteristics of classifying organism is the kind of cell, they are made up of because if we consider the place they live it will not be appropriates for example if we consider animals which live in sea, it includes corals, whales, octopuses, fishes, star fish, sea anemone which have different characteristics.

When we consider cell we place the organism into two types – Prokaryotes and Eukaryotes.

(ii) Nature of its cell.

(iii) On their mode of nutrition and organisation of cell, body, its different organs and their complexity.

Q10. **(a) What is the criterion for classification of organisms as belonging to kingdom Monera or Protista ?**

(b) In which kingdom will you place an organism which is single-celled, eukaryotic and photosynthetic ?

(c) In the hierarchy of classification, which grouping will have the smallest number of organisms with a maximum of characteristics in common and which will have the largest number of organisms ?

Ans. (i) Organism not having a well-organised nucleus bounded by membrane and absence of membrane bound cell organelles (prokaryotes) have been kept in kingdom Monera. While all unicellular prokaryotic organisms have been kept in kingdom Protista.

(ii) Protista

(iii) **Species :** Will have the smallest number of organisms with a maximum of characteristics in common. Kingdom will have the largest number of organisms.

Q11. **(a) Which division among plants has the simplest organisms ?**

(b) How are pteriodphytes different from the phanerogams ?

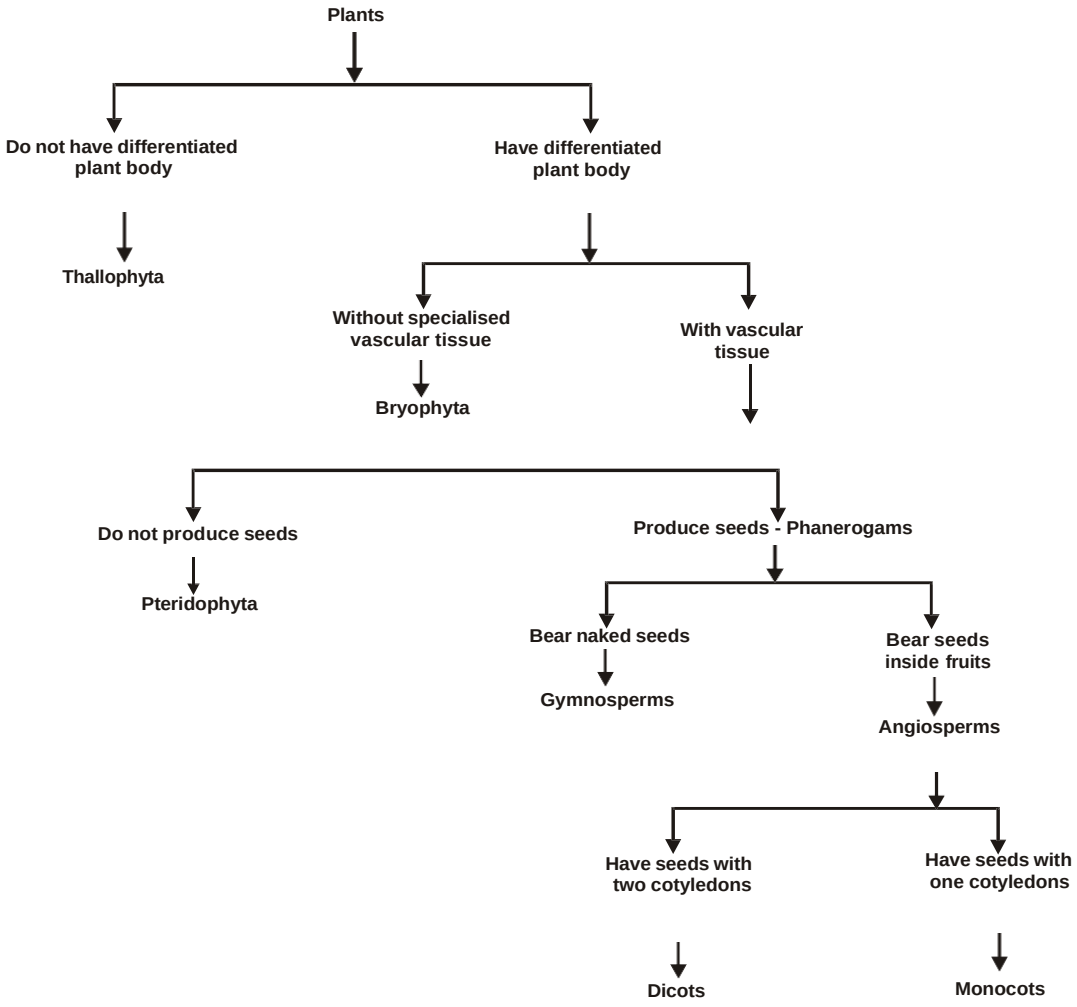
(c) How do gymnosperms and angiosperms differ from each other ?

Ans. (a) Thallophyta.

(b) Pteridophytes do not produce seeds while phanerogams seeds.

(c) Gymnosperms bear naked seeds while angiosperms bear seeds inside fruits.

Q12. **What are the major divisions in the Plantae ? What is the basis for these divisions ?**



Q13. **How are the criteria for deciding divisions in plants different from the criteria for deciding the subgroups among animals ?**

Ans. Criteria for deciding divisions in plants is based on:

(i) Differentiation of plant body.

(ii) Presence or absence of special tissues for transport of water and other substances within it.

(iii) Ability to bear seeds.

(iv) Wheather seeds are naked or enclosed within the fruit.

Criteria for deciding subgroups among animals:

(i) Body plan.

(ii) Number of layers in the body.

(iii) Presence of coelom.

(iv) Symmetry.

(v) Cold-blooded or warm–blooded.

(vi) Egg laying or give birth to young ones.

(vii) Presence or absence of vertebral column or notochord.

Q14. **Explain how animals in Vertebrata are clasified into further sub - groups.**

Ans. Animals of Vertebrata are further classified into sub – groups on the basis of

(i) nature of heart two – three or four chambered.

(ii) Presence or absence of scales.

(iii) cold – blooded or warm – blooded.

(iv) egg laying or give birth to young ones.

(v) presence of hair and mammary glands

(vi) Lays shelled egg or egg without shell.

(vii) presence of feathers.

(viii) respiration by lung or gills.3

PRACTICE EXERCISE – 1

Q1. Who proposed the 'binomial nomenclature' ?

Q2. According to Whittaker's classification, how many kingdoms of life are there ? Name them.

Q3. Give three examples of kingdom Fungi.

Q4. Give the example of kingdom Platae.

Q5. Name the division which includes seed-bearing plants.

Q6. Write a few examples of sub-division Gymnospermae.

Q7. Name the major phyla of kingdom Animalia.

Q8. Give 3 examples of phylum mollusca.

Q9. What is binomial nomenclature ? Illustrate with one example.

Q10. What are the two general classes of Angiosperms ? Give two examples of each.

Q11. Write 2 characteristics features of Phylum Platyhelminthes.

Q12. Write 2 charactrirstics feature each of

(a) class Aves

(b) class Amphibia

Q13. Write a short note on Brophyta.

Q14. What are the characteristics features of Pteridophyta ?

Q15. Write 2 examples of Arthropoda. Also write 3 characteristics features of it.

Q16. Write 4 characteristics features of chordata.

Q17. Write four characteristic features of kingdom Animalia.

Q18. Write the charactristics features of sub-division Angiosperame.

Q19. Name the kingdom which possesses muscle cells and nerve cells. Mention five characteristics of that kingdom.

Q20. Compare between Bryophytes and Pteridophytes. Give 2 advancements of Pteridophytes on Bryophytes.

EVALUATE YOURSELF

M.M. : 25 M.T. : 60 min. **M.M. : 25 M.T. : 60 min.**

TEST - 1

1. Define classfiication. **1**

2. Give one term for, a group of related species. **1**

3. Who has divided organisms into 5 kingdoms. **1**

4. What are phanerogams ? **1**

5. What is the largest phylum of kingdom Animalia. **1**

6. Differentiate between Algae and fungi. **2**

7. Name different classes of Phylum Chordata. **2**

8. Write a short-note on Binomial nomenclature. **3**

9. Why is it necessary to classify the living organisms. **3**

10. Name the major phyla of animals, along with one or two main features and examples. **5**

TEST - 2

1. Name the pore bearing Animals. **1**

2. Canal system is present in which phylum. **1**

3. Name two cold blooded Animals. **1**

4. Amphibians of plant kingdom are _____ ? **1**

5. The cell wall of fungi is made up of which material ? **1**

6. Assign Jelly fish and leech to their respective organs giving reasons. **2**

7. What is the difference between Bilateral and Radial symmetry. **2**

8. Give the names of animal which

(i) is shaped like a star.

(ii) has a pouch in which the young develops.

(iii) lives on land but lays its eggs in water.

(iv) has Pseudocoelom.

(vi) has metamieric segmentation. **3**

9. Write a short note on Lichens. **3**

10. Explain the basis for grouping into five kingdom. **5**

EVALUATE YOURSELF

M.M. : 25 **M.T. : 60 min.** **M.M. : 25** **M.T. : 60 min.**

TEST - 3

1. Name the following : **1**
(a) a worm blooded organism
(b) a diploblastic animal.

2. What is the basic unit nof classification ? **1**

3. Distinguish between gametophyte and sporophyte ? **1**

4. Give two examples of Vascular Cryptogams ? **1**

5. Define hierachial classification. **1**

6. Give an example of each. **2**
(i) Phylum Annelida
(ii) Class Pisces
(iii) Phylum Arthropoda
(iv) Protochordates

7. Rewrite the following scientific names correctly, if incorrect. **2**
(i) *Magnifera Indica*
(ii) *Fasciola hepatica*
(iii) *Homo Sapiens*
(iv) *Pila globusa*

8. Which organisms are called primitive and how are they different from so called advanced organisms. **3**

9. How are the criteria deciding divisions in plants differ from the criteria deciding the sub-groups among animals. **3**

10. Explain how animals in Vertebrata are classify into further subgroups. **5**

TEST - 4

1. Define taxonomy. **1**

2. What is the scientific names of
(i) Sea horse
(ii) Sea cucumber **1**

3. Give one point of different between Gymnosperms and Angiosperms. **1**

4. Wht is pseudocoelom. **1**

5. Identify the Animal group having jointed legs. **1**

6. Differentiate between Monocots and Dicots. **2**

7. Why are local names not sufficient to recognise the organisms ? **2**

8. Name the phylum / division of the following organisms : **3**
Mors, Tape-worm, spider, electric ray, spirogyra, sponges

9. What is classfication ? Explain its important. **3**

10. Give an outline of kingdom Plantae. **5**

MULTIPLE CHOICE QUESTION'S

1. Which of the following feature is not a characteris-tic of protochordata ?

(a) Presence of circulatory system

(b) Bilateral symmetry

(c) Presence of notochord

(d) Jointed legs

2. Tube feet are locomotary organs of

(a) Arthropoda (b) Annelida

(c) Nematoda (d) Echinodermata

3. Two chambered heart is found in

(a) Sea horse (b) Hyla

(c) Salamander (d) Jellyfish

4. Real organs are absent in

(a) Mollusca (b) Arthropoda

(c) Coelenterata (d) Echinodermata

5. Which one of the following is not a reptile ?

(a) Draco (b) Hemidactylus

(c) Hyla (d) Chameleon

6. Book 'Origin of Species' is written by

(a) Haeckel (b) Whittaker

(c) Linnaeus (d) Darwin

7. Which of the following convention is not followed while writing scientific name ?

(a) The name of the genus begins with capital letter.

(b) The name of the species begins with small letter

(c) When printed scientific name is given in italics

(d) When written by hand the genus name and the species name should be underlined together.

8. Some fungal species live in permanent mutually dependent a relationship with blue green algae such a relationship is called.

(a) Parasitic (b) Symbiotic

(c) Saprophytic (d) Epiphytic

9. In the hicrarchy of classfication which grouping will have the smallest number of organisms ?

(a) Class (b) Order

(c) Family (d) Genus

10. Kingdom Monera does not include

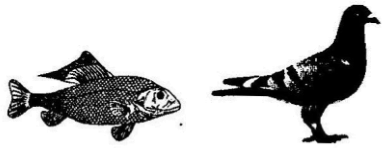
(a) Blue-green algae

(b) Archae bacteria

(c) Mycoplasma

(d) Ulva

11. The animals given below are placed in same phylum because of



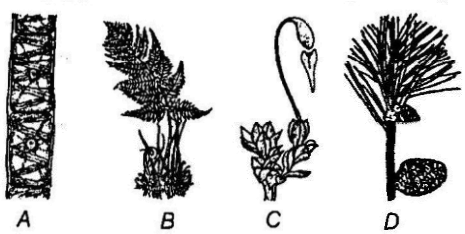
(a) Respiration by gills

(b) Shape of body

(c) The presence of fins

(d) Dorsal nerve cord

12. Identify gymnosperm from the given figures.



(a) A (b) B and C

(c) Only D (d) All of these

13. Monocotyledonous and dicotyledonous plants are classified on the basis of

(a) number of cotyledons in seeds of plants

(c) nature of leaf in plants

(c) nature of root in plants

(d) All of the above

14. Which of the following pair has dicot seeds ?

(a) Pea and onion (b) Maize and pea

(c) Pea and neem (d) Onion and maize

15. Chloroplast present in Spirogyra are

(a) book-shaped (b) irregular-shape

(c) ribbon-shaped (d) spiral-shaped

16. Which of the following statement is correct with respect to dicotyledonous plants ?

(a) Reticulate venation, tap root, pentamerous flowers.

(b) Parallel venation, tap root and pentamerous flowers.

(c) Parallel venation, fibrous root and trimerous flower.

(d) Trimerous flower, reticulate venation and tap root.

17. The correct position of clitellum in earthworm is

(a) 12,13,14 segments

(b) 14,15,16 segments

(c) 24,25,26 segments

(d) 5,6,7 segments

18. From the plants given below a dicotyledonous plant is

(a) wheat (b) maize

(c) lily (d) hibiscus

19. The scientific name of human is

(a) Avenea (b) Homo sapiens

(c) Panthera lio (d) none of the above.

20. Ulothrix is a/an

(a) alga (b) fungus

(c) pteridophyte (d) none of the above.

21. Penicillium is a member of

(a) algae (b) fungi

(c) pteridophyta (d) phanerogamae.

22. Amoeba and paramecium are the members of

(a) annelida (b) arthropoda

(c) coelenterata (d) protista.

23. Hydra is a member of phylum

(a) annelida (b) arthropoda

(c) coelenterata (d) protozoa.

24. The largest phylum of animal kingdom is

(a) annelida (b) arthropoda

(c) coelenterata (d) protozoa.

25. Pigeon belongs to class

(a) Amphibia (b) Aves

(c) Reptilia (d) Mammalia

26. Snake belongs to class

(a) Amphibia (b) Aves

(c) Reptilia (d) Mammalia

27. The animal which does not belong to class chondrichthyes is

(a) jelly fish (b) dog fish

(c) sting ray (d) electric ray.

28. Body is covered with feathers in

(a) aves (b) reptiles

(c) amphibians (d) mammals.

29. Four chambered heart is found in

(a) fish and amphibians

(b) amphibians and reptiles

(c) reptiles and aves

(d) aves and mammals.

30. The most intelligent animals are found in class

(a) aves (b) reptiles

(c) mammalia (d) all the above

31. The egg laying mammal is

(a) platypus (b) bat

(c) cat (d) dog.

32. Cockroach and scorpions are the members of phylum

(a) annelid (b) arthropoda

(c) coelenterta (d) none of the above.

33. The science of naming organism is called

(a) identification (b) nomenclature

(c) classification (d) taxonomy

34. Binomial nomenclature consists of two words

(a) genus and species (b) order and family

(b) family and genus (d) species and variety

35. Homo ; generic name : : Sapines : _____

(a) species name (b) human name

(c) division name (d) organism name

36. 'Taxa' differs from "taxon" due to

(a) this being a higher taxonomic category than taxon

(b) this being the lower taxonomic category than taxon

(c) this being the singular of taxon.

(d) this being the singular of taxon.

37. A group of similar inter-breeding organisms constitutes a

(a) species (b) genera

(c) family (d) class

38. A plant body not differentiated into root, stem and leaves is termed as
(a) thallus (b) mycelium
(c) hyphae (d) herb

39. The compound plants composed of algae and fungi are called
(a) algae (b) bryophytes
(c) pteridophytes (d) lichens

40. Which of the following plant group bears naked seeds?
(a) Pteridophyta (b) Bryophyta
(c) Gymnospermae (d) Angiospermae

41. Phylum mollusca can be distinguished from other nonchordates by the presence of
(a) bilateral symmetry and exoskeleton
(b) a mantle and gills
(c) shell and non-segmented body
(d) a mantle and a non-segmented body

42. Choanocytes are unique to
(a) Protozoa (b) Porifera
(c) Mollusca (d) Echinodermata

43. Tapeworm is member of phylum
(a) Annelida (b) Porifera
(c) Nematoda (d) Plathyelminthes

44. True coelom appeared for the first time in
(a) Mollusca (b) Nematoda
(c) Annelida (d) Arthropoda

45. In the Pila, the gastropod mollusk, the organ of the locomotion is
(a) mantle (b) foot
(c) tentacles (d) legs

46. Enchinoderms have
(a) water vascular system
(b) canal system
(c) jet propulsion
(d) book lungs

47. In higher chordates, notochord is transformed into
(a) cranium (b) limbs
(c) vertebral column (d) both (a) and (c)

48. Lateral line sense organs occur in
(a) fishes (b) amphibian larva
(c) reptiles (d) both (a) and (b)

49. The skin is devoid of scales in
(a) cartilaginous fish (b) bony fishes
(c) reptiles (d) amphibians

50. Duck-billed platypus and echidna are
(a) reptiles
(b) egg-laying mammals
(c) marsupial mammals
(d) eutherian mammals

ANSWERS

1. (d)	**2.** (d)	**3.** (a)	**4.** (c)	**5.** (c)
6. (d)	**7.** (d)	**8.** (c)	**9.** (d)	**10.** (d)
11. (d)	**12.** (c)	**13.** (d)	**14.** (c)	**15.** (d)
16. (a)	**17.** (b)	**18.** (d)	**19.** (b)	**20.** (a)
21. (b)	**22.** (d)	**23.** (c)	**24.** (b)	**25.** (b)
26. (c)	**27.** (a)	**28.** (a)	**29.** (d)	**30.** (c)
31. (a)	**32.** (b)	**33.** (b)	**34.** (a)	**35.** (a)
36. (c)	**37.** (a)	**38.** (a)	**39.** (d)	**40.** (c)
41. (d)	**42.** (b)	**43.** (d)	**44.** (c)	**45.** (b)
46. (a)	**47.** (c)	**48.** (d)	**49.** (d)	**50.** (b)

— Notes —

CH : 4 – WHY DO WE FALL ILL

Numerous activities are going on inside the body. The cells are not static. They are in dynamic state. Things are always happening there. For instance, cells move from place to place. Even if a cell is not moving, in it repairing may go on. New cells are being made.

In our body organs, too, various specialized activities are going on. E.g., the heart is beating to pump blood to all body parts, the lungs are breathing to exchange gases, the kidneys are filtering the blood and making the urine and brain is thinking. All these activities of various body organs are interconnected. If kidneys, for example, stop filtering the blood, poisonous substances will accumulate in the body. Under such conditions, the brain will not be able to think properly.

For their functioning, cells require energy and raw materials. In other words, a proper food is, necessary for functioning of cells, their tissues and organs. Anything that disturbs the proper functioning of cells, tissues and organs will result in the lack of proper activity of the body.

WHO (World Health Organisation) has defined health to be "A state of complete physical, mental and social well being (and not merely the absence of disease) that enables one to lead a socially and economically productive life."

Significance of health

Health has a different meaning in different context. For example, for a grandmother, ability to go out to market or visit neighbour is good health. Her health is not so good if she is unable to do so. A youngster is healthy if he can run, jump and play joyfully. A student who studies well, remains attentive in class and follows instructions of the teacher properly has a healthy attitude. Therefore, good health is "healthy body with a healthy mind and healthy attitude."

- Good health increases our efficiency for doing work.
- The increased efficiency of a man due to good health contributes to his own progress, the progress of community and the progress of nation as a whole.
- Good health makes a man happy and cheerful.
- It allows a person to have the initiative for betterment.
- Healthy person can also give proper attention to others in the family.

Personal & Community Issues both matter for health

- Health of an individual depends upon the surroundings or one's environment. Environment is both physical and social.

- **Physical environment** is related to heat, humidity, storm, cyclones, flood, drought, etc.
- **Social environment** is the one created by the society in which one lives.

The conditions essential for good health are :-

1. **Public cleanliness.** Surroundings should be clean by providing good sewage and rain water disposal systems and proper garbage disposals. This also includes availability of clean drinking water.

2. **Economic conditions.** A proper nutrition is essential for good health. There should be proper earning in order to provide food to every one in the family. For a good earning opportunity to do work has to be available. Therefore, good economic conditions are need to maintain health of the individuals.

3. We require to be happy in order to be truly healthy. And if we mistreat each other and are afraid of each other, we cannot remain happy or healthy. Social equality and harmonious relationships among our population are necessary for the individual health.

Distinction between Healthy and Disease-free

- **Disease or disturbed ease or discomfort is a condition of disturbed functioning of the body or its part.** For example, fever, diarrhoea, dysentery, pain etc.
- The exact cause may not be known. For example, diarrhoea is apparent by occurrence of loose motions without knowing the exact cause like viral, bacterial or protozoan infection.
- A person is disease free if there is no discomfort of the functioning of the body. However, a disease free person, can be in good health of poor health.
- There will be poor health if one is not energetic and not able to perform as per requirement. For example, a dancer would be in a poor health if the person is unable to perform, stretch, twist and bend. Similarly, a musician is in good or poor health depending upon the breathing capacity of the lungs, for controlled notes of flute.
- So we can be in the poor health without there being a simple cause in the form of an identifiable cause. This is the reason why, when we think about health, we think about societies and communities. On the other hand, when we think about disease, we think about individual sufferers.

Health		Disease-free	
(i)	It is the state of physical, mental an social well being.	(i)	It is a state of absence of any discomfort of body or its parts.
(ii)	It depends upon the person and one's environment, including society.	(ii)	It depends upon the person alone.
(iii)	A person can be unhealthy even in the absence of disease.	(iii)	A person would be disease free in the absence of discomfort.

Disease and its causes

- There are a number of tissues in the body which aggregate together to form an organ while a number of organs make up an organ system. Each organ system performs a specific function.
- Each organ has a specific role to play. For example, in digestive system, teeth help in mastication, stomach and intestine help in digestion. Kidneys take part in digestion. Bones and muscles hold the body parts together to form a muscoskeletal system that helps the body to move.
- Disruption in the functioning of any tissue, organ or organ system will cause discomfort or disease.
- Diseases are diagnosed with the help of symptoms and signs.

Symptoms. They are manifestations or evidences of the presence of diseases. Symptoms are in the form of structural and functional changes in the body or body parts. They indicate that there is something wrong in the body, example, wound with pus, cough, cold, loose motions, pain in abdomen, headache, fever. Symptoms do not give exact cause of the disease, for instance, headache ca be due to eye-sight problem, blood pressure, examination and other stress, meningitis, etc.

Signs. There are indications of the disease. On the basis of symptoms, physicians search for definite clues or signs of the disease. For this, they use certain instruments and even go for laboratory tests to pinpoint the cause of the disease.

Symptoms	Signs
(i) They indicate the presence of disease.	(i) They provide information about the presence of particular diseases.
(ii) Symptoms are collective manifestation of a number of diseases of particular parts or organs.	(ii) They are distinct for different diseases.

Active and Chronic diseases

The manifestation of diseases will be different depending upon a number of factors. One of the factors is duration of disease. On the basis of duration, a serious disease can be acute or chronic.

Acute Disease. It is a short duration disease which generally has a relatively severe course. Normal activity is impaired but only for a few days. Soon the patient recovers and begins to lead a normal active life. Being of short duration, an acute disease is unable to cause major effect on health. Example, **common cold, malaria, typhoid, diarrhoea.**

Chronic Disease. It is long duration disease which generally develops slowly. It builds up with time. Prolonged general health does not permit the patient to lead a normal life. After effects of the disease remain for a long time because the disease causes a damaging effect on the body. Example, **tuberculosis, elephantiasis, hypertension, diabetes.**

Acute Diseases	Chronic Diseases
(i) It is of shorter duration.	(i) It is long duration disease.
(ii) Every person suffers from an acute disease at one time or the other.	(ii) One some persons suffer from chronic diseases.
(iii) Being of short duration, it does not damage any organ.	(iii) It does damage the affected organ due to prolonged duration.
(iv) The patient recovers completely after the cure.	(iv) The patient does not recover completely.
(v) There is no loss of weight or feeling of tiredness.	(v) There is often loss of weight or feeling of tiredness.
(vi) There is short duration loss of work and efficiency.	(vi) There is prolonged loss of work and efficiency.

Causes of Diseases

- Causes of diseases are agents and factors which produce the diseases.
- The agent or factors that actually causes the disease is called **Immediate or Primary cause.**
- The factors which make an individual prone to catching the disease are known as **Contributory cause.**
- There are different levels of causes - first, second and third.

1. **First level of cause.** It is the immediate, or primary cause of the disease. For infectious diseases, the first level of cause is the pathogen, viz., virus, bacterium, fungus, protozoan, worm. Suppose a baby is suffering loose motions. The first level of cause is the pathogen which may be virus or bacterium. The pathogen reaches the baby through unclean drinking water, contaminated food, etc.

2. **Second level of cause.** It is the factor which makes a person prone to catching the disease. All the persons are not equally susceptible to a disease. The susceptibility may be due to poor health related to under-nourishment. Lack of good nourishment is, second level of cause. In some persons, susceptibility to a pathogen is genetically related. Here, poor heredity is the second level of cause.

	Deficient Nutrient	Disease
1.	Protein	Kwashiorkor
2.	Protein and total food calories	Marasmus
3.	Vitamin A	Xeropthalmia
4.	Vitamin A	Night blindness
5.	Vitamin B1	Beriberi
6.	Vitamin B2	Cheilosis
7.	Niacin	Pellagra
8.	Vitamin B12	Pernicious anaemia
9.	Iron	Microcytic anaemia
10.	Vitamin C	Scurvy
11.	Vitamin D	Rickets (in children)
12.	Vitamin K	Bleeding disease
14.	Fluorine	Dental caries
15.	Iodine	Goitre

4. **Third level of cause.** It is contributing cause that promotes proneness to disease. A repeated supply of unclean water will make everybody catch the water borne disease. Poor public health services will, therefore, become the third level of cause. Lack of proper nourishment is a result of poverty. Poverty can also function as third level of cause. Poor persons generally live in unclean surroundings where basic amenities provided by municipality and public health services are lacking.

Classification of Diseases

Diseases are broadly classified into two categories

(a) **Congenital Diseases.** They are diseases present since birth. Congenital diseases are caused due to defective development of any organ or genetic abnormality or due to metabolic disorders.

(b) **Acquired Diseases.** They are those diseases which are picked up after birth. Depending upon their ability or inability to spread from one individual to another, acquired diseases are of two kinds, infectious and non-infectious.

(i) **Infectious (communicable) Diseases.** These diseases are caused by microbes and other pathogens such as bacteria, viruses, fungi, protozoan, worms, etc. They are called infectious or communicable diseases because the infectious agents or pathogens can spread from diseased person to healthy person, e.g., tuberculosis, malaria, diarrhoea, etc.

(ii) **Non-infectious (non-communicable) diseases.** They are diseases which are not caused by any pathogen. They are mostly due to internal or intrinsic non-infectious causes. For e.g., high blood pressure is often caused by excessive weight and lack of exercise, cancers may be caused due to genetic abnormalities. Non infectious diseases remain confined to a person. They are neither present at birth nor spread from one person to another.

Infectious Diseases	Non-infectious Diseases
(i) They are caused by attack of pathogen.	(i) They are caused by factors other than living pathogen.
(ii) The diseases are brought about by external factors.	(ii) The diseases are mostly brought about by internal factors.
(iii) These diseases can pass from diseased person to healthy person.	(iii) These diseases cannot pass from one person to another.
(iv) Community hygiene can reduce the incidences of infectious diseases.	(iv) Community hygiene is ineffective in reducing the incidence of non-infectious diseases.

Type of disease	Causes of disease	Example
1. Physical	Temporary or permanent damage to body parts.	Bone fracture, leprosy
2. Infectious	Invasion of the body by other organisms (viruses, bacteria, fungi protozoans, nemetodes, insects, etc.)	Typhoid, diarrhoea, malaria, hepatitis, rabies, AIDS, T.B., polio, influenza, cholera
3. Deficiency	Inadequate diet	Kwashiorkor, marasmus, scurvy, rickets, anaemia, goitre, xerophthalmia, beri-beri
4. Inherited	Defective genes passed on from parents to offspring	Haemophilia, sickle-cell anaemia, cystic fibrosis
5. Degenerative	Organs and tissues wear away and do not work so well with age	Arthritis, poor sight and hearing defects
6. Mental	Brain damage or psychological	Depression, paranoia
7. Social	Social interactions with family friends and strangers	Drug dependence, alcoholism, smoking, unhealthy life-styles, social isolation.

Peptic Ulcers

Peptic Ulcers cause acidity related pain and bleeding in stomach and duodenum. They were once considered to be caused by increased gastric acidity due to stress and life style of the afflicted persons. However, Robin **Warren observed** in 1984 that area of peptic ulcers contained many small curved bacteria named Helicobacter Pylori. **Barry Marshall** succeeded in culturing the bacteria (1985).

Marshall and Warren (1985) found that by killing the bacteria one can cure the peptic ulcers. The finding helped in converting once painful chronic and disabling condition into short duration treatable disease. For this, Marshall and Warren were awarded Nobel Prize for physiology and medicine in 2005.

Infectious Agents

The various infectious agents are :-

(a) **Bacteria.** They are unicellular, prokaryotic, microscopic organisms. They reproduce very quickly. Some common disease caused by bacteria are typhoid, cholera, anthrax, tuberculosis, tetanus, Acne (caused by staphylococci).

(b) **Viruses.** They are submicroscopic organisms. They cannot reproduce by themselves as they do not have their own metabolic machinery and utilize the metabolic machinery of the host cell and divide very quickly. Example, common cold, influenza, dengue fever, SARS, AIDS, polio, small pox, chicken pox, etc.

(c) **Protozoans.** They are microscopic unicellular, eukaryotic organisms. They also reproduce very quickly. Example, malaria (caused by plasmodium), kala azar (caused by Leishmania), sleeping sickness (caused by Trypanosoma).

(d) **Worms.** Worms are mostly present in intestine. They reproduce slowly. Example of disease caused by worms are Ascariasis (caused by round worm), elephantiasis (caused by wuchereria bancrofti), etc.

(e) **Fungi.** They are also muticellular, eukaryotic, heteotrophic organisms. They reproduce very quickly. They cause ring worm, Athlete's foot and other skin infections.

Means of Spread

Infectious disease are called Communicable diseases because they can spread from an affected person to a healthy person. The means of communication are of different types :-

(a) **Direct Transmission.** The pathogens are transmitted from an infected person to a healthy person directly without an intermediate agent. It occurs in following ways :-

(i) **Contact with infected person.** Diseases like chicken pox, small pox, ring worm are spread by actual contact between infected person and a healthy person. Such diseases are called Contagious diseases.

The sexual contact is one of the closest physical contacts two people can have with each other. Diseases like syphilis, gonorrhoea, and AIDS are transmitted by sexual contact from one partner (infected) to the other (healthy). However, these diseases are not transmitted by casual physical contacts like handshakes or hugs or sports like wrestling or by any other way in which we touch each other socially.

Other than sexual contact, AIDS virus also spreads through blood to blood contact (as in blood transfusion, use of common needles and syringes) from infected to healthy persons. An infected mother also spreads disease to her baby through breast feeding.

(ii) **Contact with soil.** The infections agent of tetanus can enter the human body from soil through injuries.

(iii) **Animal Bites.** The rabies virus is injected in the human body by the bite of rabid dog or monkey.

(iv) **Transplacental transmission.** The diseases like AIDS, German measles and syphilis can be transmitted from injected mother to the foetus through placenta.

(b) **Indirect Transmission.** The pathogens of some diseases are carried through some intermediate agents. It occurs in the following ways :-

(i) **Vectors borne.** Many animals which live with us may carry diseases. These animals carry the infecting agents from a sick person to another healthy person. Thus, these animals act as intermediaries or Carriers. Vectors are carrier of a disease or infection.

For example, Mosquitoes are vectors of a disease, called Malaria. In many species of mosquitoes, the females need highly nutritious food in the form of blood in order to be able to lay mature eggs. Hence, they feed on many warm - blooded animals including human beings.

(ii) **Through contaminated food and water.** Cholera, hepatitis B, diarrhoea, ascariasis, etc, are some infectious gut diseases which are transmitted through contaminated food and water.

(iii) **Air borne disease / Droplet Infection.** Example, common cold, Pneumonia and tuberculosis. Such disease causing microbes are spread through the air. This occurs through the air. This occurs through the little droplets thrown out by an infected person who sneezes or coughs. Someone intending close by an breathe in these droplets, and the microbes get chance to start a new infection.

Organ specific & tissue specific manifestation

Human body has a number of organs, tissues and systems. Some pathogens infect a particular organ, tissue or system. In some cases the organ or tissue specificity depends upon the path of entry while in others it is not so.

Portal related organ & tissue specificity

- If they enter through nose, they are likely to go into the lungs and cause respiratory disorders like tuberculosis or pneumonia.
- If they enter through the mouth, they pass into digestive tract and may cause typhoid, diarrhoea, etc.
- Some microbes like virus reach liver and cause Jaundice.

Non-portal organ & tissue specificity

- An infection like HIV, that comes into the body via the sexual organs, will spread to lymph nodes all over the body.
- Malaria - causing microbes, entering through a mosquito bite, will go to the liver, and to the red blood cells.
- The virus causing Japanese encephalitis, or brain fever, enters through a mosquito bite, but it goes on to infect the brain.

Signs and symptoms

- The signs and symptoms of a disease will depend on the tissue or organ which the microbe targets.
- If the lungs are targets, then symptoms will be cough and breathlessness.
- If liver is targeted, there will be jaundice.
- If brain is target, headaches, vomiting, fits or unconsciousness will be observed.
- If alimentary canal is targeted, loss of appetite and abdominal pain may take place.

Common effect

- Besides tissue specific and organ specific effects; there will be other common effects too.
- Most of these common effects depend on the fact that the body's immune system is activated in response to infection.
- An active immune system recruits many cells to the affected tissue to kill off the disease causing

microbes. This recruitment process is called INFLAMMATION.

- As a part of this process, there are local effects such as swelling and pain, and general affects such as fever.
- In HIV infection, the virus goes to the immune system and damages its function. So, the person cannot fight even the microbes of cold, cough, diarrhoea, cholera, etc.
- Every small cold can become pneumonia.
- A minor gut infection may produce diarrhoea with blood loss.
- Death of the AIDS patient does not occur due to HIV infection but due to other infections.

Severity of Disease

- Disease will spread in the body only when the microbe enters the body in sufficient number called **Infective Dose.**
- Severity of disease manifestations depend on the number of microbes in the body.
- If the number of microbes is very small, the disease manifestations may be minor or unnoticed.
- But if the number is of the same microbe large, the disease can be severe enough to be life-threatening.
- The immune system is a major factor that determines the number of microbes surviving in the body.

Principles of treatment

There are two ways to treat an infectious disease. They are :-

1. Reduce the effect of the disease. The treatment reduces the effect of disease without killing the infectious agent. This is carried out by two methods :
   - **(a)** **Symptomatic treatment.** Medicines are taken to threat symptoms of the disease. Symptoms are related to inflammation, e.g., fever, pain, sneezing, coughing, loose motions. Medicines bring down fever, reduce pain, control motions, etc.
   - **(b)** **Bed rest.** Bet rest is advised to conserve energy for making the same available for healing.

2. **Killing the micro-organisms of Infectious Agents.** Infectious agents have some essential biochemical life processes which are specific to their group and not shared with other groups. These processes may be pathogens for respiration or synthesis of new substances. Drugs are available which block these processes and kill the infectious agents.

For example, antibodies like sulpha drugs prevent the folic acid synthesis in bacteria while human beings don't require this process. Penicillin prevents cell wall synthesis in bacteria while human cells are without wall.

However, viruses do not have their own metabolic machinery, they use host's machinery for life processes. They have only a few biochemical mechanisms of their own. So, we can only target these few biochemical mechanisms to block viral growth.

Prevention is better than cure

- It is because every infection brings about misery to the effected person and its family.
- Wherever there is an infection, damage occurs to one or the other body functions. One may not fully recover the same.
- Treatment of an infectious disease and complete physical recovery afterwards keep the patient bed ridden for at least a few days.
- A person suffering from infectious disease can serve as a source from where the infection spreads to other persons.
- It is therefore important to prevent the infectious disease.

General ways of preventing infection

There are two types of general ways of preventing infection :-

1. Public Health measures.
    - We can prevent exposure to air-borne microbes by providing living conditions that are not over-crowded.
    - For water borne microbes, we can prevent exposures by providing safe drinking water. This can be done by treating the water to kill any microbial contamination.
    - For vector-borne diseases, we can provide clean environment. This would not, for example, allow mosquito breeding.
2. Personal health measures.
    - For keeping good health, we should eat a balanced diet. Proper nutrition is required to develop a strong immune system, which can fight against diseases. A strong immune system is able to kill off the pathogen long before it is able to multiply and assume serious proportions.
    - For example, a number of classmates may be sitting around a student having bad cold. But, everyone will not catch the disease because of the strong immune system.
    - Good diet, hygienic habits, clean environment, clean air, water and food, habits of exercise, habit of non-consumption of alcohol and drugs confirms good health of an individual.

Specific ways of preventing infection

- They are methods to strengthen body's immune system so as to check the occurrence of microbial infection. The property is called immunity and the method of developing immunity is called IMMUNISATION.
- It is generally carried out through vaccination or administration of vaccines.
- **VACCINES are preparations containing heat killed or chemically weekend pathogens which function as antigens without actually causing the disease.**
- Vaccination is the most common method of preventing infection of micro-organisms. In this a vaccine

is inoculated inside body to stimulate the formation of antibodies by the immune system.

- The antigen mimics the microbe against which we want to develop the immunity.
- This does not cause the disease but this would prevent any subsequent exposure to infecting microbe from turning into actual disease.
- The immunity developed may be
  - Temporary. Example, choler vaccine - immunity last for 6 months.
  - Permanent. Example, MMR - measles, mumps, rubella immunity lasts throughout life.
- In older days, when small pox epidemics were common, the healthy people used to shun these suffering from disease. Only those persons who had small pox earlier, used to provide nursing care because they had no fear of recurrence of the disease.
- Small pox has been completely eradicate through immunisation programme.

Discovery of Vaccine

- In Indian, Chinese and Arabian system of medicines, skin of healthy persons was rubbed against the skin crust from small pox victims to protect them for future infection.
- Vaccination was first developed by **Dr. Edward Jenner** in 1796 A.D.
- He found that milkmaids once attacked by milder disease cow pox were immune to small pox.
- He proved it experimentally, by inoculating a healthy eight year old boy namely James Phipps with a cow pox pustules taken from the milkmaid.
- Later on he inoculated the boy with material from small pox pustules. He found that the boy did not suffer from small pox.
- Edward Jenner coined the word Vaccine from Latin word vacca means cow and vaccinia from cow pox.

Vaccines

Vaccines are available against various diseases. The vaccines are :-

DPT - Diphtheria, Pertussis (whooping cough) and Tetanus.

BCG - (Bacillus Calmette Guerine) - Tuberculosis

MMR - Measles, mumps, rubella

Polio drops - Against polio

Some other diseases against which vaccines are available are typhoid, measles, meningitis, hepatitis A, hepatitis B, etc.

- Vaccination and other health measures would be successful only if they are available to all of the children.

- Despite pulse polio campaign to eradicate polio from India, new cases do come up due to certain areas where children are unable to receive polio drops.
- Vaccines should be provided at a proper age. For example, vaccine against hepatitis A is useless if given to child after 5 years of age because by that time one has contracted an infection and become immune to the same.

Viral Diseases

1. **Jaundice or Hepatitis**

Jaundice is yellowing of white part of eye and skin. Yellowness is due to excessive deposition of bile. Yellowness is due to excessive deposition of bile pigments in these structures.

Jaundice is caused by hepatitis virus. LIVER is the organ affected in this disease. The types of hepatitis are hepatitis A, B, C, D, E or G.

Modes of transmission

- Hepatitis A spreads mostly by contaminated food and water.
- Hepatitis B spreads by contact with infected sweat, saliva, tear, blood, etc.

Symptoms

- Fever and loss of appetite.
- Nausea and vomiting.
- Yellowness of skin.
- Dark yellow coloured urine and light - coloured stool after 3 to 10 days.
- Itching of the skin de to bile pigments.
- Headache and joint pains.

Control

Since it is a viral infection it is self limited by body defences. General measures are :-

- Adequate bed rest.
- Carbohydrate rich diet should be given to patient.
- Consumption of protein and fat should be limited.

Prevention

- Eating hygienic food and clean water.
- Hepatitis B and hepatitis A vaccines should be taken.
- Properly clean hands after handling bed and utensils of patient.
- Use of disposable syringes and blood should be tested before transfusion.

2. **Rabies**

It is a fatal viral disease that is transmitted to human beings by biting (saliva) of rabid dog or cat. A number of wild animals also carry the virus, e.g., jackals, wolves, foxes, monkeys, bat, rabbit, etc.

Symptoms

- High fever and painful contraction of muscles of throat and chest.
- Restlessness, difficulty in taking even liquid food.
- Patient is afraid of water, so called hydrophobia.
- Virus destroys brain and spinal cord, so it causes paralysis and painful death.

Prevention

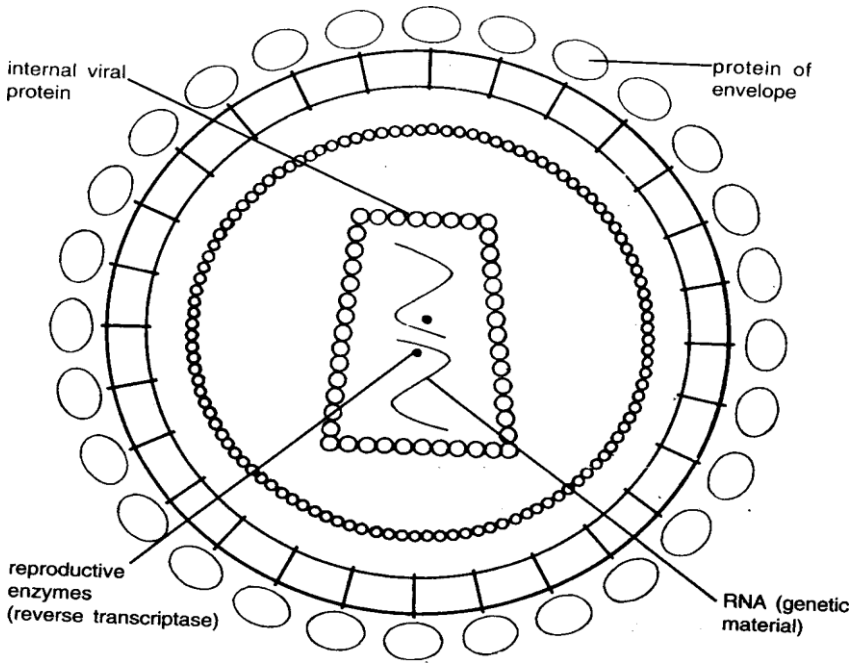
- Pet dogs or cats should be vaccinated with anti-rabies vaccine.
- Rabid animal should be killed, if it shows excessive salivation and tries to seek isolation.
- Wash the wound properly and apply antiseptic ream. Consult a doctor for anti-rabies vaccine, as soon as possible.

Control

- Rabies can be treated by Pasteur treatment in which 14 vaccines are given, one on each day.
- Now five doses of anti-rabies vaccine are given at an interval of 0, 3, 7, 14 and 30th day of dog bite.

3. **AIDS (Acquired Immuno Deficiency Syndrome)**

- AIDS is caused by HIV or Human Immuno-deficiency Virus.
- It was first detected in June 1981 in USA.
- This virus weakens the human body's immunity or self defence mechanism.
- Since, AIDS virus reduces the natural immunity of the human body, therefore, the body having AIDS becomes prone to many other infections.



Modes of transmission

- It spreads through sexual contact with an infected person carrying AIDS virus.
- It spreads through the transfusion of blood infected with AIDS virus.
- Use of infected needles, blades, injections, etc.
- Children of AIDS infected mother get this disease from mother's blood.

Symptoms

- Severe brain damage which may lead to loss of memory, ability to speak and think.
- Swollen lymph nodes.
- Decreased count of blood Platelets.
- Ulcers, prolonged cough, repeated diarrhoea.
- Sweating at night and weight loss.
- AIDS patients becomes more susceptible to infections of any systems of body.

Prevention

- No satisfactory vaccine is yet available.
- Use disposable syringes.
- People should be educated about AIDS.
- Blood tests must be done in pregnant woman, blood donors, organ donors, etc.
- Dentist should use sterilized instruments.
- Common razor at barber's shop should not be used.

Control

- There is no specific therapy against HIV infection.
- Some medicines are discovered which can suppress AIDS virus, but they have side effects, for example, Zidovudine, dideoxyinosine.
- World AIDS day is December 1.
- National AIDS control programme started in 1987.

4. **Polio**

It is caused by polio virus. It generally attacks children and often leads to paralysis. It occurs commonly in warmer months.

Modes of transmission

- Infection is direct or oral.
- Polio virus multiplies in intestinal cells. It finally reaches brain and spinal cord through blood, where there toxins damage the brain and spinal cord.

Symptoms

- Headache and fever.
- Stiffness of neck and convulsions.

- Paralysis of legs.

Prevention

- Oral polio vaccine can be given to provide immunity.

Pulse polio programme

- It is a programme to eradicate polio through mass immunisation of children.
- In this programme, polio drops are given to children (under age of 5 years) twice a year.
- The programme is continuing till year.

5. **Influenza**

Influenza is commonly called FLU. It is caused by Influenza virus (Myxovirus influenza).

Mode of transmission

- The virus is inhaled by droplet infection.
- It spreads through direct contact.
- The virus attacks the epithelial cells of nose, throat and respiratory tract.

Symptoms

- Sudden onset of chills, discharge from the nose.
- Sneezing, fever, headache.
- Muscular pain, coughing, general weakness.

Prevention

- Try to keep away from flue patients.

Control

- Vaccines are used for the control of infection and anti-viral drugs are used for cure.

Bacterial Diseases

6. **Diarrhoea**

It is group of infections of intestinal tract, including food poisoning. The main pathogens are bacteria such as Escherichia coli, Salmonella, etc.

Mode of transmission

- Contaminated food and water.
- Contamination through fingers clothes, bed-sheets and utensils.

Symptoms

- Frequent passage of stools with blood and mucus.
- Vomiting, abdominal cramps - leading to dehydration.
- Due to dehydration, eyes appear to sunken, sudden loss of weight, fever, etc.

Prevention

- Proper personal and community hygiene.
- Proper coverage of eatables to prevent contamination.
- Use of boiled water / properly disinfected water for drinking.

Control

- Complete bed rest.
- Oral rehydration therapy or oral rehydration solution (ORS) {one teaspoon of sugar and a pinch of salt to 200 ml of water}
- Saline drop may be given intravenously.
- Isabgol should be given with curd or water, to provide some relief.
- Antibiotics can treat the disease.

7. **Typhoid**

It is caused by Salmonella typhi bacteria, commonly found in intestine of man. It is most common communicable disease. This is common in age group of 1-15 years.

Modes of transmission

- Contaminated food and water and house flies.

Symptoms

- Headache and diarrhoea.
- Fever which rises maximum in afternoon.
- The temperature increases each day in 1st week.
- High fever in second week, fever gradually decline during 3rd and 4th day.

Control

- Underground disposal of human faeces.
- Hygienic food and clean water should be used.
- Typhoid oral vaccine also prevent typhoid; this vaccine provide immunity for 3 years. Typhoid is diagnosed by widal test.

8. **Tuberculosis**

- It was 1st discovered by Rober Koch.
- It is caused by bacterium Mycobacterium tuberculosis. It most commonly affects the lungs, it may also affect brain, intestine, eyes, etc.

Modes of transmission

- It can be transmitted directly by sneezing, coughing or spitting as well as indirectly (air borne disease).

Symptoms

- Symptoms of TB vary depending on the site of disease in body. Two specific sites of infection are :-

(a) Lymph Gland TB :-

– Swollen lymph glands, often in leg.

– May discharge secretions through skin.

(b) Pulmonary (Lung) TB :-

– Fever

– Chest pain and breathlessness

– Loss of weight and weakness

– Coughing

– Sputum containing blood

Control

- Anti-tubercular treatment (DOTS - Directly Observed Treatment, Short-cause) can treat the disease.
- Proper rest, diet, rehabilitation.

Prevention

- BCG vaccine.
- Health education, example, avoiding indiscriminate spitting, use of handkerchief while coughing and sneezing.
- Isolation of TB patients.

Protozoal Diseases

9. **Malaria**

- Malaria is caused by the toxins produced in the human body by the malarial parasite Plasmodium.
- Presence of malarial parasite can be checked by blood test.

Mode of transmission

- Plasmodium is transmitted by female anopheles mosquito, when this mosquito bites man to suck blood, it introduces its saliva containing the malarial parasite into the blood stream of man.

Symptoms

- Malarial attack is preceded by headache, nausea and muscular pain.
- Total period of malarial attack is of 6-10 hours and can be divided into 3 stages :-
  - Cold stage : feeling very cold and shivering.
  - Hot stage : high fever, faster rate of breathing and heartbeat.
  - Sweating stage : due to sweating, temperature goes down to normal.
- Malaria may secondarily cause enlargement of liver and spleen.

Prevention

- Use of insect repellants or mosquito net to prevent mosquito bite.
- Mosquito larva should be killed by sprinkling kerosene oil on large-sized water bodies.
- We can introduce larvivorouus fishes which feed on mosquito larvas like, Gambusia, trouts, etc.
- We should not allow collection of water in any uncovered container such as water tank, pot, cooler, flower pot, etc.

Control

- A drug named Quinine, which is extracted from bark of Cinchona tree, is used to treat a person suffering from malaria

SOLVED NCERT QUESTIONS

Q1. **State any two conditions essentials for good health.**

Sol. For good health essential conditions are :

(i) good physical environment

(ii) good social environment

(iii) balanced diet, and

(iv) good economic condition and job

Q2. **State any two conditions essential for being free of disease.**

Sol. (i) Good physical environment

(ii) Good social environment

Q3. **Are the answers to the above questions necessarily the same or different ? Why ?**

Sol. The answer to above question are same

To remain disease free and in good health, good physical as well as social environment is essential.

Q4. **List any three reasons why you would think you are sick and ought to see a doctor. If only one of these symptoms were present, would you still go to the doctor ? Why or why not ?**

Sol. (a) Reasons

(i) Change in appearance and functioning of any system of body.

(ii) Fever

(iii) Headache

(iv) Loose motion

(v) Pus in a wound

(b) Yes, I would identify visit a doctor as by not getting proper treatment well in time may lead to more complications.

Q5. **In which of the following case do you think the long-term effects on your health are likely to be most unpleasant**

• if you get jaundice,

• if you get lice,

• if you get acne,

Why ?

Sol. If I get jaundice the effect on my health will be most unpleasant.

In jaundice, the functioning of liver is impaired and for disturbed functioning of any body organ impairs our general health.

Getting lice or acne do not disturb functioning our body organs.

Q6. **Why are we normally advised to take bland and nourishing food when we are sick ?**

Sol. Bland food is soft and can easily be digested and assimilated in body. Nourshing food increase resistance for disease and is essential for repair and growth of body tissue.

Q7. **What are different means by which infectious diseases are spread ?**

Sol. (i) Direct contact

(ii) Indirect contact

(iii) By air

(iv) By contaminated food / water

(v) Mosquito / insect

(vi) Rabid animal

Q8. **What precautions can you take in your school to reduce the incidence of infectious diseases ?**

Sol. Inciodence of infectious diseases can be reduced in our school by adopting following precautionary measure :

(i) Prevent water logging to avoid mosquito breeding.

(ii) Clean environment to reduce house flies.

(iii) Provision of safe drinking water

(iv) By not eating food items sold by hawkers outside the school

(v) Periodic cleaning of toilets and use of disinfectants.

Q9. **What is immusnisation ?**

Ans. Immunisation gives protection against infectious diseases. In immunisation weakened pathogens are inoculated in our body.

When our immune systems, first sees the microbe it responds against it and then remembes it specifically. So, the next time that particular microbe or its close relative enters tehe body the immune system responds with greater vigour. This eliminates the infection quickly. This is the basis of principle of imsmunisation.

Q10. **What are the immunisation programmes available at the nearest health centre in your locality ? Which of these disease are the major health problems in your area ?**

Ans. Various vaccination programmes available at the nearest health centre are :

(i) DPT for diphtheria, pertusis (whooping cough) and tetanus.

(ii) Polio vaccine

(iii) Measles vaccine

(iv) Mumps vaccine

(v) Rubella vaccine

For (iii), (iv) and (v) vaccine name MMR is given

M = Measles

M = Mumps

R = Rubella

None of the above disease are major health problems these days in most of the areas due to immunisation programmes.

Q11. **How many times did you fall ill in the last one year ? What were the illnesses?**

(a) Think of one change you could make in your habits in order to avoid any of / most of the above illnesses.

(b) Think of one change you would wish for in your surroundings in order to avoid any of / most of the above illnesses.

Sol. Twice I fell ill during last one year

Once by malaria and then loose motions :

(a) To avoid malaria, the following changes in habit is to be made :

(i) Use of mosquito net while sleeping or use of mosquito repellent cream.

(ii) Wearing of full sleeve shirt and full pants during rainy seasons to avoid mosquito bite.

To avoid loose motions, drink water from municipal source and avoid eating state food and cut fruits kept in open.

(b) To avoid malaria following changes in environment are required :

(i) Avoid stagnation of water and keep the water storage tank clean and covered.

(ii) Get wire-mesh fixed to doors and windows.

To avoid loose motions keep the environment clean so that flies do not breed and also diinfect water by chlorine tablets if it is drawn from well or any other source.

Q12. **A doctor/nurse/health-worker is exposed to more sick people than others in the community. Find out how she/he avoids getting sick herself/himself.**

Sol. (i) He or she uses mark to avoid germs to enter his or her mouth or nose.

(ii) Uses hand gloves while handling patient.

(iii) Washes hands with antiseptic lotion after touching an infected person.

Q13. **Conduct a survey in your neigbhourhood to find out what the three most common diseases are. Suggest three steps that could be taken by your local authorities to bring down the incidence of these diseases.**

Sol. In our neighbourhood exists a resettlement colony. In that area, three most prevalent diseases are :

(i) Malaria

(ii) Jaundice and

(iii) Loose Motions

Local authorities should take following three steps :

(i) Elimination of mosquito

(ii) Hepatitis vaccinations

(iii) Provision of safe drinking water and cleanliness campaign.

Q14. **A baby is not able to tell her/his caretak- ers that she / he is sick. What would help us to find out**

(a) that the baby is sick ?

(b) what is the sickness ?

Sol. (a) Abnormal crying is one symptom which indicates baby is sick. Another symptoms can be fever, rashes and breathing trouble due to cough or any other lung infection.

(b) Infants usually suffer from painful stomach condition probably due to the baby having cannot expel the air but if you hold him in a vertical position the swallowed air is expelled.

Weezing during breathing indicates lung infection.

Fever is also indicative of infection.

Q15. **Under which of the following conditions is a person most likely to fall sick ?**

(a) when she is recovering from malaria.

(b) when she has recovered from malaria and is taking care of someone suffering from chicken pox.

(c) when she is on a four-day fast after recovering from malaria and is taking care of someone suffering from chiken pox. Why ?

Sol. A person is most likely to fall sick under condition mentioned at (c).

Reason :

After recovering from malaria she is on a four day fast. Fasting weakens the body immune systems and she is likely to get chicken pox as chicken pox is a contageous disease which spreads through direct contact with the patient.

Q16. **Under which of the following conditions are you most likely to fall sick ?**

(a) when you are taking examinations.

(b) when you have travelled by bus and train for two days.

(c) when your friend is suffering from measles.

Why ?

Ans. We may likely to fall sick under condition mentioned (c) if we are visiting the friend and have not been vaccinated for measles. However if we are not visiting the friend there are no change of falling sick.

We are likely to fall sick under condition mentioned at (b) because while travelling for two days we have been in contact with many people. It is possible that some co-passengers might be suffering from one or other infectious disease.

PRACTICE EXERCISE – 1

Q 1. Name the disease in which legs become paralysed.

Q 2. Expand BCG.

Q 3. Expand HIV.

Q 4. Name the casual organism of Koala-azar.

Q 5. Why female Anopheles mosquito feeds on human blood?

Q 6. What may be the symptoms of a disease if brain is infected?

Q 7. Define Antibiotics.

Q 8. Define Immunization.

Q 9. How does proper nourishment help us to prevent infection?

Q 10. Why we should not eat uncovered food?

Q 11. Mention the casual organism of following diseases :
Tuberculosis, Malaria, Taeniasis, Athlete's foot, Kala azar, Measles.

Q 12. Distinguish between carrier and vector.

Q 13. Explain how vaccine work.

Q 14. Distinguish between acute and chronic disease.

Q 15. "The infectious agent may or may not affect the same organ or tissue they have entered." Justify this statement.

Q 16. "Prevention is better than cure." Explain.

Q 17. Explain the methods of prevention of Malaria.

Q 18. Write notes on :-
(a) Modes of transmission of AIDS, and
(b) Rabies.

Q 19. Write short note on principle of treatment.

Q 20. What are the various means of spread of disease?

Q 21. Write short note on
(a) Malaria (b) AIDS

Q 22. What are infectious agents? Explain them with suitable examples and diseases caused by them.

Q 23. Explain the general ways of preventing infection.

EVALUATE YOURSELF

M.M. : 25 **M.T. : 60 min.** **M.M. : 25** **M.T. : 60 min.**

TEST - 1

Q 1. Name two barriers which prevent the entry of microbes in the body? **1 M**

Q 2. Write any two basic conditions necessary for keeping good health. **1 M**

Q 3. Name the disease in which legs become paralysed. **1 M**

Q 4. Why female Anopheles mosquito feeds on human blood? **1 M**

Q 5. Name two diseases against which vaccines are available. **1 M**

Q 6. Explain how does vaccine work. **2 M**

Q 7. Why a person suffering from AIDS cannot fight even very small infections? **2 M**

Q 8. Explain the three level cause of disease. **3 M**

Q 9. Differentiate between acute and chronic disease. **3 M**

Q 10. What are infectious agents? Explain them with suitable examples and diseases caused by them. **5 M**

TEST - 2

Q 1. Define antibiotics. **1 M**

Q 2. Expand DPT. **1 M**

Q 3. Mention a biochemical processes, which is blocked by sulpha drugs in bacteria. **1M**

Q 4. Name the casual organism of ringworm and elephantiasis. **1 M**

Q 5. Name the target of Japanese encephalitis and AIDS virus respectively. **1 M**

Q 6. On what factor does severity of disease manifestations depend? **2 M**

Q 7. Distinguish between carrier and vector. **2 M**

Q 8. Write short note on organ specific and tissue specific manifestations of diseases. **3M**

Q 9. Write short note on principle of treatment. **3 M**

Q 10. Write short notes on **5 M**

(a) Malaria

(b) AIDS

EVALUATE YOURSELF

M.M. : 25 **M.T. : 60 min.** **M.M. : 25** **M.T. : 60 min.**

TEST - 3

Q 1. Name any one disease caused by virus. **1 M**

Q 2. Name the vector and the casual organism of malaria. **1 M**

Q 3. Name two antibiotics. **1 M**

Q 4. Write two main reasons of a disease. **1 M**

Q 5. Which of the following diseases are caused by bacteria (choose any two). **1 M**

Q 6. Why are children vaccinated for diseases such as polio or cholera? Explain. **2 M**

Q 7. A doctor advised a patient to increase of a particular vitamin in his diet to i. **2 M**

Q 8. "Prevention is better than cure." Justify. **3 M**

Q 9. Write a short note on antibiotics and immune response. **3 M**

Q 10. Explain the general ways of preventing infections. **5 M**

TEST - 4

Q 1. Name the viral disease which occurs in human due to bite of mad dog. **1 M**

Q 2. What are casual organism of Malaria and Flu ? **1 M**

Q 3. What are antibodies? **1 M**

Q 4. What is vaccination? **1 M**

Q 5. Expand BCG. **1 M**

Q 6. List four common symptoms of malaria. **2 M**

Q 7. Distinguish between congenital and acquired diseases. **2 M**

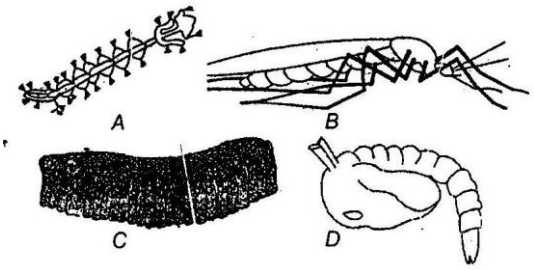
Q 8. Write a short note on antibiotics and immune system. **3 M**

Q 9. Write the names of three diseases causes by virus. Give full account of any one of them. **3 M**

Q 10. Explain the various nodes of transmission of infectious disease. **5 M**

MULTIPLE CHOICE QUESTION'S

Q1. What is the correct sequence in the life cycle of a mosquito ?



(a) A → B → C → D

(b) D → C → A → B

(c) C → A → D → B

(d) C → D → B → A

Q2. Which is correct about the feeding habit of pupa of mosquito ?

(a) Feeds on blood

(b) Feeds on leaves

(c) Feeds on organic waste

(d) Does not feed at all

Q3. Which of the following statement is true about adult mosquitoes ?

(a) It looks like a comma

(b) It does not feed

(c) It has a head and a pair of antennae

(d) It floats on the surface of water

Q4. The stage that last for one or two days in the metamorphosis of a mosquito is

(a) eggs (b) pupa

(c) larva 9) none of these

Q5. A mosquito has four stages in its life span, i.e. egg (I), larva (II), pupa (III) and adult (IV). It requires food during the stages

(a) I, II and III

(b) II and IV

(c) Only IV

(d) All of the above

Q6. Out of the various stages in the life cycle of a mosquito in which stage it does not feed but gradually chnages into adult ?

(a) Egg (b) Pupa

(c) Larvae (d) Late larvae

Q7. A larva has

(a) head, throax

(b) head, thorax, abdomen

(c) head, thorax, abdomen, wings

(d) head, abdomen

Q8. The larval stage is mosquito breathes through

(a) gills (b) lungs

(c) breathing tubes (d) All of these

Q9. Which one of the following is not important for individual health ?

(a) Good economic condition

(b) Living in clean space

(c) Social equality and harmony

(d) Living in a large and furnished house

Q10. Children are given polio vaccine because

(a) it creates immunity in the body

(b) prevents the entry of polio causing pathogen

(c) they are vectors of many diseases

(d) all the above

Q11. Which of the following diseases is / are infectious?

(a) AIDS (b) Heart disease

(c) Diabetes (d) Cancer

Q12. AIDS is due to

(a) reduction to number of helper T-cells

(b) reduction in number of killer T-cells

(c) autoimmunity

(d) non-production rons

Q13. Which one of the diseases is not infectious

(a) typhoid (b) leprosy

(c) measles (d) leukemia

Q14. Hemophilia is a

(a) acute disease (b) deficiency disease

(c) chronic disease (d) congenital disease

Q15. Infectious diseases spread through

(a) vectors (b) water

(c) sexual (d) all of these

Q16. Common cold is a

(a) acute disease (b) chronic disease

(c) congenital disease (d) genetic disorder

Q17. In chronic disease a patient suffers from

(a) poor appetite (b) short breath

(c) tiredness (d) all the above

Q18. *Ascaris lumbricoides* in common roundworm of

(a) liver (b) bile duct

(c) large intestine (d) small intestine

Q19. Which of the following is non-communicable disease ?

(a) allergy (b) malaria

(c) diarrhoea (d) tuberculosis

Q20. An insect which transmits a disease is known as

(a) intermediate host (b) parasite

(c) vector (d) prey

Q21. Droplet method of transmission of disease is found in

(a) common cold (b) AIDS

(c) hepatitis (d) syphilis

Q22. Human disease caused by a bacterium is

(a) measles (b) dengue

(c) tuberculosis (d) polio

Q23. AIDS virus has

(a) single strand DNA

(b) double strand DNA

(c) single strand RNA

(d) double strand RNA

Q24. Goitre is caused due to deficiency of

(a) fluorine (b) vitamin C

(c) vitamin A (d) iodine

Q25. Vectors can be defined as

(a) microorganisms which cause many diseases

(b) animals carry the infecting agents from sick person to another healthy person

(c) infected person

(d) diseased plants

Q26. Viruses, which cause hepatitis, are transmitted through

(a) air (b) water

(c) food (d) personal contact

Q27. AIDS cannot be transmitted by

(a) breast feeding

(b) blood transfusion

(c) hugs

(d) sexual contact

Q28. Which one of the following causes kala-azar?

(a) typnosoma (b) bacteria

(c) ascaris (d) leishmania

Q29. Which one of the following disease is not transmitted by mosquito ?

(a) typhoid (b) dengue

(c) malaria (d) brain fever

Q30. Which of the following can make you ill if you come in contact with an infected person ?

(a) high blood pressure

(b) genetic abnormality

(c) sneezing

(d) blood cancer

Q31. Making anti-viral drugs is more difficult than making anti-bacterial medicines because

(a) virus make use of host-machinery

(b) viruses are on the border line of living and non-living

(c) viruses have very few biochemical mechanisms of their own

(d) viruses have a protein coat

Q32. You are aware of Polio Eradication programme in your city. Children are vaccinated because

(a) vaccination kills the polio causing microorganisms

(b) prevents the entry of polio causing organism

(c) it creates immunity in the body

(d) all the above

Q33. SARS and Swine flue are caused by

(a) virus

(b) virus and bacterium

(c) virus and protozoans

(d) virus and helminth

Q34. A disease transmitted through sexual contact is

(a) HIV (b) Gonorrhoea
(c) Syphylis (d) all the above

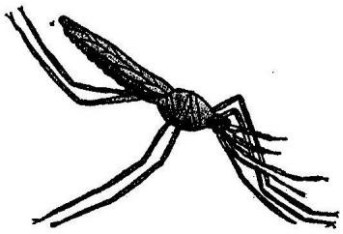
Q35. Ascariasis spreads through
(a) vectors
(b) contaminated food and water
(c) formites
(d) droplets

Q36. Which one is an acute disease
(a) disabetes (b) tuberculosis
(c) hypertension (d) typhoid

Q37. Health deals with
(a) social well being (b) physical fitness
(c) mental fitness (d) all the above

Q38. What are the respiratory organs in mosquitoes ?
(a) spiracle (b) tracheal gills
(c) gills (d) all of these

Q39. A student found a mosquito sitting on the body of her classmate. The following sketch was made. The scientific name of the mosquito in sketch is :



(a) Aedes (b) Anopheles
(c) Culex (d) None of these

Q40. Meera observed the boat-shaped legs of mosquito floating on the surface of clear water in the desert cooler. She made the following sketch. The type of mosquito in the sketch is :

(a) aedes (b) culex
(c) anophoeles (d) none of these

Q41. The number of eggs laid by the culex mosquito is :
(a) 40-100 (b) 100-150
(c) 200-400 (d) none of these

Q42. Health is a stateof _____ well being.
(a) physical (b) mental
(c) social (d) all the above

Q43. _____ is an acute disease
(a) elephantiasis (b) cancer
(c) common cold (d) all the above

Q44. We should make water safe and free from bacteria by
(a) boiling
(b) keeping it in a fridge
(c) decanting and filtering
(d) all the above

Q45. Blood stain sputum is the symptom of
(a) Jaundice (b) AIDS
(c) TB (d) Typhoid

Q46. _____ is a fungal-disease
(a) Typhoid (d) Malaria
(c) Measles (d) Ring-worm

Q47. _____ is caused by protozoa
(a) Typhoid (b) Malaria
(c) Tuberculosis (d) Ring-worm

Q48. Rabies is caused by bite of
(a) dog (b) monkey
(c) cat (d) all the above

Q49. Which is not a carrier of diseases
(a) Cockroach (b) Housefly
(c) Male anopheles (d) Female anopheles

Q50. The disease caused by sexual contact is
(a) AIDS (b) gonorrhoea
(c) syphilis (d) all the above

ANSWERS

1. (c)	**2.** (d)	**3.** (c)	**4.** (b)	**5.** (b)
6. (b)	**7.** (b)	**8.** (c)	**9.** (d)	**10.** (a)
11. (a)	**12.** (a)	**13.** (d)	**14.** (c)	**15.** (d)
16. (a)	**17.** (d)	**18.** (d)	**19.** (a)	**20.** (c)
21. (a)	**22.** (c)	**23.** (c)	**24.** (d)	**25.** (b)
26. (b)	**27.** (c)	**28.** (d)	**29.** (a)	**30.** (c)
31. (c)	**32.** (c)	**33.** (a)	**34.** (d)	**35.** (b)
36. (d)	**37.** (d)	**38.** (d)	**39.** (b)	**40.** (c)
41. (c)	**42.** (d)	**43.** (c)	**44.** (a)	**45.** (c)
46. (d)	**47.** (b)	**48.** (d)	**49.** (c)	**50.** (d)

— Notes —

CH : 5 – IMPROVEMENT IN FOOD RESOURCES

INTRODUCTION : We need food for our survival. In fact all living organisms, in this biosphere, need food to obtain energy and body building. The food supplies carbohydrates (sugars), proteins, fats, vitamins and minerals. These constituents of food are digested vitamins and minerals. These constituents of food are digested in our body and then release energy for doing work and raw materials for body development, growth and health.

Th two major sources of food are the **plants** and the **animals**. So far, only a few hundred varieties of plants and only about 20 animal species have been domesticated for the purpose of food production.

The products obtained from plants and animal sources are listed in the following table :

Plant and animal products.

	Plant Products		Animal Products
1.	Cereals	1.	Fish and other sea products.
2.	Pulses	2.	Meat, egg and poultry.
3.	Vegetables	3.	Milk and milk products
4.	Fruits	4.	Honey
5.	Nuts and oil seeds		
6.	Condiments and spices		

Explanation of some important terms

1. **Cereals.** Wheat, barley rice and otehr similar grains belonging to grass family are called cereals. The term 'cereals' came from the Ancient Romans who long before the Christian era held festivals at the time of sowing and harvesting in honour of their goddess **ceres**-giverof the grain. During these festivals, they brought offerings of wheat and barley as the gift of Ceres.
2. **Animal husbandry.** Animal husbandry is the agricultural practice of feeding, breeding and raising animal livestock whose primary purpose is to provide meat and milk. Meat animals include beef, cattle, sheep and meat goats. Milk animals include cows and buffaloes.
3. **Livestock.** Livestock are domesticated animals intentionally reared in an agricultural setting to make produce such as food and fibre. Livestock include cattle, pigs, goats, deer, sheep, yaks and poultry.
4. **Poultry.** Poultry is a class of domesticated fowl (birds) used for food and for their eggs. Poultry birds are chickens, turkeys, ducks and geese.
5. **Bee keeping (or Apiculture).** Apiculture or bee keeping is domestication of honey bees for production of honey and wax on commercial basis.
6. **Green revolution.** The Green revolution is an envormous increase in food production by using the improved strains of wheat, rice, maize and other cereals. Green revolution in 1960s and 1970s has changed the economic scenario of agriculture in India.
7. **White revolution.** Increase in production of milk and milk products since 1970s is called white revolution.
8. **Blue revolution.** Increase in fish production as an alternative food source for human beings since 1970s is called blue revolution.

Our country is second in population in the world with about 1.2 billion people. The problem is day by day aggravating by the constant rise in population. At this rate it is expected that Indian population may reach around 1.3 billion by the end of 2020. For this much population we will require about 240 million tonnes of grain production per year. In order to produce such an enormous amount of food grain, we need extra land for cultivation which is beyond our

scope as it is surely going the create ecological disturbances. The only alternative we have at present to improve the already existing crop varieties to yield more. **Green revolution** in 1960s and 70s has contributed to increase food production by improving crop varieties and cultivation practices. Though it did increase crop production many folds in the country, it was achieved at the cost of intensive use of irrigation water, chemical fertilizers, chemical pesticides, costly modern agricultural equipments and other inputs. Moreover, modern agricultural practice has resulted in many other related problems such as depletion of soil fertility, increase in soil salinization (i.e., deposition of salt, soil and water pollution, nutrient imbalance, emergence of new pests and diseases and above all, the environmental degradation. Conventional agricultural practices, with the use of locally available good quality seeds, compost, manure and biofertilisers were more ecofriendly as compared to modern agriculture which is causing more ecological damage. Therefore, it is the prime concern of the present day agricultural scientists to develop environmentally sustainable techniques to produce enough food to satisfy the hunger of more than a billion people.

In its broadest meaning, such an agriculture which aims to meet the needs of present generation without endangering the resource base of future generation and at the same time without causing environmental degradation, is called **sustainable agriculture.**

Sustainable agriculture may be defined as the practice of farming and production of maximum agricultural yield to meet the needs of present generation without endangering the resource base of future generation.

Also, simply increasing the food production by sustainable techniques cannot solve the problem of malnutrition and hunger. People should have enough money to purchase food. This can only be done by enhancing the purchasing power of people working in the various fields.

Improvement in crop yields

The crops can be generally classified into three general categories :

1. **Field crops** (like food grain crops, oil seeds, pulses, etc.)
2. **Plantation crops** (like tea, coffee, cocoa, rubber, etc.
3. **Garden crops** (like kitchen garden, orchard, vegetables, ornamentals etc.)

The other important classification of crops is **commercial classification** which is based on the trade and commerce of agricultural produce. On this basis, the crops are classified into following three categories :

1. **Food crops** (These include rice, wheat, maize, pulses, oil seeds, vegetables, spices and fruits).
2. **Fodder crops** (These include berseem, oats, nappier, sorghum, etc. which are raised as food for the livestock).
3. **Commercial crops** (These include cotton, jute, sugarcane, sugarbeet, tobacco, etc.)

The food crops give us carbohydrates, proteins, fats, vitamins and minerals. The cereals such as wheat (Triticum vulgare), rice (Oryza sativa), maize (Zea mays), barley (Hordeum vulgare) etc. provide us carbohydrates, which gives us energy. The pulses such as gram (channa), pea (matar), black gram (urad), green gram (moong), pigeon pea (arhar or tuar), lentil (masoor), etc. give us protein. We get fat from oil seeds such as soyabean, ground nut, sesame, castor, mustard, linseed and sunflower. The vegetables, fruits and spices give us a range of vitamins and minerals. In addition, we get carbohydrates, proteins, fat and lots of fibres from them.

Crops are also grouped into different categories on the basis of their climatic requirements, viz., requirement of specific temperature, humidity, photoperiods, etc. We know that different crops

require different climatic conditions, Somme crops are grown in winters whereas others in summers. Duration of light period during the day time also causes many physiological process including photosynthesis. Green plants manufacture their food in presence of sunlight by the process of photosynthesis. Light also affects several process related with growth and morphogenesis.

On the basis of seasonal variations, the crops in India can be classified into three main groups:

1. **Rabi.** It is a winter season crop grown October-November to March-April. Wheat, gram, peas, mustard, linseed are rabi crops.
2. **Kharif.** It is a rainy season crop grown from June-July to September-October. Paddy, soyabean, pigeon pea, maize, cotton, green gram and black gram are kharif crops.
3. **Zaid.** It is a summer season crop grown from April to June. Cucumbers, melons, etc. are zaid crops.

Differences between kharif and rabi crops

Kharif Crops	Rabi Crops
1. These are grown in hot and wet conditions during monsoon season	1. These are grown in cold and nearly dry conditions during winter season.
2. These are sown in the months of June-July.	2. These are sown in the months of October-November.
3. These are harvested during the months of September-October.	3. These are harvested in the months of March - April.
4. **Examples.** Rice, Maize, Groundnut, Cotton, Soyabean, Green gram etc.	4. **Examples.** Wheat, Barley, Mustard, Pea, Linseed etc.

Presently, evolution of certain strains of various crops has made it possible to grow a crop in any season or throughout the year like maize, sorghum, tomato, etc. Our scientists have made it possible to increase the production of food grains approximately four times more from 1960 to 2004 with only 25% increase in the cultivable land area. It was made possible by following three major activities :

1. **Crop variety improvemtn** (i.e. choice of seeds for planting)
2. **Crop production improvement** (i.e. the nurturing of the crop plants).
3. **Crop protection management** (i.e. the protection of growing and harvested crops from loss).

Crop variety improvement

Ever since man gve up his nomadic life and settled down in a place to start a social and cultural life, he began cultivating crops and bringing about certain changes in the wild varieties for his benefit. Nearly all the present day crop plants were developed by prehistoric man by gradual bringing about alternations in their wild ancestral species. Present day crop plants are, therefore, the products of his careful artificial selection and plant breeding practices.

The science of improvement in genotype of plants by improving their genetic potentialities is called plant breeding.

Plant Breeding Techniques.

There are four main plant breeding techniques. They are :

1. Introduction 2. Selection
3. Hybridization
4. Recombinant DNA technology or Genetic engineering

1. **Introduction.** The seeds of a plant species having some special features are brought from some other place and grown in a new place where it was not grown before. This is called

introduction. This technique provides a new environment (both climatic factors as well as biotic factors). If the plant species survives and gives the desired results, it is selected for further cultivation.

2. **Selection.** Selection is the oldest method of crop improvement. Almost all our present day crops are the result of selections carried out by the prehistoric human beings. During selection, the individual plants or group of plants having the desired characters are picked up from a population eliminating the undesirable ones. These selected plants are allowed to reproduce for setting their seeds. Selection of plant species is done for useful characters such as disease resistance, response to fertilisers, product quality and high yields.
3. **Hybridisation.** Hybridisation is a technique of plant breeding in which the two plants having the desired characters are made to cross and develop seeds. During this process, one plant is considered as male. The pollen grains of this plant are collected for pollination. The other plant is considered as female. The stigma of female plant is dusted with the pollen grains of male plant. After pollination, the fusion of desired male and female gametes results in the formation of a hybrid embryo having the characters of both the plants. The seeds of this plant are collected and grown in the fields.

   There are several types of hybridisations. Some are listed below :

   (i) **Intravarietal hybridisation** (between the two plants belonging to same variety).

   (ii) **Intervarietal hybriddisation** (between the two plants belonging to different varieties).

   (iii) **Interspecific hybridisation** (between the different species of the same genus).

   (iv) **Intergeneric hybridisation** (between two different genera).
4. **Recombinant DNA technology or Genetic engineering.** Our conventional methods of crop improvement (such as selection and hybridisation) involve the whole genomes of plants. The latest recombinant DNA technology or genetic engineering involves transfer of one or more genes (i.e. DNA fragments) from one plant to another. The plant in which the foreign gene has been introduced is called **transgenic plant** or **genetically modified plant.**

Aims and Objectives of Plant Breeding

The primary aim of the plant breeding is to produce such plant varieties which give high yields under all growing conditions such as diverse climatic conditions, soil quality, drought and flood situations. Plant breeders also keep in mind to bring together as many of the useful and desirable characters of economic value as possible, in a single variety.

Some of the important factors for which variety improvement is done are listed below :

1. **High yield.** It is the primary concern of the plant breeder to produce a crop variety having increased productivity per acre. It is achieved by developing and selecting more efficient genotype.
2. **Improved quality.** In addition to quantity, it is necessary for the breeder to consider the quality of the plant produce. For example, sweet, juicy and seedless oranges are preferred over a large number of sour, pithy once. Quality improvement is required in grain size, colour, shape and size of flower, early flowering, milling and baking quality of wheat, cooking quality rice, malting quality of barley, size and flavour of fruits, protein quality in pulses, oil quality in oil seeds, seedless quality of fruits and preserving quality in fruits and vegetables.
3. **Biotic and abiotic resistance.** Under natural conditions the crop plants are prone to certain **biotic** (diseases caused by becteria, fungi, nematodes, etc. or damage caused by insects) and **abiotic** (drought, salinity, water lodging, heat cold and frost) stresses which cause a great loss of production. Plant breeders, therefore, develop resistant varieties to control these stresses. The character of resistance can

however, be combined with other features of economic value, by making crosses between the resistant and susceptible varieties.

4. **Change in maturity duration.** Production of a crop can be increased many times by reducing the time duration from sowing to harvesting. It saves time, labour, irrigation, fertilizers and money. But reducing the duration of crop, the farmers can grow many rounds of crops in a year in the same field. Uniform maturity of crop makes the process of harvesting easy and reduces losses during harvesting.
5. **Wider adaptability.** An ability to withstand the extremes of moisture, drought, temperature and other conditions, by the cultivated plants, is another desirable trait by the breeders. Developing such varieties, which can be grown under different environmental conditions, helps farmers to grow one variety under different climatic conditions in different areas.
6. **Desirable agronomic characteristics.** Man has utilized plants to his best advantage. He has been active in improving food yielding plants by raising a complex of useful characters in them such as high yields, dwarfness, early maturing and other desirable agronomic characters. Plant breeders have also extended their hands towards the improvement of plants for the other needs. For example, cotton with long fibres and more fabric strength has been developed through hybridization.
7. **Development of novel varieties.** Developing a new variety with increased food production is not enough. The breeder is always on the look out for novel varieties which attract the consumer. Seedless tomatoes, oranges, lemons, stoneless plums and peaches are some of the products of breeder's honest efforts which have captured the market. A mango having a new look, or any other fruit having attractive shape or colour are sure to be patronized soon.

Crop production management

Looking to the problem of unprecedented growth of human population and continuous degradation of encological balance, scientists all over the world are worried about the various aspects of agriculture. However, all of them are of the same openion that food production should increase substantially without disturbing the ecosystem through nutrient cycles between the soil particles, balanced use of manures and fertilizers, recycling of organic matter, application of chemical and biofertilizers and crop production management. Crop-rotation, mixed cropping and double cropping have been a great success in the past. They are of much advantage in agricultural production without causing any damage to the environment. These practices help in lowering of soil erosion, provide better facility for maximum utilization of nutrients, improve the fertility of soil, enhance crop production and help in irradication of weeds.

Nutrient Management

Like other living organisms, plants also require nutrients for building their structure and maintaining their body functions. The plants require inorganic elements, which they chiefly obtain from the soil, where these elements occur in the form of **minerals.** Besides soil, the nutrients are also supplied to plants by air and water. The major elements supplied by air are carbon and oxygen. The hydrogen comes mainly from water. Soil is the main source to supply rest of essential elements to plants. There are sixteen elements which are essential for plants. These are :

1.	Carbon	2.	Hydrogen
3.	Oxygen	4.	Nitrogen
5.	Phosphorus	6.	Potassium
7.	Calcium	8.	Magnesium
9.	Sulphur	10.	Iron
11.	Manganese	12.	Boron
13.	Zinc	14.	Copper
15.	Molybdenum and	16.	Chlorine

Out of sixteen nutrient elements required by plants, Carbon and Oxygen are supplied by air, Hydrogen is supplied by water and remaining thirteen (13) elements are supplied by soil. Six of these elements are required in larger amounts. They are called **micro-nutrients.** The elements categorized as macronutrients are : Nitrogen, Phosphorus,

Potassium, Calcium, Magnesium and Sulphur. The remaining seven elements, required in trace or micro amounts, are called **micronutrients.** They are Iron, Manganese, Boron, Zinc, Copper, Molybdenum and Chlorine.

Nutrients supplied by air, water and soil

Source	Nutrients
Air	Carbon, Oxygen
Water	Hydrogen
Soil	(i) **Micronutrients.** Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, Sulphur.
	(ii) **Micronutrients.** Iron, Manganese, Boron, Zinc, Copper, Molybdenum, Chlorine.

The plants required various mineral elements (6 macro and 7 microelements) which they get from soil.The means, all the thirteen essential mineral elements must be present in the soil where the plants grow. Now suppose a particular mineral element or a group of elements are missing in the soil, the element or elements will, therefore, be **deficient.** If the plant also fails to get the particular element from the external source, it will show the **deficiency symptoms**. Deficiency of a particular element causes a particular kind of deficiency symptom. They affect physiological processes in plants including reproduction, growth and susceptibility to diseases.

Differences between macronutrients and micronutrients

	Macronutrients	Micronutrients
1.	These are required in large quantities by plants.	1. These are required in very small quantities by plants.
2.	Each macronutrient required by plants is more than 1 mg/g of dry matter.	2. Each micronutrients required by plants is quite below 1 mg/g of dry matter.
3.	These play a role in different protoplasmic structures leading to building of plant body.	3. Micronutrients are involved in enzyme activities and electron transport.
4.	**Example.** Nitrogen, Phosphorus, Potassium, Calcium, Magnesium and Sulphur.	4. **Examples.** Iron, Manganese, Boron, Zinc, Copper, Molybdenum, Chlorine.

To overcome the problem of deficiency of mineral nutrients and to increase the yield, the soil can be enriched by supplying these nutrients from the external sources. The major materials which are added into the soil to improve and maintain its fertility are grouped under two broad categories :

1. Manures 2. Fertilizers

1 **Manures**

Manures are partially decomposed organic materials of biological origin added to the soil to increase the fertility of soil and productivity of crop. They contain almost all the essential nutrients required by the plants. The manures are of the following four types :

(i) Farm yard manure

(ii) Compost (iii) Green manure

(iv) Vermi-compost.

(i) **Farm yard manure.** Farm yard manure is made up of dung of farm animals, urine, farm refuse and crop residues (plant remains) which are allowed to partial decay with the help of microorganisims. These microorganisms decompose complex organic debris into a dark amorphous substance (humus) and degradation products which are easily assimilated by plants.

(ii) **Compost.** It is a kind of manure which is prepared by degrading the dung of farm animals, farm wastes and otehr organic debris (arranged in layers) in specially designed pits for the desired period of time. The degradation is done either in exposed pits or the degrading material is covered by a mud pack to prevent water logging during the rainy season. It takes about 6-8 months to prepare the compost.

(iii) **Green manure.** Prior to the sowing of the crop seeds, many leguminous and non-leguminous

crops are grown in the field. They are then mulched by ploughing while they are still young and green. This practice is used to enrich the soil in nitrogen and phosphorus. The most commonly used green manure in India are - Sunn hemp, Sweet clover, Cow-pea, Berseem, Cluster bean, etc.

Green nature is a kind of manure which is prepared in the field itself to enrich the soil in nitrogen and phosphorus. Green plants (e.g., sun hemp, cow pea, sweet clover, barseem, cluster beam etc.) are mulched by ploughing and then left in the field to decompose by the activity of natural decomposers such as bacteria and fungi of decay.

(iv) **Vermi-compost.** The earthworms, popularity known as "farmers friend", have been recently employed to obtain an eco-friendly compost, called "vermi-compost", derived from organic wastes. Earthworms are very well known as "Nature's ploughman" which promote soil aeration, crush and mix the soil particles, convert the nutrients into simpler forms, act as scavenger of pathogenic bacteria and promote the activities of beneficial bacteria in the soil.

Vermi-compost is a kind of manure, rich in organic matter and nutrients, which is derived from organic wastes of plant and animal origin by the activity of earthworms. The latter promote soil aeration, crush and mix soil particles and convert the nutrients into simpler forms.

Advantages of using manure. The manure contains many organic substances of biological origin which can be easily degraded and absorbed by the plants. Therefore, they protect our environment from excessive use of chemical fertilizers. It helps in recycling of biological waste (farm waste). The manure loosens the soil, increases its aeration and makes the soil more fertile. It increases water holding capacity in sandy soils, drainage in clayey soil and avoids water logging.

Fertilizers

Fertilizers are commercially produced synthetic chemical substances added to the soil to overcome the deficiency of mineral nutrients and to maintain the fertility of soil. They enhance the vegetative growth (leaves and steam branches) to make the plants healthy. Fertilizers are generally used by rich farmers to ensure higher yield.

Production of chemical fertilizers in India was started in 1996 with single super phosphate. The only nitrogen fertilizer known at the time of India's freedom (in 1947 was ammonium sulphate. Production of urea started in 1956 and di-ammonium phosphate in 9167. It was followed by the produciton of a large number of chemical fertilizers in our country to meet the requirement of various macro-and micronutrients. The most common synthetic fertilizers used in India are super phosphate, urea, calcium ammonium nitrate, ammonium sulphate and NPK fertilizers.

Chemical fertilizers enhance the crop yield on the hand and cause environmental hazard on the other. Therefore, these chemical substances must be applied by observing utmost precautions. They should be applied in a proper dose and timing. Precautions must be observed during pre-and post-application so that the aplied dose must be completely utilized by the plants. The left over residue of these chemicals leads to water pollution. They destroy the fertility of soil, if used continuously at a place, because the organic matter in the soil is not replenished. Moreover, the microorganisims present in the soil get harmed by constant use of chemical fertilizers. Fertilizers give short-term benefits whereas manners give long-term benefits. Therefore, we must consider the use of manure for long term benefit.

Modern agricultural production has enhanced enormously by the use of chemical fertilizers and chemical pestitcides (i.e., the toxic chemical substances used to irradicate the pests and protect the useful plants). These agricultural chemicals, however, are not always beneficial to the mankind. Indiscriminate use of these chemicals causes some deteriorating effect on the environmental quality and ecological stability. Under such conditions, application of **organic farming** is much promising.

Organic Farming

In recent past, the agriculture industry has resulted in the destruction of the ecological balance due to use of synthetic fertilizers and pesticides, plant growth regulators, livestock feed additives and genetically modified organisms. To overcome the losses of the ecological balance and hazards of pollution, disease and hunger, it is the right time to shift our chemical-based agriculture into **organic farming.**

It is a kind of farming system in which the harmful chemicals are either not used or used only in minimum amounts. There are many techniques of organic-farming ; among them are use of farm-yard manure, biofertilizers, biopesticides, vermicompost, green manure, biocompost, etc. The farm-yard manure help in recycling of form-wastes (such as straw and livestock excreta). Biofertilizers are also harmless. They are the microorganisms which bring about soil nutrient enrichment, maximize the ecological benefits and minimize the environmental hazards. For this purpose some bio-agents such as cyanobacteria, and other N_2 fixing bacteria are used. Similarly, the chemical herbicides and pesticides are also not used. They are replaced by the use of biopesticides (such as neem leaves or turmeric specially during grain storage). Vermicompost is a nutrient-rich, natural fertilizer and soil-conditioner. It is prepared by conversion of biodegradable waste into organic manure with the help of earthworms, Biocompost is prepared by collecting weeds and grasses and chopping into small pieces. These pieces are then mixed with cattle dung, soaked waste paper, news paper, etc. and put in a pit. The water is thoroughly sprinkled from time to time until a black coloured compost is formed. The organic forming also recommends the healthy cropping system in the form of mixed cropping, inter-cropping and crop-rotation. Thus,

> **The organic may be defined as production of unpolluted plant products by a farming system using organic manures, biofertilizers, biopesticides, resistant varieties, crop rotation and intercropping instead of using harmful chemical fertilizers, herbicides and pesticides.**

Irrigation

Water is a treasure indispensable to all living organisms. It is a basic component for all types of agriculture. A soil which is the source of infinite life becomes barren without water.

The basic source of water is precipitation in the form of rain fall or snow fall. In India, most of the agriculture is rain-fed, i.e., the productivity of crops in many areas is largely dependent on the timely monsoons and sufficient rainfall spread through most of the growing season. However, the monsoonal climate is erratic with respect to onset, intensity, duration, distribution and retreat. To avoid the erratic behaviour of monsoon, our agriculture needs some alternative arragement at the times whenever it is needed by the crop. Such an alternative arrangement of water supply to the crops is called **irrigation.**

> **"Irrigation may be defined as the application of water to the soil for the purpose of supplying moisture essential for plant growth especially during stress periods."**

Irrigation ensures that the crops get water whenever they need it during their growing season. This results increase in the expected yields of any crop. Therefore, it is the prime need of the day to bring more and more agricultural land under cultivation.

India has quite sufficient kinds of water resources including monsoon rains, watersheds and ground water. The average annual rain fall is about 120 cm. Out of the total rain fall, a portion of it soon evaporates from the ground, a portion gets absorbed into the ground and the rest flows away over land as surface run-of. Of the portion that gets absorbed into the ground, a good amount of it is retained in the soil as soil moisture. The plants make use of this water. The excess soil water infiltrates as ground water to the ground water reservoir. The nature also stores a reasonable amount of water is the form of snow on mountains. The snow melts and feeds the rivers and streams that originate from these mountains. Thus, we can now understand the importance of rain and rain-water in agriculture. These resources of water,

however, are not dependable because rainy season flows cannot be fully utilised properly. The water have to be stored in proper reservoirs to be used during non-rainy months. Government and private bodies are engaged in this direction by doing rain water harvesting and watershed management.

Intermittent drought and poor rain fall pose a serious threat to rain-fed farming areas. These need supply of water from external sources. Under such conditions, irrigation system is adopted to supply water from different water resources. Some common irrigation systems are as follows :

1. Irrigation from wells 2. Canal system
3. River lift system 4. Tanks

1. **Irrigation from wells**. The ground water is an important source for irrigation from wells. Wells are usually owned by those farmers or cultivators who desire to have at their command an irrigation source so that they can use it whenever needed. There are two types of wells.
   (i) Dug wells (ii) Tube wells
   (i) **Dug wells.** These are open wells where water gets collected from wter bearing strata. They are owned privately by the farmers. They do not have long life and soon become dry whenever water table goes down.
   (ii) **Tube wells.** Shallow tube-wells meant for irrigation are privately owned and run mostly by electrically operated or diesel operated pumpsets. They get water from porous soil strata. Deep tube-wells take water from the deeper strata and have longer life period of 20 to 25 years.

2. **Canal system.** At present, the canal system of irrigation considered best because it is interrelated with a number of other aspects for instance, generation of hydroelectricity, flood control, mitigating drought and other hazards. Canals draw their water from rivers or from artificial reservoirs. The main canals are divided into branches which are further divided into distributaries to cover maximum area for irrigation.

3. **River lift system.** In India there are three major types of rivers. They are :
   (i) **The Himalayan rivers.** These are snow-fed and continue to flow throughout the year. Examples, the Indus, the Ganga and the Brahmaputra.
   (ii) **The rivers of Central India and the Deccan.** These are generally rain-fed so their volume of water varies throughout the year. In dry seasons some of these rivers may almost become waterless. Eeamples, Godavari, Krishna, Mahanandi, Damodar, Chambal, etc.
   (iii) **Coastal rivers and the rivers flowing into interior drainage basins.** These have limited catchement areas and have ephemeral character.
   Irrigation by river lift system is advantagous in those areas where canal system in inadequate and river water is easily available.

4. **Tanks.** Tanks are smal water reservoirs where water is stored for the purpose of irrigation, flood control, fire control, washing, pisciculture and many other purposes. They help in rain water harvesting and recharge groundwater table.

In order to take maximum advantage of surface and ground water the following policies should be adopted :

(i) Lawful utilization of available water resources.
(ii) Fresh water resources are not inexhaustible. Therefore, irrigation water must be distributed proportionately so that farmers should learn to conserve water and use only the adequate amounts in their fields.
(iii) Rules and regulations must be framed regarding the private installation of pumping machines.
(iv) Alkalinity of water must be stopped.

(v) Rain water should be stored and utilized fully for raising the crops.

Cropping Patterns

In order to get maximum benefit from the piece of land, operated as a unit for the production of agricultural products, different patterns of growing crops are followed. These are :

1. Mixed cropping pattern
2. Inter-cropping pattern
3. Crop rotation

1. **Mixed cropping pattern.** Usually only one crop (example, wheat, gram, mustard, or sunflower) is grown in the field at a time. It occupies the field for the complete growing season. Finally the farmer gets advantage of this crop after the undisturbed growing season and ripening. Now suppose if this crop faces some problem such as inadequate climate or attack of disease pathogens or insects, the entire labour and money of the farmer goes waste. This can be avoided by growing two or more crops simultaneously on the same piece of land. For example, if wheat and gram, or wheat and mustard, or ground nut and sunflower are grown simultaneously in afield, it will save atleast one crop at the time of adverse conditions or pathogen attack (one thing should be clear in mind that specific pathogens of one crop do not cause disease in another crop. For example, specific pathogen of gram causes disease only in gram plant and not in wheat or mustard). Thus, growing two or more crops in a field is highly advantageous and is called mixed cropping. Thus,

   Practice of cultivating two or more crops simultaneously on the same piece of land is caled mixed cropping.

2. **Inter-cropping pattern.** This is another type of cropping system in which two or more crops are grown simultaneously on the same field but they are not mixed with each other. They are grown in a set pattern. For example, a few rows of soyabean alternate with a few rows of maize in the total field area. Such type of cultivation in which two or more crops are grown in alternating rows is called inter-cropping pattern. The crops selected for such type of pattern should have different types of nutritional requirements. This will help the crops to utilise maximum nutrients from the soil. This pattern also prevents pests and diseases to spread in all the plants of one crop in the field. The following crop combinations are usually grown in the inter-cropping pattern.
   (i) Finger millet (Bajra) + Cow pea (Lobia)
   (ii) Cotton + Moong bean
   (iii) Soya bean + Maize
   (iv) Ground nut + Sun flower
   (v) Wheat + Mustard
3. **Crop rotation.** If one crop is grown in a field for several years (i.e., every year (or season) the same crop is grown) it reduces the fertility of soil by showing the deficiency of the same type of nutrients. Moreover, the disease causing pathogens get their host every year so that they multiply and increase in number. This can be avoided by growing different crops in a pre-planned succession. For example, a mustard crop is alternated with sugarcane which is again alternated with berseem or any other crop. Such type of planned alternate cropping is called crop rotation. Thus

   The practice of growing two or more different kinds of crops on a piece of land in a pre-planned succession is called crop-rotation.

Crop protection management

The crop plants provide us the products of economic or commercial values and grown in community for specific purpose. They provide us food, fibres, drugs, building materials and so many other countless products for our daily use. Thus, it becomes our prime duty to provide protection to crop plants from their enemies. There are three major enemies of biological

origin which cause damage to our crop plants and reduce their productivity. These enemies are :

1. Weeds 2. Insect pests
3. Disease inciting agents (pathogens)

Weed and Weed Control Management

Weeds are plant species that grow in places where they are not wanted. For example, a rose plant growing spontaneously in wheat field is considered as weed. Similarly, a wheat plant growing spontaneously in rose field is called a weed. Thus,

A plant species growing spontaneously at unwanted habitat (or in the cultivated field) is called a weed.

Weeds damage our crop plants, by competing with them for space, water, light and nutrients. Thus overall losses caused by weeds in India had been estimated at 27% of field crop production. Therefore, irradication of weeds from crop fields during the early stage of crop growth is our prime concern. In India, weeds are usually weeded with hand labour consuming an inordinate amount of farmer's time, labour and money. The chemical weed control has not been widely accepted because of the availability of farm labour at low wages. Moreover, the effective chemical herbicides are not easily available. Presently, the most commonly used methods of weed control are :

(i) **Hand pulling.** The individual weed plants are pulled by hand.

(ii) **Tillage.** Destruction of weeds and reduction of their seeds in the soil is called tillage.

(iii) **Mowing.** Mowing of fields also prevents seed production of weeds and removes weed growth.

(iv) **Flooding.** Flooding is a popular method of controlling perennial weeds.

(v) **Cropping and competition methods.** Weeds are also controlled by proper seed bed preparation, timely sowing of crops, intercropping, crop rotation, summer ploughing, adopting most effective methods of irrigation and application of fertilizers.

(vi) **Use of chemical herbicides.** An enormous variety of chemical compounds have been synthesized, tested for herbicidal activity and the successful ones have been applied to the fields.

Some of the important weeds of our crop fields are Parthenium (Gajar ghas), Xanthium (Gokhroo), Cyprus rotundus (Motha), Abutelon indicum (Kanjhi), Achyranthus aspera (Latjeera), etc.

Insect Pests

Harmful creatures for our crop plants are small insects which attack the plants in three ways :

(i) **Chewing insect.** Insect pests of this category cut the root, stem and leaf with the help of their chewing mouth parts. They chew and swallow these pieces of plant parts. Examples, Grasshoppers, Caterpillars, Locusts, etc.

(ii) **Sucking insects.** These insects puncture the plant parts and suck the cell sap with the help of their needle like hollow beaks. Examples, Leaf hoppers, Aphids, Bugs etc.

(iii) **Internal feeders.** These insects bore into stem and fruits. They live inside the plant parts and harm the crop yield.Examples, Weevils, Borers, etc.

Disease Inciting Agents (Pathogens)

Several diseases of crop plants are caused by pathogenic organisms which damage the plants and reduce the yield. Main pathogens or crop plants are - fungi, bacteria, viruses, mycoplasmas, nematodes, etc. These diseases can be easily transmitted from diseased plant to healthy plants, i.e., they are infectious. Some diseases are epidemic and cover a large area and population of plants resulting in severe outerbreak. The plant pathogens can be transmitted through the soil, water and air.

The chemical substances which are used to protect the plants are commonly **pesticides.** Depending on the kind of organism they destroy,t he chemical substances are known as-

(i) Herbicides (used against weeds)

(ii) Insecticides (used against insects)

(iii) Fungicides (used against fungi)

(iv) Bactericides (used against bacteria)

Although, the utility of pecticides for pest control cannot be questioned, their indiscriminate use in not free from problems. The regular use of these chemicals is not only hazardous, contaminate food and water, but also affect the quality of produce and leave residues which might affect the health of consumers. The chemical pesticides are also known to cause poisoning. The counter all these disadvantages of chemical preferred. In this regard Integrated Pest Management (IPM) favours biological control methods which are ecologically safe, target specific and harmless to other life forms. The vegetables and fruits of those plants which are treated with biopesticides have better taste and shine.

Storage of Grains

One of the most important aspect of agriculture is proper storage of harvested grains and other agricultural produce. Proper storage is necessary to get seasonal foods regularly through the year. It has been observed that improper storage of grains and seeds results in spoilage and wastage. In India, the loss due to improper storage of grains has been estimated do be approximately 9% annually.

1. **Storage grain losses.** There are two main factors responsible for losses during storage. They are :
   (i) Biotic factors
   (ii) Abiotic factors

   (i) **Biotic factors.** The living organisms which influence the storage of grains are called biotic factors. These include **insects** (Beetle, Weevil, Grain borer, etc.), **rodents** (Rat, Mouse, Squirrel, etc.) **birds, mites, fungi, bacteria,** etc.

   (ii) **Abiotic factors.** The non-living environmental factors are called abiotic factors. These include moisture and temperature.

   Both biotic and abiotic factors cause damage to harvested grains during storage. They destory the grain by causing degradation in their quality. Moisture and humidity invite disease inciting organisms (such as bacteria and fungi) which disintegrate the reserve food materials causing discolouration and loss in weight. High temperature favours growth of microorganisms and activity of enzymes. These damage the stored food materials and reduce their marketability.

2. **Preventive and control measures.** Biotic and abiotic factors which cause destruction of grains during storage can be prevented and controlled by using the following measures:
   (i) **Cleaning of the produce before storage.** The grains and other agricultural produce should be property cleaned and dried before their storage. They should be filled in new gunny bags before keeping in goodowns, warehouses or stores.
   (ii) **Drying.** It is desirable that the grains and nonperishable food such as flour, sugar, spices and nuts should be dried first in sunlight and then in shade. The moisture content of grains should be below 9 percent.
   (iii) **Fumigation.** Chemical pesticides are used as fumigants, i.e., the solution of pesticides is converted into fumes. These fumes kill the insect pests and other harmful biological agents. For example, two tablets (3 g each) of aluminium phosphate (black poison) can be used to protect one ton gain.

Animal products and their nutritional value

		Animal Products				
		Cow milk	**Buffalo milk**	**Egg**	**Meat**	**Fish**
Value of nutrients in %	Water	86.54	83.50	74.0	84.20	77.20
	Fat	4.92	7.16	12.00	3.60	2.50
	Sugar	4.58	4.81	x	x	x
	Protein	3.21	3.77	13.00	21.10	19.00
	Ash	0.75	0.76	1.00	1.10	1.30

Animal husbandry

A simple dictionary meaning of husbandry is farming or managemnt. Animal husbandary is, therefore, animal farming of management of animals. Here the animals which are included in this branch of agricultural science are the domestic animals raised mainly for their proper economic utilisation. Such animals are called livestock. Examples of livestock are cow, bull or ox, buffallo, yak, horse, goats, deer, sheep, pigs, ass, camel, etc. Thus,

> **Animal husbandry is the farming or management of animal livestock which includes various aspects such as animal's shelter, feeding, breeding, health and disease control.**

Good animal husbandry practices are needed to meet out the growing demand of milk, eggs, meat, etc. These practices finally benefit the farmers.

Thpes of Animal livestock Management.

The farming or management of animal livestock includes:

1. Cattle farming
2. Poultry farming
3. Fish farming
4. Bere keeping.

1. **Cattle farming**

   Cow and bullocks are the major backbone of Indian agriculture and play an important role in the rural economy. In India, there are two different species of cattle:

   1. **Cow** (cattle). The scientific anem of cow is **Bos indicus.** There are 26 breeds of cow. They are classified into three categories:
   (i) **Milch breeds,** example, Sahiwal, Gir
   (ii) **Drought breeds,** example, Malvi, Nageri
   (iii) **General ulitity breeds,** examples, Ongole, Kankrej
   2. **Buffalo** (Indian water buffalo). The scietific name of buffalo is Bubalus bubalis. There are 7 breeds of buffaloes in India. The best known are - Murrah, Jaffrabadi, Nili, Bhadwari and Surti.

Purpose of Cattle Farming

Cattle farming is done mainly for two purposes:

1. Dairy 2. Draught.

1. **Dairy animal.** Dairy animals include those animal which are kept for obtaining milk. They are also called **milch animals.** These include cow, bufrfalo, goat, camel and yak. Cow and buffalo are good milch animals which provide us milk and milk product. From the nutrition point of view milk is the most nearly perfect food available to us as a source of animal protein in vegetarian diet.

   Dr. V. Kurien, founder chairman of the National Dairy Development Board (NDDB), is called the architect of India's modern dairy industry and the **father of white revolution.**
2. **Draught animals.** Animals used in agriculture and for transport are called draught animals, e.g., Bullock, Horses, Elephants, Mules, etc., In India, there are about 84 million draught animals. More than 50% Indian farmers have holdings of less than 2 acres. They cannot afford to have tractors and other machines. In hilly terrains and sandy deserts, there are no other means of transport except draught animals. Moreover, there are about 15 million animal drawn carts which can be used on all types of roads and in all terrains. Moreover, the draught animals are used for other agricultural practices such as tilling and irrigation.

Milk Production

Protection of good quality milk depends on several factors. Some of them are:

1. **Influence of breed.** The quality and quantity of milk of some breeds in comparatively much better than others. For example, exotic or foreign breeds of cattle have long lactation periods and give more amount of milk. Jersey cows (Native of Island of Jersey, U.S.A.) and Brown

Sweiss cows (Native of Switzerland) Produce on an average 60 litres of milk in a day. On the other hand, local breeds (for example, Red Sindhi and Sahiwal) produce on an average only 6-8 litres of milk per day. Milk of Red Sindhi cow contains higher fact than those of Holstien (Native of Holand) and Brown Swiss.

2. **Duration of location period.** The period from the time of calf is born until the cow cases to give milk is called the **'period of lacation'.** The lactation period of Red Sindhi cow is 230 to 345 days. The lactation period of exotic brres is relatively longer. It is about 365 days in case of Holstein cow.
3. **Seasonal change.** Generally the quality of milk is better in cold weather and decreases in warm weather. During summer, the yield of milk is reduced but the fat content is increased.
4. **Physical health of the animal.** If the cattle is not healthy and suffering from some disease, the quality of milk is affected.
5. **Feed of the cattle.** The quality of milk is temporarily affected by variation in feeds.

Breeding for the Desired Quality

The milk production can be increased by the technique of selective breeding. This is done by cross breeding between a local breed (indigenous) cow and an exotic (foreign) bull. The local cow is selected for the character of disease resistance. The exotic breed of bull is selected for the character of prolonged period of lactation and high yield of milk. The breeding may be done by natural method or by artificial insemination (i.e. injecting the seman obtained from the desired bull into reproductive tract of the cow). The desired characters are thus obtained in the next generation.

Proper Housing

Proper housing facilities for dairy animals are required to protect them from sun burns, rain, hot and cold winds, wild animals and theft. They should be provided clean and comfortable shelter at a cheaper cost. Adequate housing of dairy animals provides increased production of higher quality milk and proper disease control. Besides proper shelter, regular brushing to remove dirt and loose hair is also required. The floor of the cattle shed should have a slope connected with prefect drainage system. It makes the shyelter dry and free from dirty water.

Feeding

The food required by dairy animals is called **feed.** The dairy animals must get adequate, palatable, laxative, appetising and balanced ration with sufficient greens and all nutrients in proportionate amounts. They also must get large quanity of water for milk production. Dairy require food for two basic purposes :

1. The require food to maintain a healthy body and to perform all life activities.
2. They require specific food to produce milk during lactation period.

Components of cattle feed. A normal feed of dairy animals (cow and buffaloes) consists of kind of components :

(i) Roughage (ii) Concentrates.

(i) **Roghage.** This part of cattle feed contains mostly fibres which come from hay (straw of crereals or **Bhusa),** green fodder (examples, Berseem, Lucerne, Cow pea, etc.) and silage.

(ii) **Concentrates.** These are mixture of substances containing less fibres and relatively excess amount of protein, fat, carbohydrates, minerals and vitamins).

A balanced ration containing all nutrients in proper amounts plus sufficient water must be offered to dairy animals at cooler time of the day with frequent intervals. Sudden changes in diet should be avoided. Legume, feed must be given with dry fodder. There are additives available in the market which contain

micronutrients, which promote the milk production of dairy animals.

Diseases of Cattle

Cattle and buffaloes suffer from several diseases which not only cause ill health but reduce the milk production. Some severe diseases, if not properly cared, lead to the death of animal. Therefore, treatment in early stages of the disease is more effective. A healthy animal looks bright, happy, peaceful, active and alert in movement; and enjoys normal appetite and feeds regularly. It ruminates and breathes normally and maintains a proper postures.

The diseases are caused by worms, flukes, bacteria, fungi, viruses and many other parasites. They parasites of cattle may be external or internal. The external parasites live on the external skin of the body and causes skin diseases. These include blood-sucking lice, ticks, fleas and mites. The internal parasites live inside the body of animals. For example, Ascaris (round worm) lives in the stomach and intestine of dairy animals. Liver flukes (Fasciola) live in the liver and cause great damage.

Mainy other infectious disease are caused by fungi, bacteria and viruses. Some of them are listed below:

1. **Anthrax.** It is a contagious and fatal disease caused by anthrax bacteria. Animal dies within a few days of infection.
2. **Haemorrhgic septicemia.** It is an acute and most serious disease of cattle caused by bacteria. It causes death of animal within few hours.
3. **Foot and mouth disease.** It is highly contagious viral disease which is not fatal except in young ones. In this disease, blisters appear on the mouth and foot. The milk productionis greately reduced.
4. **Rinderpest (cattle plague).** It is a viral disease characterised by fever, ilceration in the mouth. This disease is also highly contagious and fatal.
5. **Tuberculosis.** It is a chronic infectious disease caused by bacteria. It spreads to humans through infected milk or meat.

Poultry Farming

Poultry (French word 'poult' = chicken) is a class of dommesticated fowl (particularly young ones of common domestic fowl) used for food and for their eggs. The common poultry birds are chickens, turkeys, ducks, geese, guinea-fowls and pigeons. Eggs and high quality meat obtained from poultry give us a balanced diet and serves as a cheap source of animal protein. Now a days, the poultry products have become the choice of millions as staple food.

Poultry farming includes housing, rearing, sanitation, disease - control and marketing of poultry birds and their products. The emphasis is being laid to improve the production of good quality eggs and chicken meat. This is done by proper poultry farming and developing improved poultry birds.Such an improvement is generally done by breeders to improve the egg laying qualities in **layers (Egg layers)** and to improve the quality of meat in broliers.

Variety Improvement Through Breeding

It is the prime concern of poultry farming is to develop improved breeds of poultry birds. It is generally done by cross breeding between **desi or indigenous breeds** (such as Aseel or Indian game, Kadaknath, etc.) and **exotic or foreigh breeds** (such as Leghorn, Black Minorcha, Play mouth, Light Sussex, etc.) Desi breeds are strong and posses natural immunity against local diseases. But, they are small in size, grow slowly and lay less number of small eggs. The exotic breeds, on the other hand, lay large - sized eggs and need less feed for maintenance. But, they are prone to local diseases and require more care for maintenance. Therefore, cross breeding between desi and exotic breeds is done to get the hybrids possessing improved qualities. Thus several research programmes are going on all over the country to produce the cross breeds for the following desirable traits :

1. The cross breeds should lay more number of eggs, which produce good quality chicks.

2. The broiler chicks should be small sized (dwarf), so that they yield more and consume less.
3. The cross breeds should be able to adapt the adverse climatic conditions such as high temperature during summers and low temperature during winters.
4. They should require less expenditure for their maintenance.
5. The egg-laying birds should be small in size and consume more fibrous cheaper diets specially formulated for them by using the by-products of agriculture.

Care for Layers and Broilers

Egg laying gbires are usually called egg layers or simply **layers.** They need some special attention as compared to meat-producing **broilers.** The broilers, however, require somewhat different housing, nutritional and environmental requirements as compared to egg layers.

A comparison between layers and broilers

Layers

1. Layers are egg-laying birds, managed for the purpose of **getting eggs.**
2. Layers start producing eggs at the age of 20 weeks. So they are kept for longer perioid depending upon laying period (approx. 500 days.)
3. They require enough space and adequate lighting.
4. They need restricted and calculated feed with vitamins, minerals and micronutrients.

Broilers

1. Broilers are maintained for **getting meat.**
2. They are raised upto 6-7 weeks in poultry farms and then sent to market for meat purpose.
3. They require conditions to grow fast and low mortality.
4. They daily food requirement (ration) for broilers is rich inprotein and vitamins A and K. The fat contents should also be adequate.

The persons involved in poultry farming must keep in mind that good management practices are important for good production of poultry products. Therefore, special attention must be given to maintain regular check-up is needed and all preventive measures must be taken to control the diseases and pests related with the poultry.

Diseases Poultry

Poultry birds suffer from a variety of diseases caused by nutritional irrigularities (rickets), viruses (Bird flu, Ranikhet, Dermititis, Fowl pox), bacteria (Salmonellosis, Tuberculosis, Fowl Cholera), fungi (Aspergillosis) and parasites (Round worm disease, Taeniasis). They also have arthropod infestations of lice, fleas, ticks and mites. Tick fever is a very serious disease, These diseases reduce the growth of bird, diminish egg poduction, decrease fertility and even cause death.

Therefore, the following preventive measure must be taken to avoid the poultry diseases:

1. Get disease-free chicks raised in proper sanitary conditions from healthy parents.
2. Clean and disinfect the poultry house by spraying of disinfectants at regular intervals. The pultry should be free of ticks.
3. Give fresh and balanced feed to the birds to avoid nutritional diseases.
4. Avoid overcrowding of the birds, ill ventilation and dampness, because these favour the spread of the diseases.
5. Have newly hatched chicks vaccinated in time. Vaccination prevents the occurence of infectious diseases. If at all, infection occurs, isolate the sick birds, and burn or burry the birds that die of disease. This will stop further spread of the disease and reduce loss of poultry.

Fish Production

Fish serves as the common man's food and a cheap source of animal protein that is easily digestible. Fish is a general term that includes AGNATHA (i.e., Jaw-less fish), CHONDRICHTHYES (i.e., Cartilaginous

fish) and OSTEICHTHYES (i.e., Bony fish), Besides true fishes (i.e. fin fishes), there are other animals which are commonly called one or the other type of fish. For example, Jelly fish (Aurelia), Cuttle fish, Star fish (An Echinodermate) and Shell fish (Prawns and Molluscs). It is because the term fish has been commonly used for many water-dwelling animals. The true fish, however, is a gill-breathing water dwelling vertebrate that possesses fins. The skin of fish is usually covered with scales. Thus, production of fish includes both, the production of true fish as well as production of shell fish (Prawns and Molluscs).

The process involved in obtaining fish from the source is called **fishing,** i.e., catching of fish.There are two different sources of obtaining fish :

1. Natural resources (capture fishery)
2. Fish farming (Culture fishery)

Natural Resources

There are two natural resources for fishing : (i) The fishes obtained from ocean and seas, and (ii) The fished obtained from rivers, canals, lakes, reservoirs, tanks, ponds, etc. The first category of obtaining fish from marine water is called Marine fisheries. The second category of obtaining fish from fresh water ecosystem is called inland fisheries (or fresh water fisheries). These two categories are discussed below :

1. **Marine Fisheries:**

   It is a branch of fishereis concerned with obtaining fish from ocean and seas. India is surrounded by 750 km of coastline and extensive sea (i.e., Arabian sea, Bay of Bengal and many other small bays, gulfs, etc.) The fisherman enter into the sea on their fishing boats and ships. The fishes are caught by using different kinds of fishing nets and gear operated by fishing vessels. In order to increase production of fish from the sea, modern technologies have been developed. These include ecosounders and use of settlites to locate fish shoals (or schools).

   The common marine fish varieties popularly consumed as food are:

   1. Pomphrets, 2. Mackerels, 3. Tuna, 4. Sardines, 5. Bombay duck, 5. Eel 7, Hilsa, 8. Salmon, 9. Flying fish and 10. Flat fish

2. **Inland Fisheries:**

   Inland fisheries includes capture fishing from fresh water resources as welll as brackish water resources. The fresh water resources include rivers, canals, lakes, reservoirs, tanks, ponds, etc. Brackish water is saline water that flows from sea and gets mixed with fresh water. The common brackish water resources are estuaries and lagoons. They are also important fish reservoirs.

   The common fresh - water fish varieties popularly consumed as food are :

   1. Rohu (The carp)
   2. Calbasu 3. Catla
   4. Mrigal 5. Malhi
   6. Sanghara 7. Snake head and
   8. Chital.

Fish Farming (Culture Fishery)

During the past few decades, fish production has been increased many folds to met out the demand of growing population. In this regard, modern technologies have developed special devices to assist the easy catpuring and cultivation of fishes in marine and fresh water ecosystem. The cultivation of fishes is done by fish farming or culture fishery. Thus,

Fish farming or culture fishery is a kind of business and research activity concerned with the culturing, feeding, breeding and production of fishes in marine and fresh water ecosystem.

There are two categories of fish farming:

(i) Mariculture (ii) Aquaculture.

(i) **Mariculture.** Culturing of marine fishes in coastal water on commercial basis is called mariculture. In fact, the mariculture is practiced to culture and cultivate many similar organisims. These include : Sea fish of high economic value

such as Mullets, Bhetki, Pearl spots, etc.; Shell fish such as Prawns; Mussels; Oyesters; Sea weeds ; etc Besides getting sea food, the Oysters are also cultivated for the pearls they make. These sea foods have significant economic value and considered high valued food as delicacies.

(ii) **Aquaculture.** Fish culture in inhald water bodies (i.e., fresh water resources and brakish water resources) is called aquaculture. There are several types of fresh water fish culture systems. Some of them are as follows:

1. **Fish culture in cages.** Large cages made of bomboo or steel are lowered into the fresh water reservoir (such as river). Some special type of fishes are cultured in these cages.
2. **Integrated fish culture.** When culturing fish is combined with other agricultural crops (such as paddy, banana, coconut, etc.) or along with poultry farming so that the excreta of birds is used as food in fish culture ponds. The best integrated fish culture system combines growth of fishes in water of paddy field. The farmer gets benefit of both in the same piece of land.
3. **Composite fish culture systems.** Fish production by culturing a single species of fish is called monoculture. It is old method of fish culture. Now a days a combination of five or six species of fish are cutlured in a single fish pond. Selection of several species of fish for culturing in a pond helps to enhance yield with the same cost and to utilise most of the available food in the water reservoir. Selection of fish is done on the basis of the following characters :
   (a) The selected species are fast growing. For example, if common Indian major carps (i.e., Rohu, Catla and Mrigal) and exotic carps (i.e., Silver carp, Grass carp and Common carp) are selected for culturing, they give 8-9 times more yield.
   (b) They do not compete with each other for space and nutrition.
   (c) They live in distinct zones inside the pond. For example, Catla and Silver carp live mostly in the surface zone; Rohu and Grass carp live in the middle zone and Mrigal and common carp live at the bottom.
   (d) The feeding habits of the selected species are distinct. For example, silver carp feeds on phytoplanktons; Catla feeds on zooplanktons; Rohu and Mrigal feed on decaying plants and detritus; Grass carp feeds on aquatic plants and weeds.

Thus, fish farming is advantageous, economical and profitable from business point of view. There are, however, certain problems in fish farming. One of the major problem is availability of good quality seeds (i.e., eggs or spawn). It is because these fishes breed only in monsoon months, i.e., from July to August. So the seeds are available only for a short duration. Alternatively, if one tries to obtain seeds of these fishes from natural sources, i.e., from rivers, then the availability of pure seeds is not sure. It is because the seeds of desired species get mixed with those of undesired species.

To overcome these problems of composite fish culture and to get desired quality seeds, scientists experimented and worked out ot breed these fish in ponds. They used induced breeding technique with the help of hormonal stimulation. The hormones were extracted from the pituitary glands of carps. This new breeding technique ensured the supply of pure seeds of fish in desired quantity and let to **Blue revolution** through fish farming.

Comparison between capture fishing, mariculture and aquaculture.

Capture fishing

It capture fishing, the fish catching is done from various natural resources such as rivers, lakes, oceans, seas, etc.

Mariculture

In mariculture, culture of marine fishes is done in coastal water. The desired marine fishes and other animals are cultivated and obtained.

Aquaculture

In aquaculture, culturing of fish is done using fresh water ponds. The desired fresh water fishes are cultivated and obtained.

Bee-Keeping

Bee keeping is an important enterprise of agriculture. It is concerned with the commercial production of honey and wax. The practice of bee keeping is called **apiculture.** Bee keeping is a low investment, less problematic and highly profitable enterpirse. Therefore, farmers practice it as an additiona source of extra income. Some farmers have undertaken it on commercial basis as a business.

The Important Products Obtained From Bee-keeping

Apiculture or bee keeping provides us **Hone** (A sweet edible fluid containing sugar, water, minerals, vitamins, amino acids, enzymes and pollen) ; **Wax** (secreted by wax glands of wrker bees for construction of bee hive); **Prpolis** and **Poissons** (used in some Ayurvedic and Homeopatic preparations).

Imprtance of Honey

1. Honey is an editable fluid and eaten directly as a source of energy. It also helps in growth of our body as to contains iron and calcium.
2. Honey has a gread importance for its medicinal value. It is useful in the treatment of various disorders related to digestion, dysentery, vomiting and stomach and liver ailments.
3. Honey acts as a blood purifier.
4. It is also used as a source of sugar in confectionary items such as pasteries, cakes, etc.

Varieties of Honey Bee Used For honey production

In India, both local varities as well as exotic varities are used for commercial production of honey. The local varities are Apis cerana indica (Indian bee), A. dorsata (rock bee) and A. flora (little bee). The exotic varities used for honey production are Apis mellifera (An Italian bee variety) and A. adamsoni.

Some common species of Honey bee are as follows:

1. Apis dorsata (Rock bee) - It is an elongated and long bee that yields maximum amount of honey i.e., upto 60 pounds per comb. It is wild and not easily domesticated for commercial purposes.
2. Apis indica (Indian bee) - It is a gentle kind of bee that can be easily domesticated. It yields approximately 6 to 7 pound honey per comb.
3. Apis florae (little bee) - It is smallest that Apis indica and yields very little amount of honey.
4. Apis mellifera - It is an exotic variety commonly called European bee. The honey production is less but this bee is best for domestication because of its docile nature.

Division of Labour : The honey bees, the tiny inspect, represent a well organized system of division of labour. Each honeybees colony consists of three distinct castes : (i) One queen, which is functional female produced from fertilized egg and can layupto 15,000 egg per day and can live for three years; (ii) 10,000 to 20,000 workers (sterile females) which have underdeveloped reproductive orgains; and (iii) Few hundred drones (males) which are heavily built as compared to the workers and queen. The only function of drones is to mate with the queen. Their life span is 57 days.

Commercial Production of Honey

For production of honey on commercial basis, bee farms or **apiaries** are established in good and desirable locations where abundance of flowering plants (flora) is available in 1 to 2 kms radius for nectar and pollen collection. Availability for flowering plants for collection of nectar and pollen is called pasturage. It plays a very important role in the quantity and quantity of honey. We know that the type of plants growing in mountains are different that those growing in plains. Thus, pasturage of mountains is different from that of plains. In fact, the taste of honey depends upon the type of flowers available for pasturage.

Besides pasturage, the other important factor which plays role in the commercial production of honey is teh selection of bee variety. At present, the Italian bee variety, Apis mellifera is used in aspiary for large scale production of honey and wax. This variety yields and average of 50 to 200 kg of honey per hive per year. Moreover, the Italian variety of bee stay for longer duration in a given bee hive, breed very well and sting less. Thus,

There are two important factors for production of good quantity and good quality honey. They are :

1. Pasturage (i.e., Availability of flowers to bees for nectar and pollen collection).
2. Selection of god variety of bee.

SOLVED NCERT QUESTIONS

Q1. **What do we get from cereals, pulses, fruits and vegetables?**

Ans. 1. Cereals: We get **carbohydrates** for our energy requirements.

2. **Pulses :** We get **proteins.**
3. **Fruits :** we get vitamins, minerals, Carbohydrates and organic acids etc.
4. **Vegetables :** We get minerals, vitamins, proteins, carbohydrates and oils.

Q2. **How do biotic and abiotic factors affect crop production?**

Ans. Biotic factors like insects, fungi, pests etc. spoil crops, thereby reducing crop yield. Few me matodes help in increasing soil fertility.

Abiotic factors like drought, salinity, water logging heat, cold and frost cause major loss to crops. Plant breeders, therefore are engaged in developing resistance varieties to control such stresses.

Q3. **What are the desirable agronomic characteristics for crop improvements?**

Ans. For crop improvement the following agronomic characteristics are desirable:

(i) **Crop variety improvement:** A variety of crop that is high yielding disease resistance and well adapted for fertilizers and climatic conditions is required.

(ii) **Crop production improvement :** Variety suitable for soil, climate and availability of irrigation should be used using improved method of its production.

(iii) **Crop protection improvement:** Improved methods of crop protection are desirable.

Q4. **What are macro-nutrients and why are they called macro-nutrients?**

Ans. Nitrogen, phosphorus, potassium, calcium magnesium and sulphyur are called macro-nutrients. They are called macro-nutrients because their sufficient quanity is required by crop-plants.

Q5. **How do plants get nutrients?**

Ans. Plants get nutrients from air, water and soil. Air supplies them carbon and oxygen and water supplies them hydrogen. Other thirteen nutrients are supplied through water from soil.

Q6. **Compare the use of manure and fertilizers in maintaining soil fertility.**

Ans. If we supply only mannures to the field, then its fertility increases slowly an dnot instantly. But the fertlity is sustained for a longer time. Moreover, manure is not nutrient specific, therefore, the soil may be deficit of a particular type of nutrient.

If only fertilizers are supplied to the field, there will be high crop yield because they provide nutrients instantly. But the fertility of the soil does not remain for a longer time. Excessive use of nitrogenous fertilizers is harmful. When a nitrogenous fertilizers is used in excess, then the nitrate salts get concentrated in water and soil. The nitrate-rich water becomes unfit for drinking.

Q7. **Which of the following conditions will give the most benefits? Why?**

(i) Farmers use high quality seeds, do not adopt irrigation or use fertilizers.

(ii) Farmers use ordinary seeds, adopt irrigation and use fertilizer.

(iii) Farmers use quality seeds, adopt irrigation, use fertilizer and use crop protection measures.

Ans. Condition (c) will give the most benefits because quality seeds, proper irrigation and use of fertilizers is essential for plant growth and crop protection measures are essential for ensuring high production of crop.

Q8. **Why should preventive measures and biological control methods be preferred for protecting crops?**

Ans. Preventive measures and biological control methods are preferred for protection of crops

because they are not harmful to crop as well as to environment. They are ecologically safe, target specific and harmless to other organisms.

Q9. **What factors may be responsible for huge losses of grains during storage?**

Ans. Biotic and abiotic factors may be responsible for losses of grains during storage. Biotic factors include insects, rodents, fungi, mites and bacteria and abiotic factors include in appropriate moisture and temperature in the place of storage.

Q10. **Which method is commonly used for improving cattle breeds and why?**

Ans. The following method is used for cross breeding in the cattle : (a) natural cross or (b) artificial insemination.

(a) **Natural Cross Breeding :** The females of indigenous (desi) breed are allowed to mate with bull of other country, the exotic variety with desirable characters.

(b) **Artificial Insemination :** The semen is collected from a desired bull and is injected into the vagina (reproductive tract) of cows during the period of **heat** (they are ready to make). By it, several crows (up to 3000) may be fertilized by the semen collected from one bull. Frozen semen can be stored for a long period, and easily transported to remote parts of our country.

Q11. **Discuss the implications of the following statement:**

"It is interesting to note that poultry is India's most efficient converter of low fibre food stuff (which is unfit for human consumption) into highly nutritious animal protein food."

Ans. This statement is correct because the chickness are feed on caracked grains of wheat, rice barley, jawar, bajra, etc. and bone meal, waste meat meal, etc., which are not of much use for the human consumption and in return they produce egges and meat, full of protein and nutrious food. So the statement is very much true.

Q12. **What management practices are common in dairy and poultry farming?**

Ans. In dairy and poultry farming, the common management practicles are (i) food requirement (ii) shelter and (iii) protection against diseases and pests.

Q13. **What are the differences between broilers and layers and in their management?**

Ans. Difference between Broilers and Layers:

	Broilers		Layers
1.	Broilers are raised to get meat.	1.	Layers are produced for the eggs.
2.	They are produced on environmentally controlled broiler units.	2.	They need sufficient space and lighting.
3.	They are fed on high protein diet, minerals, vit. A and vitamin D.	3.	They are fed on high protein diet with good mineral and vitamin D.

Q14. **How are fish obtained?**

Ans. The fish are obtained in two ways :

(i) **Capture fising :** In this way, they are obtained from natural resources.

(ii) **Culture fishery:** In this way, they are obtained using farming.

Q15. **What are the advantages of composite fish culture?**

Ans. Fish production increases as fish use all the available food due to different food habits.

Q16. **What are the desirable characters of bee varieties suitable for honey production?**

Ans. (i) Ability to collect nector.

(ii) Ability to protect it self against enemy.

(iii) Queen's ability to produce healty eggs.

(iv) Gentleness in the nature.

Q17. **What is pasturage and how it is related to honey production?**

Ans. The flowers available to the bees for the collection of nector and pollen, is called pasturage. The quality of honey depends on pasturage.

Q18. **Explain on method of crop production which ensures high yied.**

Ans. Hybridization ensures high yield. It refers to crossing between two or more genetically dissimilar plants.

First of all two existing varieties of crop are selected, each possessing one of the desired characteristics like high yield or resistance to diseases. Cross breeding of these two varieties of plants is then carried.

Q19. **Why are manures and fertilizers used in fields?**

Ans. Manure helps in enriching soil with nutrients and organic matter and increasing soil fertility. Fertilizers are used to increase crop yields providing some particular nutrient.

Q20. **What are the advantages of intercropping and crop rotation?**

Ans. (i) **Advantages of intercropping :** Two or more crops are grown simultaneously in the same field. Both crops may provide better returns.

(ii) **Advantages of crop rotation:** Two ore three crops may be grown in a year. Maximum harvest is posible. It enriches soil also.

Q21. **What is genetic manipulation? How is it useful in agricultural practices?**

Ans. Genetic Manipulation: R refers "to the incorporation of desirable characters by different methods such as r-DNA technology or genetic engineering etc."

It is useful to increase higher yields by means of **improved varities of plants.**

Q22. **How do storage grain losses occur?**

Ans. Storage grain losses: These are done by rodents e.g., rates and certain insects. The factors responsible for storage grain losses fall in two types : (a) biotic, (b) abiotic.

Biotic factors are raodents, insects, fungi, mites and the bacteria. Abiotic factors include temperature and the moisture contents.

Q23. **How do good animal husbandry practices, benefit farmers?**

Ans. (i) It helps to increase animal production of cattles, goat,sheep and polutry farming.

(ii) It helps to get better yields.

(iii) Cattle raising is done for fulfilment of our needs like dairy, dual and draft.

Q24. **What are the benefits of cattle farming?**

Ans. Milk production is increased by having exotic breeds of cow and buffalo and good breed of drought animals may give labour for fields.

Q25. **For increasing production, what is common in poultry, fisheries and bee-keeping?**

Ans. Exotic breeds are being popularly used and modern technologies are practised to get proteins.

SOLVED IMPORTANT QUESTIONS

Q1. How do weeds damage the crop?

Ans. Weeds damage the crops : The decrease the growth of crop plants and complete for good.

Q2. Give three scientific approaches to obtain highyields of crop in India.

Ans. (i) Crop production management.

(ii) Crop improvement by genetic manipulation.

(iii) Crop protection management.

Q3. Enlist the sources of our food.

Ans. (i) Derived from the animals, and

(ii) Derived from the plants.

Q4. Name two cereal rops.

Ans. (i) Wheat, (ii) Rice

Q5. What is helpful to increase waterholding capacity of sandy soil?

Ans. The bulk of organic matter.

Q6. How is biological waste material useful to us?

Ans. It protects our environment from chemicals.

Q7. Define mixed cropping.

Ans. Mixed cropping is "growing of two or more crops simultaneously on same piece of land."

Q8. What will happen if there is too much water is the soil?

Ans. The roots of the plants will rot and die.

Q9. Which one of the following crops would require a minimum quantity of NPK or urea for its proper growth?

Paddy, Peas, What, Sugarcane

Ans. Peas.

Q12. Give one example each of (i) Macro-nutrients and (ii) Micro-nutrients.

Ans. (i) Macronutrients - C, H, O, N, S, P, K, Ca Mg.

(ii) Micronutrients - Fe, Mg, Cu, Zn, Mn, B, Cl, Mo.

Q13. Name any two macro-nutrients required by living organisms.

Ans. (i) Oxygen, (ii) Calcium

Q14. What is fertilizers?

Ans. It is a salt or chemical compound prepared in factory.

Q15. Name any two common weeds that grow with whata and paddy.

Ans. Grass, wild oat, motha.

Q16. Which of the following crops would enrich the soil with nitrogen?

(a) Apple, (b) Pea,

(c) Paddy, (d) Potato

Ans. Pea.

Q17. Name two common weeds that grow with wheat and paddy.

Ans. (i) Amaranthus (chaulai) is broad leaf weed.

(ii) Chenopodium (bathua) is kharif season weed.

Q18. Which crops required more water to grow Rabi or Kharif?

Ans. Kharif. It grow in the monsoon.

Q19. An agriculture extension worker talking to the farmer said, "For obtaining good wheat crop the use of fungus-resistant seeds, irrigation after maturity of crops are needed." Which part of the statement is not correct?

Ans. 'Irrigation after manurity of crops are needed' part is not correct. All these should be before maturity.

Q20. What are weedicides?

Ans. Chemicals which destroy or kill the weeds without affecting the crop plants.

Q21. Which one of the following crops would require a minimum quanitity of NPK or urea for its proper growth?

Sugarcane, paddy, groundnut, blak grain.

Ans. Black grain

Q22. Which elements do A and B represent in the the following table?

Source	Nutrients
Air	Oxygen 'A'
Water	Oxygen 'B'

Ans. A = Carbon, B = Hydrogen.

Q23. What is compost rich in?

Ans. The compost is rich in organic matter and nutrients.

Q24. Name one nitrogenous fertilizers.

Ans. Area $[CO(NH_2)_2]$.

Q25. Name one common disease of wheat crop.

Ans. Rust of wheat.

Q26. Name one solid fumigant.

Ans. Aluminium phosphide.

Q27. Name the two nutrients which are eliminated to a large extent during the milling and polishing of rice.

Ans. Vitamin B_1 and protein

Q28. What is meant by infestation?

Ans. The attack of micro-organisms on the food items to destroy the food is called as infestation.

Q29. Name one biotic and abiotic factor which is responsible for the damage of stored food grains.

Ans. Biotic factors : Rodents, insects, bacteria, fungus.

Abiotic factor : Temperature, moisture.

Q30. On what factor does irrigation requirement depend?

Ans. Nature of crop and nature of soil.

Q31. Name any two biotic factors that damage stored foodgrains.

Ans. Bacteria, Fungi, Rodents, Insects.

Q32. Expand EDB.

Ans. EDB : Ethyl Dibromide.

Q34. Which bacteria present in bird excreta cause food poisoning?

Ans. Salmonella.

Q35. Write two advantages of storing food grains in gunny bags.

Ans. (i) They can be easily transported.

(ii) They can be easily distributed.

Q36. What is prime objective of crop improvement?

Ans. Prime objective of crop improvement is to develop superior plants in relation to their use or need of the area. Therefore, objectives may differ from crop to crop.

Q37. Name on HYN of maize.

Ans. Navjot.

Q38. Name the plants used in multiple cropping.

Ans. Wheat and gram crop.

Q39. Give the full form of GNP.

Ans. GNP = Gross Net Production.

Q40. Name the scientist who intorduced Mexican variety of wheat in India.

Ans. N.E. Borlaug.

Q41. Give one advantage of mixed cropping.

Ans. It saves time of the farmer.

Q42. Name two HYV of wheat.

Ans. HYV of wheat : (i) HD2285 and (ii) C-306.

Q43. How are HYV formed?

Ans. By hybridization and selection.

Q44. Kharif crops are more prone to animals parts than Rabi crops. Why?

Ans. Kharif crops are more prone to animal pests because the hot and humid weather during this season is favourable for the growth of pests.

Q45. How will you find the presence of pests in a grain store?

Ans. By noticing white powdery substance on the bags or on the floor.

Q46. What does CAN stand for?

Ans. Calcium Ammonium Nitrate.

Q47. Name any three high-yielding varities of (i) Wheat, (ii) Rice.

Ans. High-yielding varieties:

(i) **Wheat :** C306, Kalyan sona, PBW354.

(ii) **Rice :** Pusa Basmati, Kasturi and Vikas. T23, Jaya IR-8.

Q48. Which crop is generally grown between two cereal crops to restore soil fertility?

Ans. Leguminous crop.

Q49. Define monoculture.

Ans. Growing same crop in the same field/soil year after year.

Q50. Which of the following crops would enrich the soil with nitrogen?

Ans. Pea.

Q51.Define mix cropping.

Ans. Technique of saving two or more crops together int he same soil at one time.

Q52.Give one advantage of HYV.

Ans. It leads to formation of hybrids.

Q53.Give one disadvantage of HYV.

Ans. It gives less folder.

Q54.How can we improve food production?

Ans. By crop rotation and multiple cropping.

Q55.What is hybrid?

Ans. Hybrid is produced by cross breeding of two varieties of a species either animal or plant.

Q56.Mention one characteristic of hybrid variety of wheat.

Ans. Dwarfness.

Q57.What is compost (or vermiscompost)?

Ans. It is the decomposed remains of organic materials (of plants and animals)

Q58.A farmer grows rice crop year after year in his field. He notices a gradual decrease in yield. What could be its cause?

Ans. The same crop requires same type of nutrients. Hence, they get exhausted and there is a gradual decrease in crop yied.

Q59.Why is it advisable to leave the land follow for one or two seasons after harvesting a major crop?

Ans. To restore the fertility of the soil.

Q60.Mention one disadvantage of following the practice of monoculture.

Ans. Monoculture depletes the soil of nutrients, so reduces fertility.

Q61.A farmer did not use nitrogenous fertilizer before growing cereal crop as the soil had been richer with this nutrient by the crop grown earlier. Name the crop which the farmer might have grown earlier.

Ans. Any leguminous crop like pulse, gram. bean, groundnut etc.

Q62.Mention two disadvantages of nitrogenous fertilisers.

Ans. Excess use of nitrogenous fertilisers causes :

(i) eutrophication in lakes

(ii) makes soil alkaline.

Q63.Name two oil seed crops.

Ans. Mustard and ground nut.

Q64.What is the need of varietal improvement?

Ans. Varietal improvement : It is essential to improve the crop yield to meet our food demand.

Q65.What is plant breeding?

Ans. Plant breeding is "the science and art to improve genetic make up of the plants in relation to their use."

Q66. A farmer grows grain crops between two cerceal crops. Which agricultural practice is he following ?

Ans. Crop rotation.

Q67. A farmer grows maize crop in a field year after year. He finds that the yield becomes low. Give one possible reason for it.

Ans. The soil becomes depleted in nitrogen and those nutrients which had been utilized by that crop and it lowers the fertility of the soil. Therefore, the yield become low.

Q68. With which crop production is the green revolution in our country connected?

Ans. What and Paddy.

Q69. Give two examples of micronutrients.

Ans. Manganese. copper.

Q70.Name a process by which improvement in crops can be brought about.

Ans. By selective hybridization.

Q71.Name two by-products of fishery.

Ans. Liver oil and fish meal.

Q72.Define fingerlings.

Ans. Fingerlings are about 4" - 6" size fishes formed from fries in nursery ponds and rearing ponds.

Q73.Write main sources of nutrient supply to the plants.

Ans. (i) Manures and (ii) fertilizers.

Q74. Cattle husbandry is done for two purposes. What are they?

Ans. (i) For milk production and
(ii) Bullock labour.

Q75. Distinguish between fertilizers and chemicals.

Ans. Fertilizers are the commercially manufactured materials from chemicals.

Q76. What is Green Revolution?

Ans. Breakthrough in cereal production by the use of high-yielding varities (HYV), higher dose of fertilizers as well as irrigation is called **green revolution.**

Q77. State the damage caused by insect pests and diseases.

Ans. Insect-pests and diseases and cause 50-70 percent damage to crops.

Q78. What is meant by plant breeding?

Ans. Plant breeding is defined "as a science well as an art of improving genetic make up of plants in relation to their economic use."

Q79. Why is the induced breeding an useful technique?

Ans. In freshwater, the **induced breeding technique** is useful to get good quality fish seeds in large quantities.

Q80. Define apiary.

Ans. It is an artificial beehive formed of wooden chambers.

Q81. What is meant by crop rotation.

Ans. Growing of different crops on a piece of land in pre-planned succession is termed as the crop rotation.

Q82. Define intercropping.

Ans. The growing of two or more crops but in definite row pattern is known as intercropping.

Q83. What is composite fish culture system?

Ans. The composite fish culture system is used commonly to produce table fish and includes a combination of 5 or 6 fishes.

Q84. Name two improved cross breeds of cows.

Ans. Two improved breeds of cows : Karan Swiss, Karan Fries.

Q85. Give two modern devices for fishing.

Ans. Fishes are fishing caught by fishing nets and gears operated from fishing vessels having modern devices such as echo-sounders and nagivational gadgets.

Q86. What is honey flow period?

Ans. Honey flow period is the total time period when a bee collects nector and pollen.

Q87. Give examples of pasturage or flora for bee-keeping.

Ans. Pasturage or **flora** involves crops like mango, coconut, tamarind, litchi, berseem, badam etc.

Q88. What do you mean by pasturatge?

Ans. Plants which provide nector and pollens to the honey bee is known as pasturage.

Q89. Give the number of members in a colony of bees.

Ans. A colony of honeybees has one queen and 40,000 to 100,000 workers and drones are in hundreds.

Q90. Name the animals raised on polutry farm.

Ans. Poultry farming is done to raise domestic fools, ducks, geese, turkeys, pigeons etc.

Q91. Define artificial insemination.

Ans. Artificial insemination is a technique to facilitate cross breeding at large scale. It is available at the veterinary did units all over the country.

Q92. Write the names of two exotic breeds of poultry.

Ans. Two exotic breeds of poultry are:
(i) White leghorn and
(ii) Rhode Island Red.

Q93. What is a laying period?

Ans. Laying period : When hens lay egg, the period is called laying period. It comes after growth phase. Chickens are called **layers.**

Q94. Write full form of VHS.

Ans. VHS = Viral Haemorrhagic Septicemia.

Q95. Name any three indigenous breeds of goat.

Ans. Three indigenous breeds of goats in are: (i) Jamunapuri, (ii) Himalayan, and (iii) Osmanabadi goats.

Q96.Name the breed of buffalo which yields more than the indigenous breeds.

Ans. Murrah breed yields more milk.

Q97.What is the lactotation period of Karan Swiss and Karan fries?

Ans. About 300 days.

Q98.Name two high milk-yielding varieties of cow.

Ans. Karan Swiss, Fresion Sahiwal, Brown Swiss.

Q99.What qualities would a poultry farmer look for in a good broody hen?

Ans. A good broody hen is one that lays large eggs and gives a large number of such eggs every year.

Q100.Name the main food components found in egg white.

Ans. Proteins.

Q101.Mention one method of improving plant varieties.

Ans. Cross breeding.

Q102. "Fish meat is better than cattle meat". Why?

Ans. It is because fish has more nutritive value.

Q103. What is the importance of a good feed in the poultry?

Ans. Poultry birds become more healthier and they lay more eggs.

Q104. Mention good and cheap source of proteins, vit. A and D.

Ans. Fish.

Q105.Mention the use of animal excreta.

Ans. Used as fuel and manure.

Q106. Give two uses of draught cattle.

Ans. Leather goods are prepared from their hides while these are useful in agricultural operations like ploughing, levelling, harvesting etc.

Q107.What are the disadvantages of HYV? Ans.

Disadvantages of HYV : (i) Gives less fodder,

(ii) Requires higher inputs of fertilizer, water, etc., (iii) Require more frequent weeding and more use of pesticides.

Q108. How can desirable characters of two or more varities be combined in a single platn?

Ans. By selective hybridization.

Q109. Name two drought animals.

Ans. Bullocks, ho-buffaloes.

Q110. In what respect does the roughage differ from concentrates with reference to cattle feed?

Ans. Roughage includes straw and cellulose while concentrates are oil cake, oil seeds rich in fat, proteins, minerals and vitamins in cattle feed.

Q111.Which of the following will provide maximum roughage to the food of dairy animals if taken in equal quantity? Green fodder, oil cake, straw, cotton seeds.

Ans. Green fodder.

Q112. Name (i) a viral disease of cattle, (ii) a bacteria disease of cattle.

Ans. (i) Foot and mouth disease, (ii) Rinderpest.

Q113. Name two dairy products.

Ans. Milk, chese, butter, curd.

Q114. Define pisciculture.

Ans. It is "the production of fishes in fresh water ponds or lakes".

Q115. What is average feed of a cow per day?

Ans. Water 30 litres, concentrate 4 kg and green fodder (roughage) 17 kg etc.

Q116. Which viral decease infects cows?

Ans. Cow-Pox.

Q117. Name of two high yielding breeds of cow.

Ans. (i) Fresion Sahiwal and (ii) Jersey.

Q118. Name two varities of marine fish and fresh water fishes.

Ans. (i) **Marine fishes.** Eel, Salmon.

(ii) **Fresh water fishes.** Rohu and Catla.

Q119. Name major food nutrient provided by fishes.

Ans. Proteins and fats.

Q120. Name two common diseases of polutry.

Ans. (i) Fowl - Cholera, and (ii) Fowl - pox

Q121. Name any two breeds of cattle.

Ans. (i) **Murrah, Surti and Mehsana of Buffalo.**
(ii) **Jersey and Brown Swiss of cow.**

Q122. What is poultry?

Ans. Poultry includes chicken, ducks, geese, hen and turkey.

Q123. Name one bacteria disease of cattle.

Ans. Rinderpest.

Q124. Give examples of weeds.

Ans. Xanthium and Parthenium.

Q125.Give the milk yield of Karan Fresion and Holstein Fresion cows.

Ans. Karan Fresion cow cow gives about 3500 litres of milk and **Holstein-Friesion** cow gives about 3200 litres of milk during the location period.

Q126. Give two advantages of animal husbandry.

Ans. (i) Provide technique to get HYV of animals.
(ii) It is beneficial to the farmers.

Q127. Name any two diary products.

Ans. (i) Ghee and (ii) Milk

Q128. List the animal sources of food.

Ans. Fish, egg, milk, meat, pork etc.

Q129. What is operation flood?

Ans. Increase in milk production.

Q130. What is silver revolution?

Ans. Increase in production of eggs.

Q131. What is trickle irrigation?

Ans. It involves the slow application of water drop by drop to the root zone of a crop.

Q132. For what composite fish culture is used?

Ans. To produce table fishes.

Q133. Mention two eamples of biological method of controlling weeds.

Ans. (i) Herbivorous fish and geese feed on aquatic weeds.
(ii) Mexican beetles feed on parthenium weeds.

Q134. What are marine fisheries and mariculture?

Ans. The marine fisheries and mariculture deals "with the catching/capturing of culture of fish in marine ecosystem having 7500 kms coastline."

Q135. What is meant by " artificial insemination"?

Ans. The artificial insemination means "a technique to facilitate cross breeding at large scale."

Q136. What is poultry farming?

Ans. The poultry farming is done "to raise domestic fowls, ducks, geese, turkeys, pigeons etc."

Q137. What does poultry production include?

Ans. The poultry production includes (i) egg production and (ii) broiler production for get meat.

Q138. What is done to enhance poultry production?

Ans. To increase poultry production, cross breeding is done between Indian and exotic breeds for variety improvement.

Q139. What is farm yard manure?

Ans. It is prepared by pulling livestock farm waste in a pit for decomposition for about 12 months.

Q140. State the number of queen and workers as well as drones in a honey bee colony.

Ans. The honebee colony consists of one queen and 40,0000 to 100,000 workers and drones are in hundreds.

PRACTICE EXERCISE – 1

Q1. State any two factors which have helped us to raise the food production.

Q2. What are macro and micronutrients of plants? Name two of each kind.

Q3. What are the animal sources of our food?

Q4. Why are fertilizers used in agriculture?

Q5. Describe the role of water in crop-production.

Q6. Give the role of fertilizers in cropo production.

Q7. Write the effect of excess irrigation.

Q8. Give the effect of excessive use of fertilizers.

Q9. What are plant sources of our food?

Q10.(i) What is kharif season? What is its duration?

(ii) Name a few kharif crops.

Q11. Enlist various methods of weed control.

Q12. Mention two advantages of artificial insemination.

Q13. Define weeds. How do they damage the crops?

Q14. Enlist the functions of manures.

Q15. Mention the names of animal products which are used as food.

Q16. How do insect-pests attack the crops?

Q17. Name two insect-pests each of surgarcane and mustard and suggest their control measures.

Q18. How are disease transmitted to crops?

Q19. What are the factors responsible for loss of grain during storage?

Q20. Soil is essential for plants. Why?

Q21. Name two fertilizers supplying N.P and K to crops.

Q22. What are the advantages of using manures?

Q23. Define sustainable agriculture.

Q24. Name various sources of plant nutrients.

Q25. What is mixed farming? What are the factors affecting mixed farming system?

Q26. Name two weeds each of kharif and rabi season. How can they be controlled?

Q27. How can mixed farming sustain agricultural production? Answer with suitable examples.

Q28. Write advantages of Hybridization.

Q29. Disadvantages of hybridization:

Q30. How irrigation requirements depend on the nature of the soil?

Q31. What is the use of mixed farming?

Q32. Why should we adopt crop rotation?

Q33. State any two advantages of mixed cropping.

Q34. Why are legumes desirable in crop rotation?

Q35. Define inter-cropping.

Q36. Distinguish between unitary crop production and cropo rotation.

Q37. What are the characteristics which are expected to be available in the seeds of improved varities?

Q38. Define 'Sustainable Agriculture'. What is the need of sustainable agriculture?

Q39. What are micro and macro-nutrients?

Q40. Write two cropping seasons along the crops grown.

Q41. From where are fishes obtained?

Q42. What is poultry production?

Q43. Name some useful aniamsl. What does milk contain?

Q44. How do seed, soil, water and air brone disease affect plants.

Q45. What are the effect on human health due to use of pesticides? Give two examples.

Q46. How do moisture and temperature affect the longevity of food grains?

Q47. Write two types of fisheries.

Q48. Define animal husbandry?

Q49. (i) What is poultry farming ?

(ii) How does it help is solving the problem of food and nutrition?

Q50. (i) What are the water sources of the fish?

(ii) What are the two ways of fishing?

Q51. Give main considerations to increase egg production in poultry.

Q52. Name the main important factors for fish culture.

Q53. Name four animals which provide us food.

Q54. Name any two Indian breeds of (i) cows and (ii) buffaloes.

PRACTICE EXERCISE – 2

Q1. Mention the improved cross breeds of cows.

Q2. Define animal husbandry.

Q3. Write full form of NDRI.

Q4. Write two infectious diseases each of cows, poultry and fishes.

Q5. What is the economic importance of cattle?

Q6. Name any two diseases of the animals caused bybacteria and virus.

Q7. What do you understand by the term 'operation flood'? Write any two factors responsible for it. Mention one viral and bacterial disease that affects the cattle.

Q8. What is artificial insemination? Mention two of its advantages. Name any one high-yielding cow breed and its lactation period.

Q9. A cow is fed on straw, oil-cake, oil seeds, gram and bajra. To what classes of cattle feed these items belong and what is their importance?

Q10. In wheat cultivated field, if mustard / oat / barley plants are grown naturally and in random fashion, then what will you do?

Q11. What is the advantage of using insect-resistant varieties?

Q12. Why buffalo milk is preferred?

Q13. What determines good quality of eggs?

Q14. What is cropo production?

Q15. What are the major sources of our food?

Q16. "Milk production is meagre in India" in spite of large population of cattle." Why?

Q17. Write the common symptoms of sick animals.

Q18. Mention any one difference in external features of weeds and wheat plant. How do weeds affect crop yield? How are weeds removed?

Q19. Write some measures of provention of pests.

Q20. Write the main fresh-water fish culture systems.

Q21. What are weeds? Give the names of some common weeds in wheat and rice fields.

Q22. What are the methods of irrigation in India?

Q23. What is fumigation? Name any two fumigants which are commonly used.

Q24. Explain in brief the role of fertilizers in improving crop production?

Q25. How would you control the insects and micro-organisms in food grains?

Q26. State one indicator each for infestation by insects and rodents in stored foodgrains. Describe one method each for controlling population of insects and rodents.

Q27. Mention the essential features of a god storage.

Q28. What is green manuring? Give suitable examples for green manures.

Q29. Mention the main objectives of animal husbandry.

Q30. What the differences between Broilers and Layers with respect to their purpose of breeding and daily food requirement? What necessary steps has to be taken to prevent the occurence of infections diseases in poultry farm?

Q31. Name one disease each of wheat, rice and sugarcane and suggest their control of measure.

Q32. Which types of crops are more prone to harm from weeds during kharif season?

Q33. Describe the main steps involved in the process of hybridisation to produce an improved variety of wheat. Mention one advantage and one disadvantage of a high-yielding variety of wheat.

Q34. A farmer grows rice crop in a field year after year and finds the yields very low. What advice would you give him to prevent such occurrence in future? Suggest any four measures.

Q35. Green revolution has led to an ecological imbalance. Give four points to justify the statement.

Q36. Why is soil replenishment explain? Explain two natural methods / ways of soil replenishment.

Q37. The fields, in which legumes are grown, get enriched with nitrogen. Why?

Q38. What are the main steps of green revolution?

EVALUATE YOURSELF

M.M : 25 **M.T: 60 min.** **M.M : 25** **M.T: 60 min.**

TEST - 1

Q1. What do you understand by soil fertility? Mention any four methods by which soil fertility can be replenished or regained. **1**

Q2. Wheat is mixed cropping? What are its advantages ? **1**

Q3. What is the requirement of high yielding varities ? **1**

Q4. What is monoculture ? **2**

Q5. Explain the method of crop rotation. **2**

Q6. Explain three kinds of fisheries. **2**

Q7. Enlist two factors that helped us to raise food production. **2**

Q8. Mention any three advantages of HYV. **3**

Q9. What do you mean by varietal improvement ? **3**

Q10. Give the procedure of breeding in plants by a diagram only. **3**

Q11. How is crossbreeding useful in cattle ? **5**

TEST - 2

Q1. What is helpful to increase waterholding capacity of sandy soil ? **1**

Q2. How is biological waste material useful to us ? **1**

Q3. Define mixed cropping. **1**

Q4. What will happen if there is too much water is the soil ? **2**

Q5. Which one of the following crops would require a minimum quantity of NPK or urea for its proper growth ? **2**

Paddy, Peas, What, Sugarcane

Q6. Give one example each of (i) Macro-nutrients and (ii) Micro-nutrients. **2**

Q7. Name any two macro-nutrients required by living organisms. **2**

Q8. What preventive and control measures are used before grains are stored for feture use ? **3**

Q9. What precautions should be taken in the selection of animals for selective reproduction ? **3**

Q10. Mention few measures for prevention of diseases in the animals. **3**

Q11. (i) Why are exotic breeds selected during cross breeding ?

(ii) Why are local breeds selected during cross breeding ?

(iii) What are the desired qualities in a cross breed ? **5**

MULTIPLE CHOICE QUESTION'S

Q1. Increase in oil production is

(a) golden revolution

(b) yellow revolution

(c) white revolution

(d) blue revolution

Q2. The place for keeping and studying dry plants is called :

(a) arboreum (b) vasculum

(c) herbarium (d) museum

Q3. 'Organic farming' does not include

(a) green manures (b) chemical fertilizers

(c) crop rotation

(d) compost and farmyard manures

Q4. Pulses are rich in

(a) carbohydrades

(b) protein

(c) oils

(d) vitamins and minerals

Q5. The technique used to obtain variety with high yield and other desirable characters is

(a) introduction (b) selection

(c) hybridization (d) both (a) and (b)

Q6. Pusa Lerma is an improved variety of

(a) rice (b) wheat

(c) maize (d) soyabean

Q7. Growing two or more crops in definite row pattern is

(a) mixed farming (b) mixed cropping

(c) inter-cropping (d) crop rotation

Q8. Which one is a micronutrient for the crop plants?

(a) calcium (b) iron

(c) magnesium (d) potassium

Q9. The common biofertilizers used in organic farming are

(a) margosa (b) pyrethrum

(c) green manure

(d) nitrogen fixing bacteria and cyanobacteria

Q10. Growing different crops in the same field in a prepalanned succession is

(a) crop management

(b) crop rotation

(c) intercropping

(d) plant breeding

Q11. Maximum milk yielding buffalo is

(a) nagpuri (b) surti

(c) mehsana (d) murrah

Q12. Lactation period is maximum in

(a) Frieswal (b) Sahiwal

(c) Holstein-Friesian

(d) Karan-Swiss

Q13. Exotic breed of poultry bird having high egg laying capacity is

(a) White leghorn (b) Broilers

(c) White cornish (d) New Hemisphere

Q14. The fungus disease causing maximum death of poultry bird is

(a) coryza (b) pollurium

(c) rickets (d) aspergillosis

Q15. The method maximum used in cattle breeding is

(a) random mating

(b) artificial insemination

(c) controlled breeding

(d) super ovulation and embryo transfer

Q16. Which of the following is the high milk yielding variety of cow ?

(a) Holstein (b) Dorset

(c) Sahiwal (d) Red Sindhi

Q17. Wax glands of honey bee are present in :

(a) queen (b) drones

(c) workers (d) both (a) and (b)

Q18. "Drones" in the honeybee colony are born out from:

(a) unfertilized eggs

(b) fertilized eggs and well nourished larvae

(c) same as worker bee

(d) fertilized eggs giving heat treatment

Q19. Several embryos can be produced at a time in a single cow by the process of

(a) hybridization

(b) artificial insemination

(c) embryo transfer

(d) random mating

Q20. Rinderpest disease of poultry is caused by

(a) insects (b) bacteria

(c) virus (d) protozoa

Q21. The Jersey bull used for cross breeding is exotic variety from

(a) England (b) Scotland

(c) Switzerland (d) Holland

Q22. Layers continue to produce eggs upto

(a) 350 days (b) 425 days

(c) 500 days (d) 600 dyas

Q23. Alikunhi is famous for development of the technique of

(a) hypophysation

(b) composite fish culture

(c) mariculture

(d) shell culture

Q24. All animals are

(a) parasitic (b) saprophytic

(c) autotrophic (d) heterotrophic

Q25. Which is the most important source of food and fodder ?

(a) algae (b) fungi

(c) lichen (d) cereal

Q26. Application of nitrogenous manure to a plant causes

(a) vigorous vegetative growth

(b) early flowering

(c) early fruiting

(d) growth retardation due to toxicity of NH_3

Q27. The elements which is required in largest quantity by plant is

(a) sulphur (b) calcium

(c) phosophorus (d) nitrogen

Q28. Nodules with nitrogen-fixing bacteria are present in

(a) mustard (b) wheat

(c) gram (d) cotton

Q29. Inland fisheries is referred to

(a) culturing fish in freshwater

(b) trapping and capturing fishes from sea coast

(c) deep sea fisheries

(d) extraction of oil from fishes

Q30. Plants can be made disease-resistant by

(a) heat treatment

(b) hormone treatment

(c) colchicine treatment

(d) breeding with their wild relatives

Q31. The process of cross breeding two different varieties of crop plants each having a desired characteristic, is known as

(a) selection (b) hybridization

(c) crossing (d) introduction

Q32. Milk does not provide

(a) vitamin A and D

(b) carbohydrates, proteins and fats

(c) minerals such as photophorus and calcium

(d) iron

Q33. Which of the following statement is correct about fertilizer ?

(a) it is nutrient specific

(b) it is water insoluble

(c) it is readily absorbed by the plant

(d) it is compact and easy to transfer

Q34. Which of the following is incorrect for green manure ?

(a) it supplies organic matter

(b) it supplies nitrogen

(c) it prevents soil erosion

(d) it allows leaching

Q35. When both crops and livestock are raised on the same farm, it is known as

(a) mixed farming (b) mixed cropping
(c) itercropping (d) crop rotation

Q36. Living organsims are used in
(a) organic manure
(b) biofertilizers
(c) natural insecticides
(d) pesticides

Q37. The principal cereal crop of India is
(a) wheat (b) rice
(c) maize (d) sorghum

Q38. Ground bug is a pest of
(a) sugarcane (b) cotton
(c) rice (d) wheat

Q39. Sustainable agriculture involves
(a) mixed farming (b) mixed cropping
(c) crop rotation (d) all of these

Q40. Which of the following have been artificially selected ?
(a) cabbage (b) cauliflower
(c) broccoli (d) all of these

Q41. Kranti, Pusa agarni and pusa bold are improved varieties of
(a) urad bean (b) sunflower
(c) chick pea (d) mustard

Q42. Which of the following is not a draught animal ?
(a) camel (b) elephant
(c) sheep (d) horse

Q43. Which of the following is a leguminous green fodder commonly available in winter ?
(a) cow pea (b) elephant grass
(c) berseem and lucerne
(d) rice and jowar

Q44. Which one of the following is mirconutrient ?
(a) nitrogen (b) phosphorus
(c) potassium (d) boron

Q45. Which of the following is not an exotic breed of cow ?
(a) Jersey (b) Holstein-Friesian
(c) Sahiwal (d) Brown Swiss

Q46. The first experiment in artificial insemination was performed by
(a) Aristotle (b) Berzelius
(c) Spallanzani (d) Linneaus

Q47. Which of the following yields maximum milk / year?
(a) Holstein-Friesian
(b) Frieswal
(c) Red sindhi
(d) Sahiwal

Q48. What is pulse rate of bufallominute ?
(a) 16-18 / minutes (b) 40-45 / minutes
(c) 40-60 / minutes (d) 70-72 / minutes

Q49. Which of the following poultry bird lays maximum number of eggs ?
(a) ILS-82 (b) B-77
(c) HH-260 (d) IBL-80

Q50. Which one of the following is the fastest growing carp ?
(a) rohu (b) catla
(c) mrigal (d) singhara

Q51. Which of the following is gaseous fumigant ?
(a) DDT
(b) aluminium phosphide
(c) ethylene dichloride
(d) methly bromide

Q52. Which of the following is natural insecticides ?
(a) nicotene (b) neem
(c) pyrethrum (d) all of these

Q53. Which of the following is broad leaf weed ?
(a) Chenopodium (b) Convalvulus
(c) pyrethrum (d) all of the above

Q54. Find out the wrong statement from the following:
(a) white revolution is meant for increase in milk production
(b) blue revolution is meant for increase in fish production
(c) increasing food production without com-

promising with environment quality is called as sustainable agriculture

(d) none of the above

Q55. To solve the food problem of country, which among the following necessary ?

(a) increased production and storage of food grains

(b) easy access of people to the food grain

(c) people should have money to purchase the grains

(d) all the above

Q56. Which one is oil yielding plant among the following?

(a) lentil (b) sunflower

(c) cauliflower (d) Hibiscus

Q57. Which one is not a source of carbohydrate ?

(a) rice (b) millets

(c) sorghum (d) gram

Q58. Weeds afect the crop plants by

(a) Killing of plants in field before they grow

(b) dominating the plants to grow

(c) competing for various resources of crops (plants) causing low availability of nutrients

(d) all the above

Q59. Find out of the correct sentence

(i) hybridisation means crossing between genetically dissimilar plants

(ii) cross between two varieties is called as interspecific hybridisation

(iii) introducing genes of desired characters into a plant gives genetically modified crop.

(iv) cross between plants of two species is called as inter varietal hybridisation

(a) (i) and (ii) (b) (ii) and (iv)

(c) (ii) and (iii) (d) (iii) and (iv)

Q60. Which one of the following species of honey bee is an Italian species ?

(a) Apis mellifera (b) Apis dorsata

(c) Apis florae (d) Apis cerana indica

Q61. Find out the correct sentence about manure

(i) manure contains large quantities of organic matter and small quantities of nutrients

(ii) it increases the water holding capacity of sandy soil

(iii) it helps in draining out of excess of water from clayey soil

(iv) its excessive use pollutes environment because it is made of animal excretory waste

(a) (i) and (iii) (b) (i) and (iii)

(c) (ii) and (iii) (d) (iii) and (iv)

Q62. Cattle husbandry is done for the following purpose

(i) milk production (ii) agricultural work

(iii) mean production (iv) egg production

(a) (i), (ii) and (iii) (b) (ii), (iii) and (iv)

(c) (iii) and (iv) (d) (i) and (iv)

Q63. Which of the following are Indian cattle ?

(i) Bos indicus (ii) Bos domestica

(iii) Bos bubalis (iv) Bos vulgaris

(a) (i) and (iii) (b) (i) and (ii)

(c) (ii) and (iii) (d) (iii) and (iv)

Q64. Poultry farming is undertaken to raise following :

(i) egg production (ii) feather production

(iii) chicken meat (iv) milk production

Q65. Poultry fowl are susceptible to the following pathogens

(a) viruses (b) bacteria

(c) fungi (d) all the above

Q66. Which one of the following fishes is a surface feeder ?

(a) rohus (b) mrigals

(c) common carps (d) catlas

Q67. Animal husbandry is the scientific management of

(i) animal breeding (ii) culture of animals

(iii) animal livestock (iv) rearing of animals

(a) (i), (ii) and (iii) (b) (ii), (iii) and (iv)

(c) (i), (ii) and (iv) (d) (i), (iii) and (iv)

Q68. Which one of the following nutrients is not avail-

able in fertilizers ?

(a) nitrogen (b) phosphorus

(c) iron (d) potassium

Q69. Preventive and control measures adopted for storage of grains include

(a) strict cleaning (b) proper disjoining

(c) fumigation (d) all the above

Q70. Which one is a source of protein ?

(a) Millets (b) Sorghum

(c) Gram (d) Rice

ANSWERS

1. (b) **2.** (c) **3.** (b) **4.** (b) **5.** (c)

6. (b) **7.** (c) **8.** (b) **9.** (d) **10.** (b)

11. (d) **12.** (c) **13.** (a) **14.** (d) **15.** (b)

16. (a) **17.** (c) **18.** (a) **19.** (c) **20.** (c)

21. (a) **22.** (c) **23.** (a) **24.** (d) **25.** (d)

26. (a) **27.** (d) **28.** (c) **29.** (a) **30.** (d)

31. (b) **32.** (d) **33.** (b) **34.** (d) **35.** (a)

36. (b) **37.** (b) **38.** (c) **39.** (d) **40.** (d)

41. (d) **42.** (c) **43.** (c) **44.** (d) **45.** (c)

46. (c) **47.** (a) **48.** (b) **49.** (c) **50.** (b)

51. (d) **52.** (d) **53.** (d) **54.** (d) **55.** (d)

56. (b) **57.** (d) **58.** (c) **59.** (a) **60.** (a)

61. (a) **62.** (a) **63.** (a) **64.** (a) **65.** (d)

66. (d) **67.** (d) **68.** (c) **69.** (d) **70.** (c)

— Notes —