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# **BIOLOGY**

## **IX CLASS**



**Subject:**  
**Biology**  
**Class : IX**

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# FUNDAMENTAL UNIT OF LIFE

## CELL

- All living forms are composed of microscopic units called as “Cells”.
- A cell is the basic structural and functional unit of all life forms.
- Study of structure and composition of cell is called as “Cytology”.
- Cell was first observed by “Robert Hooke” in a dead cork slice in the year 1665. He described about this in his book “Micrographic”.
- The word cell was derived from a Greek word “Cellulae” which means small room.
- First living cell was discovered by A.V. Leeuwenhoek.
- The term protoplasm was coined by Purkinje in 1839.
- Protoplasm was discovered by “Felix Dujardin” and named as sarcode.
- It’s consistency differs under different condition. It exists in sol-gel states.
- Protoplasm is an aggregate of various chemicals such as water, ions, salts and other organic molecules like proteins, carbohydrates, fats, nucleic acids, vitamins etc.

## CELL THEORY

Two biologists, “Schleiden and Schwann” gave the “Cell theory” which was

later on

expanded by

“Rudolf Virchow ”. Cell theory states that

(i) All plants and animals are composed of cells.

(ii) Cell is the basic unit of life.

(iii) All cells arise from pre-existing cells.

- Viruses are the exceptions of cell theory.

## **TYPES OF CELL & ORGANISM**

**(a) On the Basis of Number of Cells Organisms can be categorized**

**as:**

(i) Unicellular organisms: These are organisms which made up of single cell only. This single cell

Performs all the vital body functions of an organism. **e.g. Amoeba**

(ii) Multicellular organisms: These are the organisms which made up of numerous cells. These cells then combine to form an organ and group of organs performing different functions forms an organ system which further forms an organism. e.g. plants and animals

**(b) On the basis of type of organization, cells are two types :**

(i) Prokaryotic cells: these are primitive and incomplete cells. They have less developed nucleus without nuclear membrane & nucleolus.

**e.g. Bacteria.**

(ii) Eukaryotic cells: these are well developed cells. They have advanced nucleus with nuclear membrane and nucleolus. **e.g. Plants & animals.**

## **CELL SHAPE**

Cells are of variable shapes and sizes. Their shape is according to the function. Generally cells are spherical but they may be elongated (nerve cell), branched (pigmented), discoidal (RBC), spindle shaped (muscle cell) etc.

## **CELL SIZE**

Size of cell is variable depending upon the type of organism. Some are microscopic while some are visible with naked eyes.

Their size may vary from 0.2  $\mu\text{m}$  to 18 cm.

- Size of a typical cell in a Multicellular organism ranges from 20-30  $\mu\text{m}$ .
- The largest cell is ostrich egg (15 cm. in dia with shell & 8 cm. in dia without shell)
- The longest cell is nerve cell. (upto 1m. or more)
- Smallest cells so far known are PPLOs e.g. mycoplasma (0.1  $\mu\text{m}$  in dia.)
- Human egg is 0.1 mm. in dia.

### **COMPONENTS OF CELL**

There is an occurrence of division of labour within a cell as they all got certain specific components called “Cell organelles” each of them perform a specific function.

- The three basic components of all the cells are
  - (i) PM (Plasma Membrane)
  - (ii) Nucleus
  - (iii) Cytoplasm

## EXERCISE

### OBJECTIVE DPP – 1.1

- . The first person to observe a cell under microscope was  
(A) M. Schleiden      (B) T. Schwann      (C) Robert Hook  
(D) A.V.Leeuwenhoek
- . Cell theory was propounded by  
(A) Morgan      (B) Halden  
(C) Schleiden and Schwann      (D) Robert Hooke
- . The word cell was coined by  
(A) Robert hooke      (B) Weismann      (C)  
Cuvier      (D) Darwin
- . Nucleus discovered by  
(A) Robert Hooke      (B) Robert Brown      (C)  
Dujardin      (D) Purkinje
- . Smallest cells so far known are  
(A) Bacteria      (B) blue green algae      (C)  
PPLOs      (D) human egg
- . Which of the following is the longest cell of animal kingdom?  
(A) Bacteria      (B) Nerve cell      (C)  
Virus      (D) Muscle cell
- . Which one of the following is an example of prokaryotic cell?  
(A) Typical plant cell      (B) Typical animal cell      (C)  
Bacteria      (D) None of these
- . What is cytology?  
(A) Study of cytoplasm      (B) Study of structure and  
composition of cell  
(C) Study of animal cell only      (D) Study of  
cell only
- . Who coined term protoplasm?  
(A) Leeuwenhoek      (B) Purkinje      (C) Robert

- hooke (D) Robert Brown
1. Cell is
- (A) Functional unit of life (B) Structural unit of life
- (C) Hereditary unit of life (D) all of the above

### **SUBJECTIVE DPP – 1.2**

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#### **VERY SHORT ANSWER TYPE QUESTIONS**

- . Name the largest cell of living world.
- . Amoeba is a ..... organism.
- . Who wrote the book "Micrographia"?

#### **SHORT ANSWER TYPE QUESTIONS**

- . What is the composition of protoplasm?
- . Define cell.

#### **LONG ANSWER TYPE QUESTION**

- . Who gave the cell theory? What does it state? Which organism is an exception of cell theory?

# **FUNDAMENTAL UNIT OF LIFE**

## **CELL MEMBRANE**

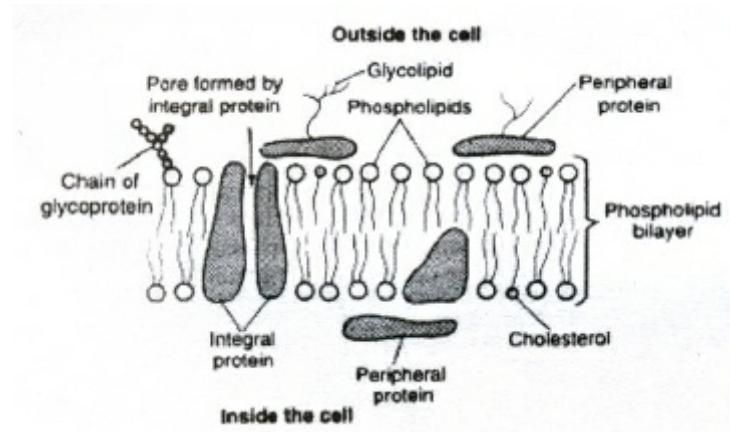
### **(a) Cell Membrane:**



- Cell membrane is also called as plasma Membrane or Plasma lemma.
- It is the limiting boundary of each cell which separates the cytoplasm from its surroundings.
- It is found in both plant as well as animal cells.
- It is the outer most covering of a cell in case of animals and lies below the cell wall in case of plants.
- It is made up of proteins and lipids where proteins are sandwiched between bilayer of lipids.
- Plasma membrane name was given by Nageli.
- Plasma membrane is selectively permeable in nature. It allows or permits the entry and exit of some materials in and out of the cell.
- **Singer and Nicholson** gave the fluid mosaic model of plasma membrane

according to him it consists of a protein layer sandwiched between two layers of lipids. It is in quasifluid state. It is 75A thick.

- It is flexible and can be folded, broken and reunited.



**(i) Function of plasma membrane:**

(A) It regulates the movement of molecules inside and outside the cell.

(B) It helps in maintaining the distinct composition of the cell.

**(ii) Transportation of molecules across the plasma membrane:**

This can be done by following ways:

(A) **Diffusion:** Movement of solutes or ions from higher concentration to lower concentration is called as diffusion. It does not require energy therefore it is called as passive transport.

**(B) Osmosis:** The movement of solvent or water from higher concentration (solvent) to lower concentration (solvent) through a semipermeable membrane is called as osmosis. Or The movement of solvent or water from lower concentration to higher concentration of solution through a semipermeable membrane is called as osmosis. Osmosis can also be called as diffusion of solvents”.

- **Endosmosis:** Movement of solvent into the cell is called as Endosmosis.
- **Endosmosis:** Movement of solvent outside the cell is called as Endosmosis.

**(iii) Types of solution on the basis of concentration:**

**(A) Isotonic solution:** When the concentration of the solution outside the cell is equal to the

Concentration of cytoplasm of the cell it is called as isotonic solution.

**(B) Hypertonic solution:** When the concentration of the solution outside the cell is more than that inside the cell. Due to this cell loses water and becomes plasmolysed.

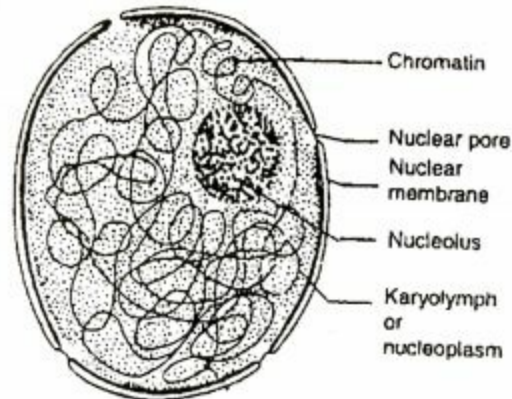
**(C) Hypotonic solution:** When the concentration of the solution outside the cell is lesser than that of cytoplasm of cell. Due to this cell swells up and bursts.

**(b) Cell Wall:**

- It is the outermost covering of the plant cells.
- It is absent in animal cells.
- Cell wall is rigid, strong, thick, porous and non living structure. It is made up of cellulose and hemicelluloses. Cell walls of two adjacent cells are joined by a layer called middle lamellae. It is made up of calcium and magnesium pectate.
- Functions of cell wall:
  - It provides definite shape to the cell.
  - It provides strength to the cell.

- It is permeable and allows entry of molecules of different sizes.
- It is antigen specific.
- It has the characteristics of repair and regeneration.

### (c) Nucleus:



**Figure: Nucleus**

- Nucleus is the most important cell organelle which directs and controls all its cellular activities.
- It is called as “Headquarter of the cell”.
- It was discovered by “Robert Brown in 1831”.
- In eukaryotes a well defined nucleus is present while in prokaryotes a well defined nucleus is absent.
- Prokaryotes contain a primitive nucleus.
- It has double layered covering called as nuclear membrane.
- Nuclear membrane has pores which regulate the movement of materials of materials in & out of the cell.
- Besides nuclear membrane nucleus also contains nucleolus and chromatin material and the substance filled inside the nucleus is nucleolus or karyolymph.
- Chromosomes or chromatin material consists of DNA which stores and transmits hereditary information for the cell to function, grow and reproduce.

(i) Function of the nucleus:

(A) It controls all the metabolic activities of the cell and regulates the

cell cycle.

(B) It helps in transmission of hereditary characters from parents to off springs.

## EXERCISE

### OBJECTIVE DPP – 2.1

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- . Plasma membrane is made up of
  - (A) Proteins and carbohydrates
  - (B) Proteins and lipids
  - (C) Proteins and nucleic acids
  - (D) Proteins, some nucleic acids and lipids
- . Plant cell wall is mainly composed of
  - (A) Sugars
  - (B) Cellulose
  - (C) Proteins
  - (D) lipids
- . Nucleus was discovered of
  - (A) Robert Brown
  - (B) Robert Hooke
  - (C) A.V. Leeuwenhoek
  - (D) Schwann
- . A solution is said to be hypotonic when
  - (A) Concentration of medium is higher than that of the cell
  - (B) Concentration of medium is equal to that of the cell
  - (C) Concentration of medium is lower than that of the cell
  - (D) None of the above are correct.
- . Cell wall shows
  - (A) Complete permeability
  - (B) semipermeability
  - (C) Differential permeability
  - (D) impermeability
- . Plasma membrane is –
  - (A) Impermeable
  - (B) formed of cellulose
  - (C) selectively permeable
  - (D) nonselective
- . Ribosome was named by –
  - (A) Palade
  - (B) Porter
  - (C) de Duve
  - (D) Koliker
- . Ribosome consist of –
  - (A) DNA and protein
  - (B) RNA and protein
  - (C) RNA and amino acids
  - (D) RNA and DNA
- . The solution having concentration equal to the concentration of solution

of inside the cell is called as

(A) Isotonic solution

(B) hypotonic solution

(C) Hypertonic solution

(D) all of the above

1). .If a cell will be placed in hypotonic solution what will happen to it ?

(A) The cell will swell and burst

(B) The cell will become

flaccid

(C) It will remain unchanged

(D) None of the above

## **SUBJECTIVE QUESTION – 2.2**

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### **VERY SHORT ANSWER TYPE QUESTIONS**

1. Who gave the fluid mosaic model of plasma membrane ?
2. Movement of solvent into the cell is called as.....
3. Which cell organelle is called as the head quarter of cell?

### **SHORT ANSWER TYPE QUESTIONS**

4. What is the difference between diffusion and osmosis?
5. Why plasma membrane is called as selectively permeable membrane ?

### **LONG ANSWER TYPE THE QUESTION**

6. Draw a neat and labeled diagram of nucleus. State its main function.

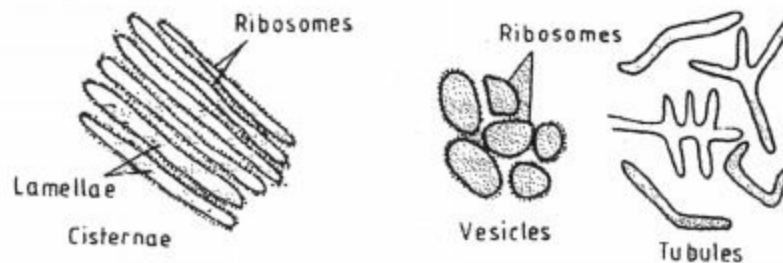


# FUNDAMENTAL UNIT OF LIFE

## CYTOPLASM

- Cytoplasm was discovered by Kolliker in 1862.
- It is the site of both biosynthetic and catabolic pathways.
- It can be divided into two parts:
  - (i) Cytosol:  
Aqueous soluble part contains various fibrous proteins forming cytoskeleton.
  - (ii) Cell  
organelles: Living part of the cells having definite shape, structure and function bounded By Plasma membrane.

## ENDOPLASMIC RETICULUM



**Figure: Endoplasmic Reticulum**

- It is the network of membranes present in the cytoplasm.
- It was discovered by Porter, Claude and Fullam.
- These are present in all cells except prokaryotes and mammalian

erythrocytes.

- They are made up of three components:

(i) **Cisternae:** These are long, flattened, parallel arranged, unbranched tubules. These

form successive layers of nucleus. These are found in cells which are active in protein synthesis and are 40-50  $\mu\text{m}$  in diameter.

(ii)

**Vesicles:** These are round or spherical they are found in synthetically active cells.

**(a) Types :**

Endoplasmic reticulum is of two types

	Smooth ER	Rough ER
	-Made of tubules mainly.	-Made of cisternae and vesicles.
	-Helps in sterol, lipids and protein synthesis.	-helps in Polysaccharide synthesis.
		Contains ribosomes on its surface.
	-Ribosomes are absent.	
	-Helps in membrane biogenesis.	

#### **Function of ER:**

(i) It is the only organelle which can move within a cell so it serves as a channel for the transport of materials between various regions of cytoplasm and between cytoplasm and nucleus.

(ii) It also function as a cytoplasmic framework to provide space for some of the biochemical activities. It forms endoskeleton of cell.

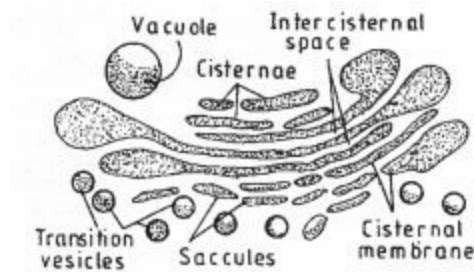
(iii) It helps in synthesis of fats, steroids, cholesterol etc.

(iv) It contains secretory proteins.

(v) SER plays a crucial role in detoxification of drugs and

poisonous by-products.

## **GOLGI APPARATUS**



**Figure: Golgi apparatus**

- Golgi apparatus consists of a system of membrane bounded vesicles arranged parallel to each other in stacks called Cisternae along with some large and spherical vacuoles.
- It was discovered by Camilo Golgi.
- In plants Golgi membrane bounded.
- It is single membrane bounded.
- It is absent in prokaryotes, mammalian RBC's & sieve cells.

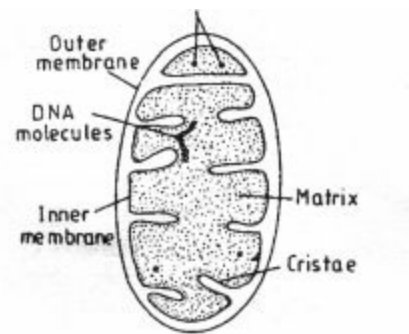
### **(a) Functions:**

- (i) It helps in formation of lipids
- (ii) It helps in formation of middle lamellae
- (iii)

It is secretory in nature.

- (iv) It helps in melanin synthesis
- (v) Lipids and proteins synthesized in endoplasmic reticulum are packed at Golgi complex. They provide the site for assembly of new membrane material.

## **MITOCHONDRIA**



**Figure: Mitochondria**

- It is a rod shaped structure found in cytoplasm of all eukaryotic cells except mammalian RBC's.
- These are also absent in prokaryotes.
- It was first seen by Kolliker in insect cells.
- Maximum mitochondria are found in metabolically active cells.
- It is also called as "Power House of the Cell" or the "Storage Battery".
- It is double membranous structure where outer membrane has specific proteins

While inner membrane is folded inside to form chambers called Cristae. "Cristae" are the infoldings of inner mitochondrial membrane that possess enzymes for respiratory cycles like Krebs Cycle. ATP synthesizing units are called Oxysomes or  $F_1$  particles.

- Space between inner and outer mitochondrial membranes is called as Perimitochondrial space. The fluid present in mitochondrial is called as matrix.

#### **(a) Functions:**

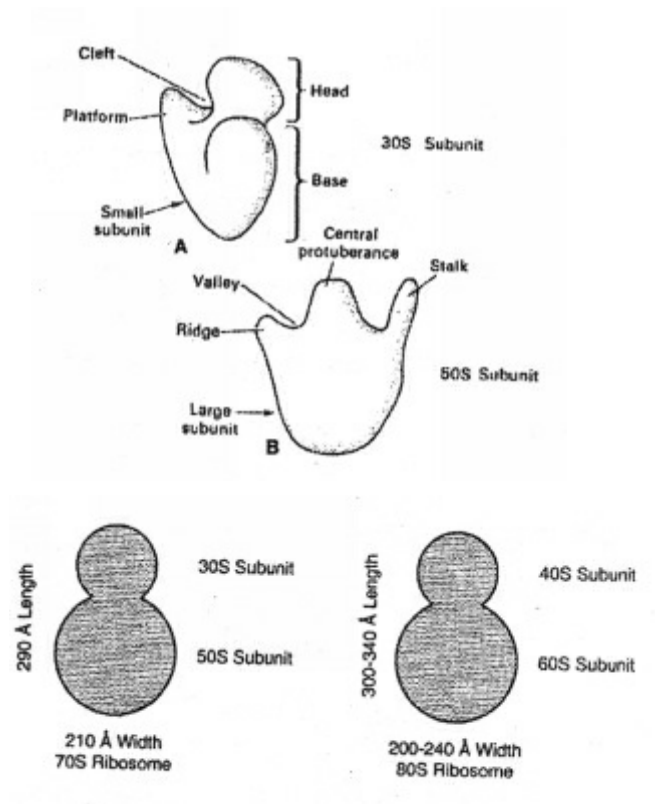
- (i) Its main function is to produce and store the energy in the form of ATP.
- (ii) It is the site of Krebs cycle of respiration.
- (iii) Oxysome contains enzymes for ATP production.
- (iv) Matrix contains enzymes for Krebs cycle.

### **RIBOSOMES**

**Ribosomes are the sites of protein synthesis.**

All structural and functional proteins (enzymes) coded by the nuclear DNA, are synthesized upon cytoplasmic ribosomes. The DNA codes are transcribed into messenger RNA (mRNA) molecules in the chromosomes of the nucleus. mRNA molecules diffuse out into the

cytoplasm and each becomes attached to several ribosomes which thus form a group called polyribosome or polyribosomes. In this way each mRNA molecule brings about polymerization of specific protein molecules, with the help of ribosomes from amino acid molecules found in the Cytosol.



**Fig: Ribosome**

## EXERCISE

### OBJECTIVE DPP- 3.1

- . What is more abundant in smooth endoplasmic reticulum?  
(A) Cisternae and vesicle (B) Tubules  
(B) Tubules and vesicles (C) Cisternae
- . Mitochondria are concerned with  
(A) Krebs cycle (B) C, cycle (C) glycolysis (D)  
none of the above
- . Which of the following organelle is the site of Krebs cycle?  
(A) Ribosome's (B) Lysosomes (C)  
eukaryotic cells (D) Nucleus
- . Mitochondria are absent in  
(A) Prokaryotic cells (B) RBC of mammals  
(C) eukaryotic cells (D) (A) and (B) Both
- . Mitochondria stores energy in form of  
(A) Heat energy (B) ATP (C) light energy (D)  
none of the above
- . The ATP synthesizing units of Mitochondria are  
(A) Oxysomes (B) peroxysomes (C) glyoxysomes  
(D) lysosomes
- . Lipid synthesis is performed by  
(A) Rough ER (B) smooth ER (C) both of above  
(D) none of the above
- . Who observed Mitochondria at first?  
(A) Porter (B) Palade (C) Koliker (D)  
Camilo Golgi
- . Detoxification of body is done by?

- (A) Mitochondria (B) lysosomes  
(C) Smooth endoplasmic reticulum (D) rough endoplasmic reticulum
1. Golgi apparatus is made of  
(A) Cisternae (B) vesicles (C) golgian vacuoles  
(D) all of the above

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### **SUBJECTIVE QUESTIONS – 3.2**

#### **VERY SHORT ANSWER TYPE QUESTIONS**

- . Which cell organelle is called as ‘power house of cell’?
- . Which cell organelle contains enzymes for ATP production?
- . In mitochondria which portion contains specific proteins?

#### **SHORT ANSWER TYPE QUESTIONS**

- . Define Cristae.
- . State any two function of Golgi body.

#### **LONG ANSWER TYPE QUESTION**

- . Describe the types of endoplasmic reticulum and draw necessary figure. Give it's main functions also.
- . Draw a neat and labeled diagram of mitochondria.



# FUNDAMENTAL UNIT OF LIFE

## PLASTID

- It is double membranous discoidal structure, found only in plant cells.
- Term plastid was given by Haeckel.
- Chloroplast was discovered by A.V. Leeuwenhoek and named by Schimper.
- Besides being discoidal or rhombic in plant cells they occur in variable shapes like in algae they can be 'U' shaped, spiral, coiled, ribbon shaped etc.

**Depending upon the type of pigment present in them they are of following three types.**

Leucoplast	Chromoplast	
Chloroplast		
-Non pigments		
colour		-White in
chlorophyll is found	-Coloured pigments other	-Green pigment
-Generally found in	than green	in
them		
-Underground parts	Phaeoplast – Brown	-Found
in aerial parts of plant		
-Important for food storage,	Rhodoplast – Red	which
are green in colour		
e.g. Aleuronoplast, Elaioplast		

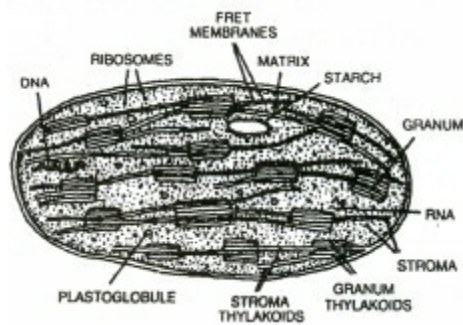
**(a) Chloroplast have Following Two Parts :**

(i) **Grana:** It constitutes the lamellar system. These are found layered on top of each other, these stacks are called as Grana. Each granum of the chloroplast is formed by superimposed closed compartments called Thylakoids.

- **Function:** They are the sites of light reaction of photosynthesis as they contain photosynthetic pigment chlorophyll. In each thylakoid Quantasomes are present which are called as Photosynthetic units. Each quantansome possesses 230 chlorophyll molecules.

(ii)

**Stroma:** It is a granular transparent substance also called as matrix. Grana are



embedded in it. Besides Grana they also contain lipid droplets, starch grains, ribosomes etc.

- **Function:** This is the site of dark reaction of photosynthesis. Also helps in protein synthesis due to presence of ribosomes.

## VACUOLES

- These are membrane bounded regions in the cytoplasm containing water and other substances.
- They are bounded by a single membrane called Tonoplast.
- In animal cells vacuoles are smaller in size and numerous while in plant cells a single large vacuole is found which occupies about 90% of the volume of cell.

### (a) Functions:

- It helps in maintaining osmotic pressure in a cell.
- It stores toxic metabolic products of plant cell.
- It contains various coloured pigments like anthocyanins.

## LYSOSOMES



Fig: Lysosomes

(Discovery: Christian de Duve) (Lyso = digestive,

some = body)

- These are tiny sac like granules containing enzymes of intracellular digestion.
- They are bounded by a single membrane.
- They occur in animal cells and a few plant cells.
- They do not have a definite shape or size.
- They contain hydrolyzing enzymes called **acid hydrolases**.

### (a) FUNCTION :

- Their main function is phagocytosis = digestion
- They are kind of waste disposal system.
- They help in digesting foreign materials and worn out cells.

- During disturbances in cellular metabolism i.e. in case of cell damage lysosomes burst and their enzymes are released into the cytoplasm and they digest their own cell so they are also called as “**Suicidal Bags**”.

### **PEROXISOMES**

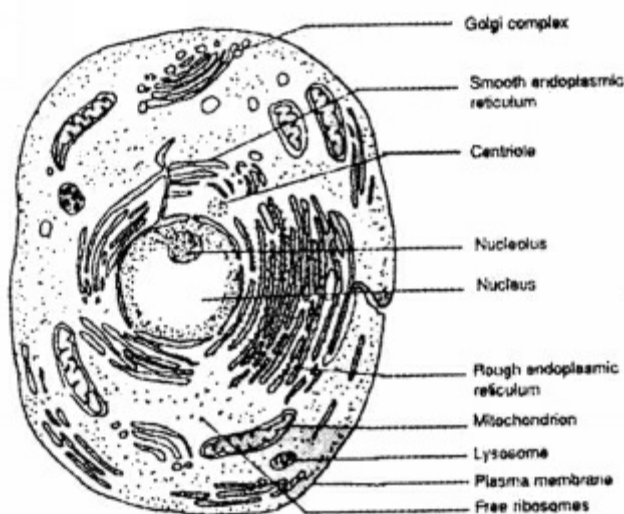
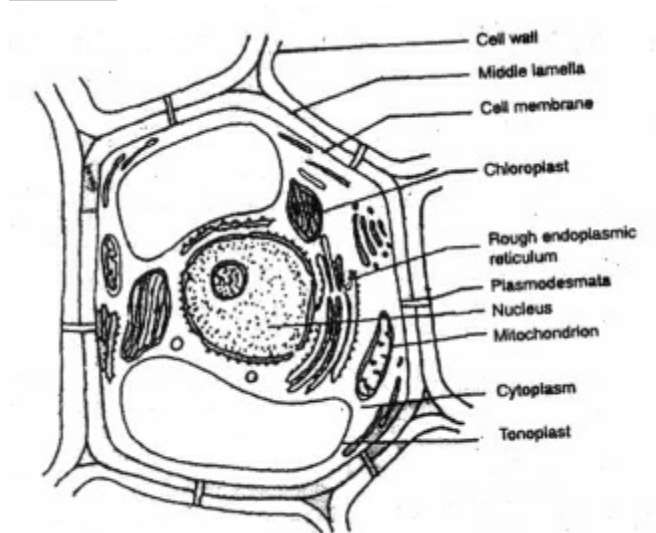
- These structures were first described from liver and kidney cells by Rodhin(1954)
- In plant cells, they were first observed in germinating seeds by Tolbert(1969)
- The term ‘peroxysomes’ was first used by de Duve and also called as uricosomes.
- Peroxysomes are ovoid or granular structures, limited by a single unit membrane and have a diameter of 0.5 to  $\mu\text{m}$ .
- In green leaves of  $C_3$  plants, peroxysomes carry out photorespiration.
- In animal cells they carry out lipid metabolism.
- They contain important enzymes as oxidases (peroxide producing enzyme), peroxidases and catalases (which break down toxic peroxides to water and oxygen).

### **GLYOXYSOMES**

- A beaver (1961) was the first person to discover these organelles and were described later by **R.W. Briedenbach** (1967).
- They are about 0.5 to **1  $\mu\text{m}$  in** size and are surrounded by a single unit membrane.

- They are found in plant cells, particularly, in germinating fatty seeds e.g. Ricinus (castor) and groundnut where fat is being converted into carbohydrates by a process called glyoxylate cycle.
- Glyoxysomes contain important enzymes, isocitrate, lyase, maltase and Synthelast along with several others.
- Structure of glyoxysomes is similar to peroxisome.

## DIFFERENCES BETWEEN A PLANT CELL AND AN ANIMAL CELL



**Figure: Plant cell**

**Figure: Animal**

## cell

<b>Plant Cell</b>	<b>Animal Cell</b>
Cell wall is present	Cell wall is absent
Plastids are found	Plastids are absent
One large vacuole	Numerous tiny vacuoles are found
Centriole is absent	Centriole is present

## ON THE BASIS OF TYPE ORGANIZATION CELLS CAN BE DIFFERENTIATED AS

<b>Characters</b>	<b>Prokaryotic Cells</b>	<b>Eukaryotic Cells</b>
<b>1. Nuclear body</b>	<b>Incipient nucleus,</b> <b>No nuclear membrane</b> <b>Nucleolus absent' No</b> <b>mitosis</b> <b>Single closed loop,</b> <b>(histones absent)</b>	<b>True nucleus,</b> <b>Nucleolus membrane</b> <b>present</b> <b>Nucleolus present</b> <b>Mitosis found</b> <b>Multiple</b> <b>chromosomes, (</b> <b>histones</b> <b>present in</b> <b>chromosome)</b>
<b>2. Mitosis</b>	<b>No mitosis</b>	<b>Mitosis found</b>

Characters	Prokaryotic cells	Eukaryotic cells
3. DNA arrangement	Single closed loop, (histones absent)	Multiple chromosomes, (histones present in chromosome)
4. Respiratory system	In plasma membrane, (mitochondria)	In mitochondria
5. Photosynthetic apparatus	In internal membranes, (chloroplasts absent)	In chloroplasts
6. Golgi bodies, chloroplast, Endoplasmic reticulum. Mitochondria, Lysosomes	Absent	Present
7. Ribosomes	70 S type	80 S type
8. Cell wall	Generally present, complex chemical composition	Present in some types, simple Chemical composition
9. Flagella	Submicroscopic, do not have 9+2 fibrillar structure	Microscopic size, have 9+2 Fibrillar structure
10. Cytoplasmic movements	Cytoplasmic streaming rare or absent	Cytoplasmic streaming often occurs
11. Vacuoles	Absent	Present

12. Lysosome	Absent	Present
13. Capsule	May be present	Always absent
14. Hereditary material	DNA circular	DNA (linear)

### **SOME IMPORTANT POINTS**

(i) Centrosome :

It is found in animal cell.

It consists of two centrioles.

It is non membranous.

It is made up of microtubules.

It helps in cell division and spindle formation.

(ii) Cilia and flagella: These are thread like appendages used for locomotion and emerge from baso body.

(iii) Chromosomes: These are thread like structures containing hereditary information in from of genes.

(iv) There are four different types of membranes on the basis of permeability:

(A) Permeable: They allow diffusion of both solvent and solute molecules or icon through them.

e.g. Cell wall of plant cell.

(B) Impermeable: They prohibit the diffusion of both solvent and solute particles through them.

e.g. Cutinized cell wall, Lignified cell wall.

(C) Semipermeable: Allows diffusion of solvent molecules but do not allow the passage of solute

molecules.e.g. Parchment paper, Kidney membrane.

(D) Differentially Permeable: It allow some solutes to pass through them along with the solvent molecules.

E.g. Plasmalemma, Tonoplast.

- Cell organelles can be separated by the method of differential



centrifugation.

- First cell that developed in laboratory by Sydney Fox and A.I. Oparin was called as Coacervate.
- Smallest cell is Mycoplasma (PPLO)(0.1  $\mu$  dia)
- Largest cell is Ostrich egg (15 cm.dia.)
- Longest Animal Cell is Nerve fibre (1m.)
- Lysosomes exhibit polymorphism i.e. they occur in different forms.
- Mitochondria, plastid and centrioles have their own DNA molecules so they are called as “Semiautonomous Cell Organelles ”.
- Connection through which cells communicate chemically with each other through their thick walls are called as “Plasmodesmata”.
- Cell wall of fungi is made up of chitin instead of cellulose.
- Protoplasm was called as “Physical Basis of Life” by Huxley
- DNA is called as “**Chemical Basis of life**”.
- Euglena is the connecting link between plants and animals as it lacks cell wall but has plastids.
- Mesosomes in bacteria are analogous to mitochondria as they both help in cellular respiration.
- Centre for cellular and molecular biology is situated at Hyderabad.
- In animal cell the ‘Cell Coat’ is present instead of cell wall which provides them protection. It is made up to glycocalyx.
- ATP (Adenosine Triphosphate) is the energy currency of the cell i.e. energy in cell is stored in from of ATP molecules.

## EXERCISE

---

**OBJECTIVE DPP – 4.1**

- Which of the following is called as 'Suicidal bags' ?  
 (A) Centrosome (B) Lysosome (C) Microsome (D) Mesosomes
- Eukaryotic ribosomes are  
 (A) 30s (B) 50s (C) 80s (D) 70s
- Plastids that are white in colour (Pigment free)  
 (A) chloroplast (B) lysosome (C) leucoplast (D) Chromoplast
- Striking difference between a plant cell and an animal cell is due to the presence  
 (A) mitochondria (B) plasma membrane (C) cell wall (D) ribosome
- Tonoplast is the membrane surrounding the  
 (A) cytoplasm (B) vacuole (C) nucleus (D) mitochondria
- Lysosomes are responsible for  
 (A) protein synthesis (B) digestion of organic molecules (C) fat synthesis (D) fat emulsification
- In prokaryotic cell  
 (A) nucleus is developed (B) membrane bounded organelles are present (C) double membrane bounded organelles are absent (D) none of these
- A typical plant cell contains

(A) cell wall                      (B) plastids                      (C) large  
vacuole                      (D) all of the above

- . The waste disposal system of cell is formed by  
(A) lysosomes                      (B) peroxysomes                      (C)  
mitochondria                      (D) glyoxysomes
- l. In which cell Centriole is absent ?  
(A) plant cell                      (B) Animal cell  
(C) Both of above                      (D) None of above

### **SUBJECTIVE DPP – 4.2**

#### **VERY SHORT ANSWER TYPE QUESTIONS**

- . Which cell organelle is called as “digestive bag “ ?
- . Which organelle controls osmotic pressure in a cell ?
- . Plastids having Coloured pigments are called as .....

#### **SHORT ANSWER TYPE QUESTIONS**

- . Name various type of plastids present in a plant cell.
- . State the main function of lysosomes ?

#### **LONG ANSWER TYPE QUESTION**

- . Differentiate between plant and animal cell with suitable figures.

### **ANSWER KEY**

#### **(Objective DPP # 1 .1)**

Q	1	2	3	4	5	6	7	8	
A.	C	C	A	B	C	B	C	B	

#### **(Objective DPP # 2 .1)**

Q	1	2	3	4	5	6	7	8	
A.	B	B	A	C	A	C	A	B	

**(Objective DPP # 3 .1)**

Q	1	2	3	4	5	6	7	8	
A.	B	A	C	D	B	A	B	C	

**(Objective DPP # 4 .1)**

Q	1	2	3	4	5	6	7	8	
A.	B	C	C	C	B	B	C	D	

# TISSUE

## INTRODUCTION

- In unicellular organisms a single cell performs all the vital activities for example, digestion, respiration, excretion etc.
- In case of Multicellular organisms specialized functions are performed by a different groups of cells. As blood flows for transportation of  $O_2$ ,  $CO_2$ , food hormones & waste material, muscle cells are involved in movement etc.
- In plants vascular tissue conduct food & water from one plant to another part of the plant. Thus Multicellular organisms possess well-developed division of labour to provide highest possible efficiency or particular function.
- A tissue is defined as a group of cells with similar structure, organized to do a common function.
- Term tissue was coined by **Bichat**.
- As plants are fixed or stationary, most of their tissues are of supportive type.  
Animals move around in search of food, mate & shelter so they consume more energy as compared to plants.
- Plants have some localized regions with special tissue but there is no such distinct regions in animals. Growth in animals remains uniform. Branch of biology deals with the study of tissue is called **Histology**.

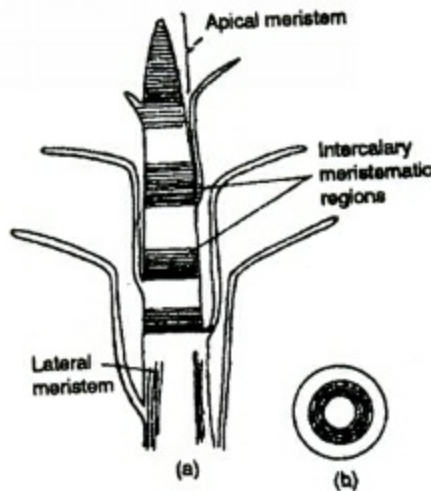
## PLANT TISSUE

Mainly they are of two types :    ↑ Meristematic,    ↑ Permanent

### (a) Meristematic Tissue :

These are simple living tissues having thin walled compactly arranged immature cells which are

capable of division and formation of new cells.



(i)

**Main features of Meristematic tissues are :**

(A)  $G_1 \diamond S \diamond G_2 \diamond M$  cell cycle is switched on.

(A). Thin primary cell wall (cellulosic).

(B). Intercellular spaces are absent (Compact tissue)

(C). Generally vacuoles are absent, dense cytoplasm & prominent nuclei are present.

(D). Large number of cell organelles are present.

(E). Active metabolic state, stored food is absent.

(F). Actively dividing cells are present in growing regions of plants e.g. root & shoot tips

(ii) Classification on the basis of origin :

(A). primary (Promeristem):

Derived directly from the Meristems of embryo.

They consist of cells derived from primary meristem.

They add to primary growth of plants.

(B). Secondary :

Formed by permanent tissues.

These are having cells derived from primary permanent tissue.

They usually add to the diameter of plants.

Permanent tissue Dedifferentiation Secondary meristem

**(iii) Classification on the basis of location :**

(A) **Apical meristem:** It is present at the growing tips of stems and roots. Cell

division in this tissue leads to the elongation of stem & root thus it is involved in primary growth of the plant.

(B) **Intercalary meristem:** It is present behind the apex. It is the part of apical

meristem which is left behind during growth period. These are present at the base of leaf & internode region. These lead to the increase in the length of leaf (Primary) e.g. in grass stem, bamboo stem, mint stem etc..

(C) **Lateral meristem:** It is also called as secondary meristem. It occurs along the

sides of longitudinal axis of the plant. It gives rise to the vascular tissues. Causes growth in girth of stem & root. They are responsible for secondary growth.

## EXERCISE

## OBJECTIVE DPP – 5.1

A group of cells having common origin and performing similar function is called

- (A) tissue aggregate      (B) organ      (C) organ system      (D) cell

. Meristems are cells that

- (A) store food excretion (B) help in

- (C) provide support  
(D) divide continuously to produce new cells

Plant length is increased by the activity of

- (A) apical meristem      (B) lateral meristem      (C) cambium  
(D) all of the above

. In plants, cell division is restricted to

- (A) Meristematic cells (B) permanent cells (C) xylem (D) phloem

. In grasses the length of increases by the activity of

- (A) apical meristem      (B) intercalary meristem      (C)  
lateral meristem      (D) secondary meristem

Special feature of dividing cells is

- (A) large lacuna (B) thick cell walls  
(C) dense cytoplasm devoid of lacuna (D) large intercellular spaces

. Totipotency is present in

- (A) meristem      (B) cambium      (C) phloem      (D) cork

10. Which of the following is a feature of Meristematic tissues ?

- (A) Thin cell wall  
(B) Compact tissue  
(C) Large no. of cell organelles are present in the cells of tissues.  
(D) All of the above



- . Which of the following plant tissue is formed by permanent tissue ?  
 (A) primary tissue (B) Secondary tissue (C) Both of above (D) None of above
- l. Which of the following plant tissues causes growth in girth of stem and root ?  
 (A) Apical meristem (B) Intercalary meristem  
 (C) Lateral meristem (D) None of the above

### **SUBJECTIVE DPP - 5.2**

#### **VERY SHORT ANSWER TYPE QUESTIONS**

- . The tissues derived directly from the meristem of embryo is called as .....
- . A group of cells with similar structure, organized to do a common function is called as.
- . Which plant tissue remains in active metabolic state always ?

#### **SHORT ANSWER TYPE QUESTIONS**

4. Define tissue.
5. What do you mean by division of labour ?

#### **LONG ANSWER TYPE QUESTION**

6. What is tissue? Explain Meristematic plant tissue.

# **TISSUE**

### **PERMANENT TISSUE**

- The permanent tissues are composed of those cells which have lost their capability to divide. They have definite shape, size and thickness.

- The permanent tissue may be dead or living.
- The division & differentiation of the cells of Meristematic tissues give rise to permanent tissues. In cell differentiation, developing tissue and organs change from simple to more complex forms to become specialized for specific functions. The cells of permanent tissue lose the capacity to divide and attain a permanent shape, size and function.

**(a) Depending Upon the structure and composition, The permanent tissues are classified into two types :**

**(i) Simple permanent tissues :** These are made up of same type of cells which are similar structurally and functionally. They include two types of tissue :

**(A) Protective Tissues :** these tissues are primarily protective in function. They consist of :

- **Epidermis :** Epidermis forms one cell thick outermost layer of various body organs of plants such as leaves, flowers, stems and roots. Epidermis is covered outside by cuticle. Cuticle is a water proof layer of waxy substance called as cutin which is secreted by the epidermal cells. Cuticle is very thick in xerophytes. Cells of epidermis of leaves are not continuous at some places due to the presence of small pores called as stomata. Each stomata is guarded by a pair of bean shaped cells called as guard cells. These are the only epidermal cells which possess chloroplasts, the rest being colorless.
- **Functions :**
  - (i) The main function of epidermis is to protect the plant from desiccation and infection.
  - (ii) Cuticle of epidermis cuts the rate of transpiration and evaporation of water

and prevents wilting.

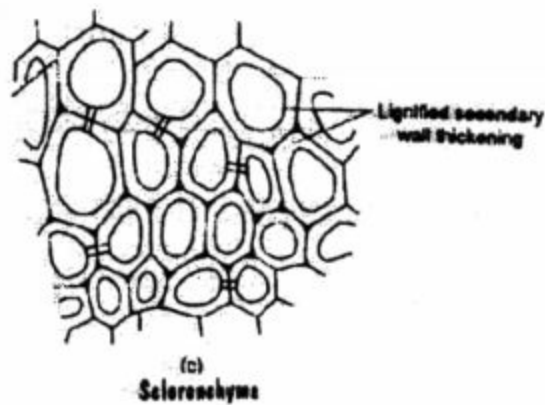
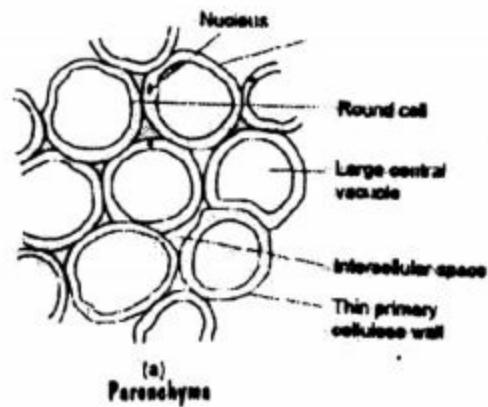
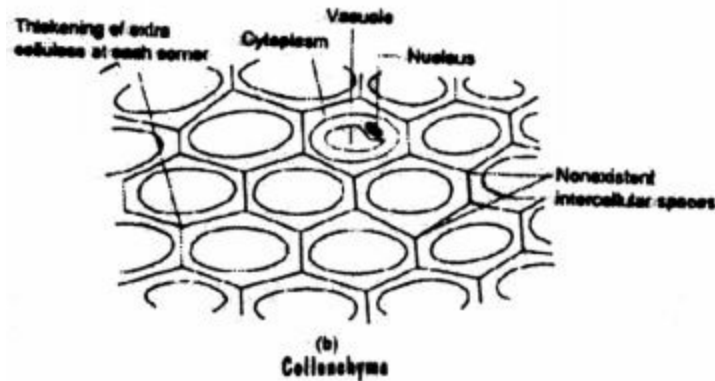
(iii)

Stomata in epidermis allow gaseous exchange to occur during photosynthesis respiration.

(iv) Stomata also helps in transpiration.

- **Cork or phellem** : in older roots and stems, tissues at the periphery become cork cells or phellem cells. Cork is made up to dead cells with thick walls and do not have any intercellular spaces. The cell walls in cork deposit waxy substance called as suberin. The cells of cork become impermeable to water and gasses due to the deposition of suberin. The cork cells are without any protoplasm but are filled with resins or tannins.
- **Functions :**
  - (i) Cork is protective in function. Cork cells prevent desiccation, infection and mechanical injury.
  - (ii) Imperviousness, lightness, toughness, compressibility and elasticity make the cork commercially valuable.
  - (iii) Cork is used for insulation, as shock absorber in linoleum.
  - (iv) Cork is used in the making of a variety of sport goods such as cricket balls, table tennis, shuttle cocks, wooden paddles etc.

**(B) Supporting tissue :** These are supportive in function and of three types



- **Parenchyma:** it is the fundamental tissue.
- Tissue first time evolved in bryophyte.
- Thin walled cells, oval or spherical in structure.
- Cell wall mainly composed of cellulose & pectin.
- Large central vacuole for food & water storage.

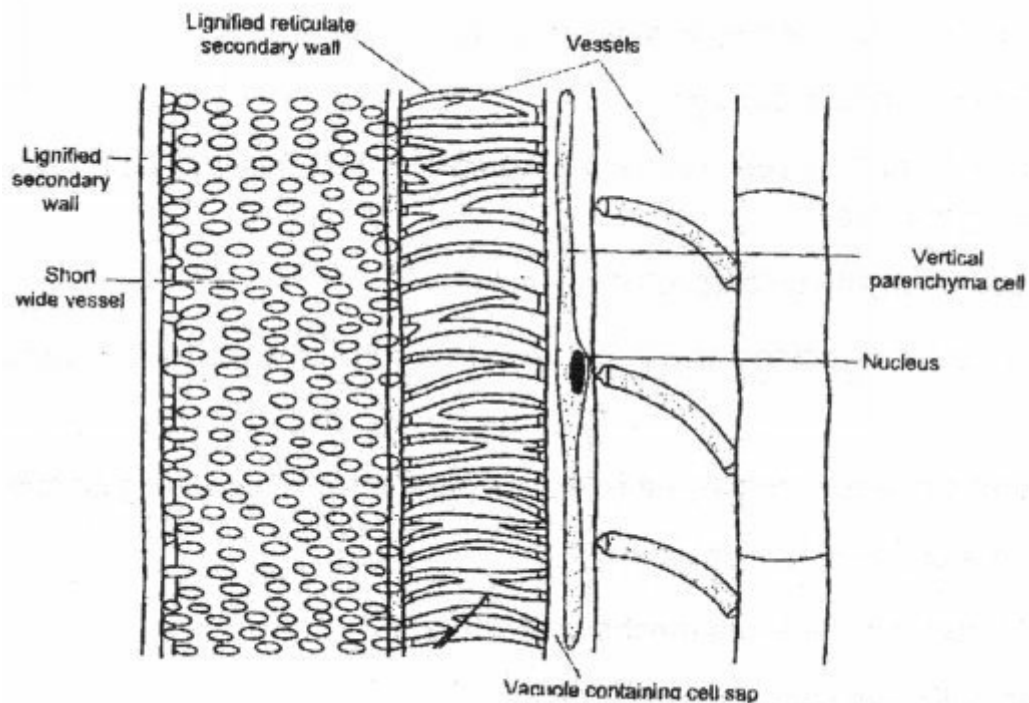
- Primary function is food storage.
- Some parenchyma involved in excretory substance storage are so called as idioblast, storing such as resin, tannin, gums & oils. In typical parenchyma chlorophyll is absent.
- Chloroplast containing parenchyma tissue are chlorenchyma which perform photosynthesis e.g. mesophyll of leaves.
- In hydrophytic plants aerenchyma (A type of parenchyma containing air spaces) provides buoyancy.
- Parenchyma provides turgidity to cells.
- Collenchyma : it is the living mechanical tissue.
- Elongated cells with thick corners.
- Localized cellulose & pectin thickening.
- Provides flexibility to plant parts & easy bending of various parts of plant.
- Present only in herbaceous dicot stem.
- Present at thin margin of leaves.
- Few chloroplasts may be present.
- If gives mechanical strength & elasticity to the growing stems.
- Sclerenchyma : (Scleras-hard)
- Strengthening tissue.
- Composed of extremely thick walled cells with little or no protoplasm.
- Cells are dead & possess very thick lignified walls.
- Lignin is water proof material.
- Inter cellular spaces are absent.
- Cells of Sclerenchyma are of two types :
- **Sclereids:** These are also called grit cells or stone cells. These are small cells, where lumen is so small due to higher thickening of cell wall, as present in drup fruit (Mango, coconut walnut) in legume seeds (Macrosclereid)

- **Fibers** : They are very long, narrow, thick, lignified cells. Lumen is large as compared to sclereids. Generally 1-3 mm. long. In the thick walls of both the fibres and sclereids are present thin areas called as pits.
- Sclerenchyma fibres are used in the manufacture of ropes, mats & certain textile fibres.
- Jute & coir are obtained from the thick bundles of fibres.

**(ii) Complex permanent tissue** : it consists of more than one type of cells which work together as a unit.

- It helps in transportation of organic materials, water & minerals.
- It is also known as conducting or vascular tissue.
- Xylem & phloem together form vascular bundles.

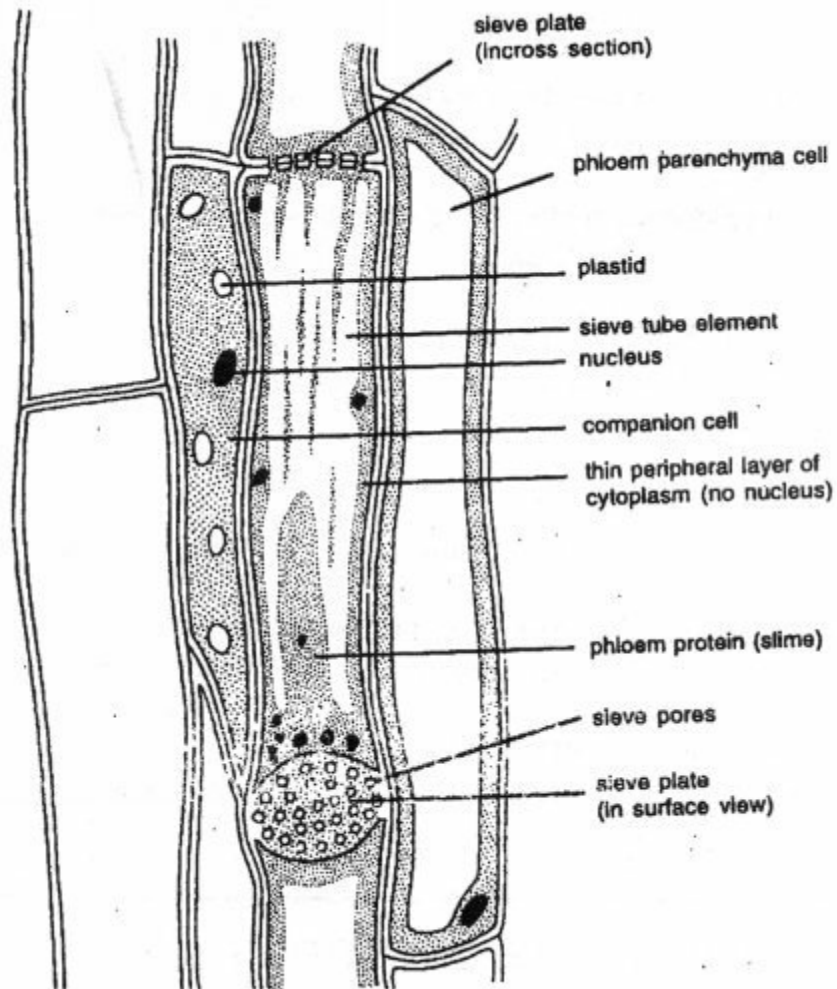
**(A) Xylem** : Also known as wood and is a vascular and mechanical tissue. Thick walled cells are found in the form of tubular passages.



- **Xylem consists of four types of cells called as elements :**

- **Tracheids** : They are elongated angular dead cells (Primitive elements) mainly involved in conduction of water & minerals in gymnosperms.
- **Vessels**: they are advance element (Generally found in angiosperms).  
Vessels are cylindrical tube like structures placed one above the other end to end which form a continuous channel for efficient conduction of water.
- **Xylem parenchyma** : they are small & thick walled parenchymatous cells
- Subjected for storage of starch (food).
- **Xylem Sclerenchyma** : They are non living fibres with thick walls & narrow cavities provide mechanical support.
- **Except xylem parenchyma all other xylem elements are dead.**
- **Hadrome** : Tracheids & vessels are collectively called hadrome, as main
- Conducting elements in xylem.
- The annual rings present in the trunk of a tree are xylem rings. By Counting the number of annual rings we can determine the age of a tree.

**(B) Phloem** : They also consist of both parenchymatous & sclerenchymatous cells.



- **Phloem consists of four types of element :**
- **Sieve tubes :** Sieve tubes are slender tube like structures made up of elongated, thin walled cells placed end to end. The end walls of sieve tube cells are perforated by numerous pores are called as sieve plates. Nucleus of sieve cell degenerates at maturity, however. Cytoplasm persists, because of protoplasmic continuation of sieve tube with companion cell through plasmodesmata. Sieve cells possess slime protein or protein which is concerned with growth and repair of sieve cells.
- **Companion cells :** Companion cells have dense cytoplasm and prominent nuclei.



- Sieve cells & companion cells are so called sister cells because they originate from single mother cell.
- Phloem fibre : They give mechanical support to sieve tubes
- Phloem parenchyma : They store food & help in radial conduction of food.
- Leptome : main part of phloem involved in conduction of food, which is sieve tube.
- In xylem only unidirectional movement is possible while in phloem bidirectional movement can occur.
- In phloem except phloem Sclerenchyma all elements are living.

## EXERCISE

### OBJECTIVE DPP – 6.1

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- . A permanent plant tissue consisting of thin walled living cells is  
(A) parenchyma                      (B) collenchyma                      (C) Sclerenchyma  
(D) xylem
- . A permanent plant tissue made up of living having thickening at the comers is  
A) Sclerenchyma                      (B) collenchyma                      (C) parenchyma  
(D) phloem
- . The main function of Sclerenchyma is to help in the  
(A) conduction of food                      (B) synthesis of food                      (C)  
exchange of gases                      (D) mechanical support
- . The wall of cork cells are thickened by the deposition of  
(A) cutin                      (B) suberin                      (C) lignin                      (D) pectin
- . The wax like substance present in the cell wall of onion skin is  
(A) pectin                      (B) lignin                      (C) cellulose  
(D) suberin
- . The outer wall of epidermis in stems and leaves has a waxy covering made up of  
(A) lignin                      (B) suberin                      (C) pectin  
(D) cutin
- . Collenchyma differs from Sclerenchyma in  
(A) retaining cytoplasm at maturity                      (B) having thick walls  
(C) having a wide lumen                      (D) being  
Meristematic
- . Lignified elongated bead cells are  
(A) parenchyma                      (B) collenchyma                      (C) sclerenchyma  
(D) Epidermis

- . Which of the following plant tissue lacks protoplasm at maturity ?  
 (A) Sclerenchyma                      (B) Collenchyma                      (C) parenchyma  
 (D) Epidermis
- . In plants phloem tissues perform the function of  
 (A) conduction of water    (B) conduction of food (C)  
 photosynthesis                      (D) mechanical support

---

## **SUBJECTIVE DPP – 6.2**

### **VERY SHORT ANSWER TYPE QUESTIONS**

- . sieve tubes and companion cells are found in..... tissue  
 (xylem/phloem/collenchyma)
- . Long, narrow, dead cells having a thick deposition of lignin in the cell  
 wall are called ..... Cells.  
 (parenchyma/ cambium / sclerenchyma)
- . Which tissue is responsible for transport of water in plants ?

### **SHORT ANSWER TYPE QUESTIONS**

- . Name the different elements of xylem and phloem.
- . In hydrophytes xylem is less developed, why ?

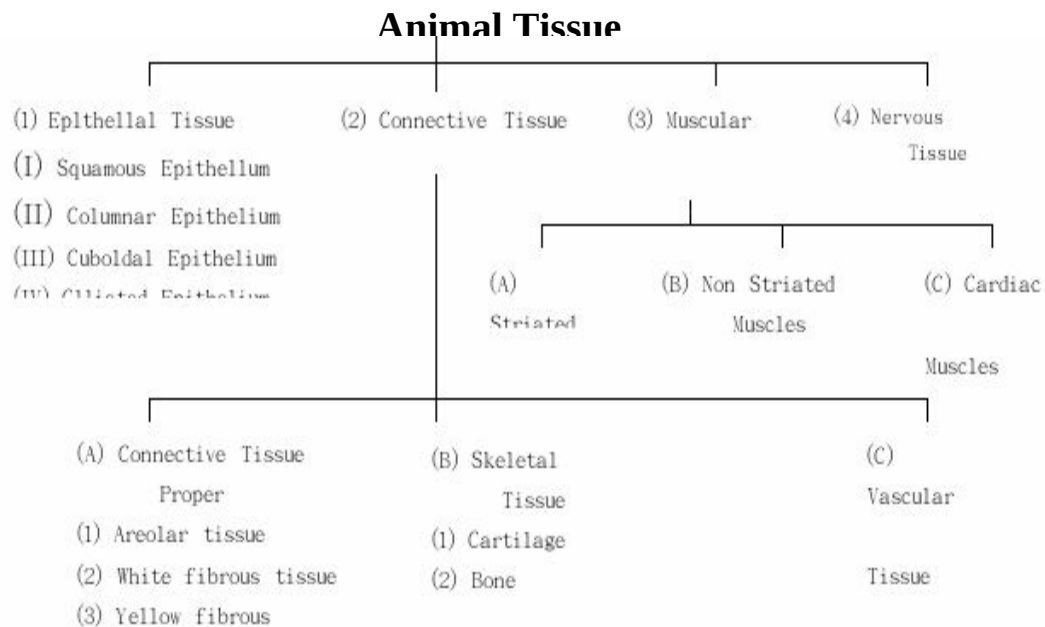
### **LONG ANSWER TYPE QUESTION**

- . Mention the role of parenchyma, collenchyma & Sclerenchyma.

# TISSUE

## ANIMAL TISSUE

### Outline classification of Animal tissue :



- The study of microscopic structure of tissues is called as Histology. Cells of a tissue are often held together by cell junctions.

#### **(a) Epithelial Tissue :**

[Epi means above & thelial means to grow)

- Always grows on some other types of tissue.
- Cells of epithelium are set very close to each other and the tissue rests on a non- cellular basement membrane.
- Consists of single layer of cells.
- Blood vessels are absent & non nervous in nature.

- It covers all the organs & lines the cavities of hollow organs like stomach.
- It is primarily protective in function.
- Epithelial tissues are classified as :
  - (i) Squamous epithelium: Also called pavement epithelium.
- Cells arranged end to end like tiles on a floor.
- Cells are polygonal in surface view.
- It forms the delicate lining of cavities (mouth, oesophagus, nose, pericardium, alveoli etc.) blood vessels and covering of the tongue and skin.
- Epithelial cells are arranged in many layers (stratum) to prevent wear and tear in skin. This pattern is stratified squamous epithelium.
- (ii) Cubical epithelium : They are cube like cells that fit closely, cells look like squares in section, but free surface appears hexagonal.
- It is found in kidney tubules, thyroid vesicles & in glands (salivary glands, sweat glands).
- It forms germinal epithelium of gonads (testes & ovaries)
- It involves in absorption, excretion & secretion. It also provides mechanical support.
- (iii) Columnar epithelium : Columnar means “pillar-like” epithelium. It forms lining of stomach, Small intestine & colon, forming mucous membranes. Border of microvilli is present at the free surface end of each cell which increases absorption efficiency in small intestine.
- (iv) Ciliated epithelium :
  - Cells may be cubical or columnar.
  - On it's free surface are present protoplasmic outgrowths called cilia.
  - It helps in the movement of ova in the fallopian tube.

**(b) Connective Tissue :**

The cells of the connective tissue are widely spaced and

embedded in an intercellular matrix.

- The nature of matrix decides the function of tissue.
- White & yellow fibres are present in the matrix.
- Their basic function is to provide support to different organs & keeping them in place.

(i) Fluid or vascular tissue :

(A) Blood & lymph : Blood is a connective tissue, fluid matrix of blood is plasma having wandering or floating cells, called corpuscles, blood helps in the transportation of various materials such as nutritive substances, gases, excretory products, hormones etc.

Plasma : form 55% part of blood.

**Constitution**

90-91% : water

7% : protein (Albumin, fibrinogen, globulin)

0.9% : inorganic salt etc.

- Corpuscles: Forms 45% part of blood.
- RBC's they are also called as erythrocytes, containing red Coloured respiratory pigment called hemoglobin that helps in transportation of oxygen.
- WBC's (Leucocytes: They are also called as "Soldiers of the body". They are irregular, amoeboid, phagocytic cells that protect our body by engulfing bacterial & other foreign particles. They are of five types: Monocytes, Lymphocytes, Basophiles, Neutrophils, Eosinophils.
- Blood platelets or thrombocytes: They are spindle shaped cells which are involved in clotting of blood.

(ii) Skeletal tissue : It is hard connective tissue that forms supportive frame work of the body. It is of two types :

(A) Bone :Matrix of bone is very hard because of salts such as calcium phosphate,  $\text{CaCO}_3$  (60-70%) etc. and a protein ossein. Bone cells (osteoblasts) are embedded in this hard matrix. Matrix is

deposited in the form of concentric layers of lamellae formed round a central canal (Haversian canal), the dense cells occupy small spaces between the concentric layers of matrix. The long bones are usually hollow containing cavity called as marrow cavity. It is full bone marrow.

(B) Cartilage : This tissue is elastic, less harder as compared to bone. Elasticity is

due the presence of chondrin (protein). Cells are called as chondroblast, which are widely spaced and matrix is reinforced by fibres. It occurs at joint of bones, in the nose, ear, trachea & larynx. It provides flexibility and great tensile strength.

(C) Connective tissue proper : it is the most abundant type of connective tissue.

It is further divided into following types:

(D) Areolar tissue : It is the most distributed connective tissue in the body. This

tissue fills spaces inside organs & is found between the skin & muscles, around blood vessels, nerves & in the bone marrow.

Inelastic white

- Elastic yellow fibres There are two types of fibres

(A) Adipose tissue : These are oval & round cells, filled with fat globules. The

cells are called as adipocytes. It found in subcutaneous layer below the skin, around the heart, brain & below the eyeballs. It acts as an insulator & prevents loss of heat from the body.

(B) White fibrous connective tissue : They are very little matrix containing

abundant white fibres forming layers. Bundles of this tissue are called as tendons, which attaches muscles to the bones.

(C) Yellow fibrous connective tissue : They are very elastic due to the presence of

a network of yellow fibres in it's matrix called as ligament which

attaches bone to bone.



## EXERCISE

### OBJECTIVE DPP - 7.1

- . The entire body surface and cavities inside the body are lined by  
(A) muscle tissue  
(B) epithelial tissue (C) connective tissue (D) nervous tissue
- . Which one of the following is a fluid connective tissue ?  
(A) Areolar tissue (B) cartilage (C) Blood (D) Ligaments
- . The tissue that attaches muscles to the bones is  
(A) cartilage (B) tendon (C) ligament (D) blood
- . The tissue that joins one bone to the other is  
(A) ligament (B) tendon (C) blood (D) cartilage
5. Areolar tissue is a  
(A) nervous tissue (B) muscular tissue (C) connective tissue (D) epithelial tissue
6. Tendon is a structure which connects  
(A) a bone with another bone (B) a muscle with a bone  
(C) a nerve with a muscle (D) a muscle with a muscle
7. Fluid part of blood after removal of corpuscles is  
(A) plasma (B) lymph (C) serum (D) vaccine
8. Which of the following structures joins skeletal muscle to bone ?  
(A) Ligament (B) Tendon (C) Blood (D) Bone
9. Yellow muscle fibers are also called as  
(A) bone (B) muscle (C) ligament (D) none of these
10. Ligament joins  
(A) bone the muscle (B) muscle to muscle (C) bone to bone

(D) none of these

### **SUBJECTIVE DPP – 7.2**

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#### **VERY SHORT ANSWER TYPE QUESTIONS**

- . The special property of muscle fibres to contract forcefully and return to relaxed state  
Is called ..... (Excitability/contractility/flexibility)
- . A branch of science dealing with the study of bones is called .....  
(Ornithology/physiology /osteology)
- . The fluid matrix of blood is called.....(plasma/lymph/serum)

#### **SHORT ANSWER TYPE QUESTIONS**

- . What do you mean by division of labour?
- . Write the composition of mammalian blood.

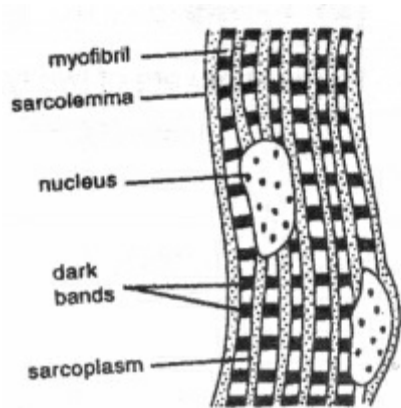
#### **LONG ANSWER TYPE QUESTION**

- . Give summarized classification of animal-tissue

# TISSUE

## MUSCULAR TISSUE

Movements are brought about in our body with the help of muscular tissues.



(a)

**Features :**

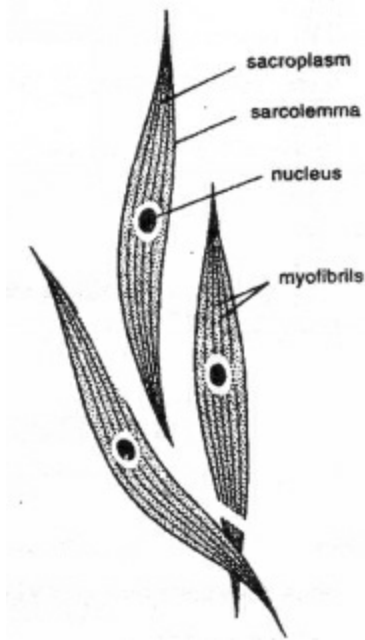
They are long fibre-like cells called muscle fibres.

They are capable of contraction or relaxation

**(b) Types :**

It is of three types :

(i) **striated muscles** : They are also called as voluntary muscles because these are

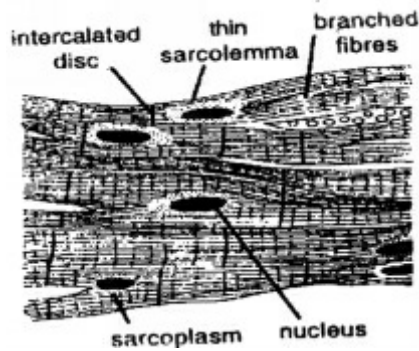


under the control of one's will. Muscle fibres or cells are multinucleated and unbranched.

Each fibre enclosed by thin membrane which is called as sarcolemma.

Cytoplasm is called as sarcoplasm. These muscles get tired & need rest.

(ii) **Non striated muscles:** They are involuntary muscles also called as smooth muscles. These muscle fibres are uninucleated & spindle shaped. They are not enclosed by membrane but many fibres are joined together in bundles. Such muscles are found in the walls of stomach, intestine, urinary bladder, bronchi, iris of eye etc. peristaltic movements in alimentary canal are brought about by smooth muscles.



(iii) cardiac muscle fibres : They are also involuntary

muscles. Only found in the walls of heart. Their structure is in between the striated & non-striated muscles. They are uninucleated & branched.

Branches are united by intercalated disc. In these muscles rhythmic contraction & relaxation occurs throughout the life.

### **NERVOUS TISSUE**

- They are highly specialized tissue due to which the animals are able to perceive and respond to the stimuli.
- Their functional unit is called as nerve cell or neuron.
- Cell body is cyton covered by plasma membrane.
- Short, hair like extensions arising from cyton are dendrons which are further subdivide into dendrites.
- Axon is long, tail like cylindrical process with fine branches at the end. Axon is covered by a sheath.
- Axon of one neuron is very closely placed to the dendrons of another neuron to carry impulses from one to another neuron in the form of electrochemical waves. This close proximity is called as synapse

#### **(a) Types :**

Nerve fibres are of two types :

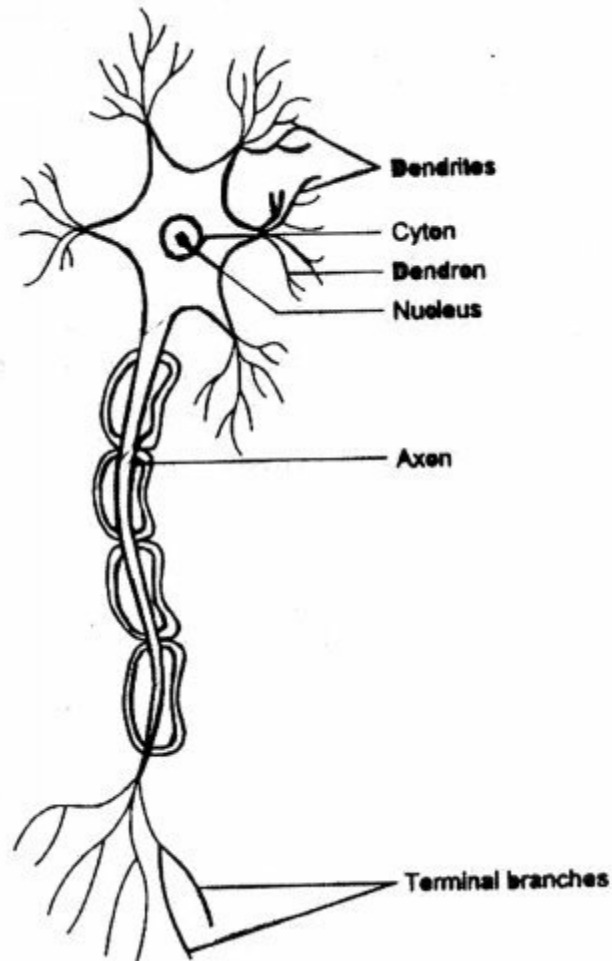
- (i) **Medullated fibres**
- (ii) **Non-medullated fibres**

#### **(b) Functions :**

- (i) They control all the body activities

- (ii) They co-ordinate between various parts during any body function.

Spinal cord & brain are made up of nervous tissue.



## EXERCISE

### OBJECTIVE DPP – 8.1

Contraction and relaxation are unique features of

- (A) epithelial tissue      (B) connective tissue      (C)  
muscle tissue      (D) nervous tissue

- . The tissue which is under the control of animal's will is  
 (A) cardiac muscle (B) striated muscle (C) non-striated muscle (D) cartilage
- . The muscle which work throughout life without undergoing fatigue is  
 (A) striated muscle (B) non-striated muscle (C) cardiac muscle (D) all of the above
- . Which of the following is a voluntary muscle ?  
 (A) striated muscle (B) Unstriated muscle (C) cardiac muscle (D) (A) and(B)
- . Wall of urinary bladder consists of  
 (A) striated muscle (B) Unstriated muscle (C) both of above (D) none of these
- . Intercalated discs are present in  
 (A) striated muscle (B) Unstriated muscle (C) cardiac muscle (D) all of the above
- . The function unit of nervous tissue is called as  
 (A) cyton (B) synapse (C) neuron (D) axon
- . Which type of tissue forms spinal cord and brain ?  
 (A) muscle tissue (B) Nervous tissue (C) epithelial tissue (D) Epidermis
- . Involuntary tissue forms wall of which of the following organ ?  
 (A) intestine (B) stomach (C) bronchi (D) all of the above
- . Movements in body are brought about by  
 (A) muscle tissue (B) epithelial tissue (C) Bones (D) tendons and ligaments

### **VERY SHORT ANSWER TYPE QUESTIONS**

- . Spindle-shaped, non-striated, involuntary muscle fibres present in hollow internal organs like urinary bladder are called ..... ( smooth muscle fibres /striated muscle fibres/cardiac muscle fibres)
- . The brain and the spinal cord are made up of ..... (nephrons/erythrocytes /neurons)
- . The small, branched processes of a nerve cell are called..... (dendrites/axons/neurons)

### **SHORT ANSWER TYPE QUESTIONS**

- . What is the function of nervous tissue ?
- . State the main features of muscular tissue.

### **LONG ANSWER TYPE QUESTION**

- . Describe the structure of neuron with labeled diagram.



# ANSWER KEY

(Objective DPP # 5 .1)

Q	1	2	3	4	5	6	7	8	
A.	A	D	A	A	B	C	A	D	

(Objective DPP # 6 .1)

Q	1	2	3	4	5	6	7	8	
A.	A	B	D	B	B	D	A	C	

(Objective DPP # 7 .1)

Q	1	2	3	4	5	6	7	8	
A.	B	C	B	A	C	B	A	B	

(Objective DPP # 8 .1)

Q	1	2	3	4	5	6	7	8	
A.	C	B	C	A	B	C	C	B	

# DIVERSITY OF LIVING ORGANISM

## **DIVERSITY AND CLASSIFICATION**

Diversity means = variety. Different places on the earth have their own typical kinds of living beings. This gives rise to the need of classification. So “Diversity is the need of classification”.

- Classification is the theory and practice of classifying organisms. It is the systematic arrangement of organisms on the basis of their relatedness.
  - Classification is the arrangement of organisms into sets or groups according to the similarities and dissimilarities present between them.
- (a) Advantages / Significance of Classification :**
- It establishes hierarchy of groups of organisms on the basis of their

common features.

- It makes the systematic study easier.
- It is essential to understand the interrelationship amongst different groups of organisms.
- It serves as a base for the development of there biological sciences as well as different fields of applied biology like public health, environment etc.

### **(b) Taxonomic Hierarchy :**

It is the framework by which taxonomic groups are arranged in definite order from higher to lower categories. the hierarchical order of classifying of classifying organisms is :

Kingdom ◇ phylum ◇ class ◇ order ◇ family ◇ genus ◇ species

(i) Taxon : it refers to any rank or category in the hierarchial order of classification. E.g. kingdom, phylum etc. the highest tacxon is kingdom while the lowest taxon is species.

(ii) Species : These are the groups of organisms having similar morphological characters which can freely interbreed & produce their own kind. It is the basic unit of classification.

### **(c) Nomenclature :**

It is the system of naming an individual. Nomenclature is done on the basis of a set of rules stated in the ICN i.e. international Code of Nomenclature.

(i) Binomial nomenclature : It is a system of naming the organisms in such a way that each of their names contain two components first is genus and the second one is species. E.g. scientific name of human is Homo sapiens. Scientific name of crow is Corvus splendus. Homo and Corvus are the genus while sapiens and splendus are the names of species. This system was introduced by carolus Linnaeus in his book Systems Naturae. Who is also called Father of Taxonomy.

(ii) Certain convections are followed while writing the scientific names

- The name of the genus begins with a capital letter.
- The name of the species begins with a small letter.

- When printed, the scientific name is given in italics.
- When written by hand, the genus name and the species name have to be underlined separately.

**(d) System of Classification :**

(i) **Artificial system:** It was based on some superficial similarities. i.e. only one or few characters were taken .e.g. on the basis of habitat and ability to fly.

(ii)

**Natural system:** It was based on natural affinity i.e. more than one natural characters were used.

(iii)

**Phylogenetic system:** It was based on evolutionary sequence as well as genetic relationship amongst the organisms.

**Classification of Organisms :**

(iv) **Two kingdom system:** It was given by Carolus Linnaeus in 1758. organisms were divided into plant kingdom and animal kingdom. Fungi, Bacteria and Euglena could not find an appropriate position.

(v) **Three kingdom system:** It was given by Earnst Haeckel. In this kingdom protista was also included along with plant kingdom and animal kingdom.

(vi) **Four kingdom system:** It was given by Copeland. Kingdom Monera was also included in this system of classification.

(vii)

**Five kingdom system:** It was given by Robert Whittaker. According to him organisms were divided into five kingdoms.

**(A) Kingdom Monera :** Unicellular, prokaryotic, microscopic, most ancient, can live in deep oceans, hot spring, deserts, high salt concentration etc. they include bacteria, filamentous and photosynthetic blue green algae etc.

**(B) Kingdom Protista:** Unicellular, colonial, eukaryotic. They

include photosynthetic algae,  
decomposers (slime moulds) and protozoa (predators) etc.

**(C) Kingdom Fungi:** Unicellular or multicellular eukaryotic organisms, they are heterotrophic, parasitic or saprotrophic.

**(D) Kingdom Plantae:** They are multicellular, eukaryotic, autotrophic (photosynthetic), some are heterotrophic and parasitic. They include photosynthetic algae, green plants etc.

**(E) Kingdom Animal:** Multicellular, eukaryotic, heterotrophic.

### **BASIS OF CLASSIFICATION**

- Complexity of structure
- Mode of nutrition
- Level of organization
- Plant kingdom was divided in two sub kingdoms by Eichler

Sub kingdom Cryptogamae : (Cryptos = hidden gamous = marriage) :

- These are also called as lower plants, flowerless or seedless plants.
- Their reproductive organs are hidden till they reproduce.

(i) Division Thallophyta :

- Thallus : Undifferentiated plant body i.e. absence of root, stem & leaves.
- There is no vascular system.
- Reproductive organ are single-celled and there is no embryo formation after fertilization.



**Spirogyra**

- Dominant gametophyte.

- Three classes of thallophyta are :

(A) Class Algae :

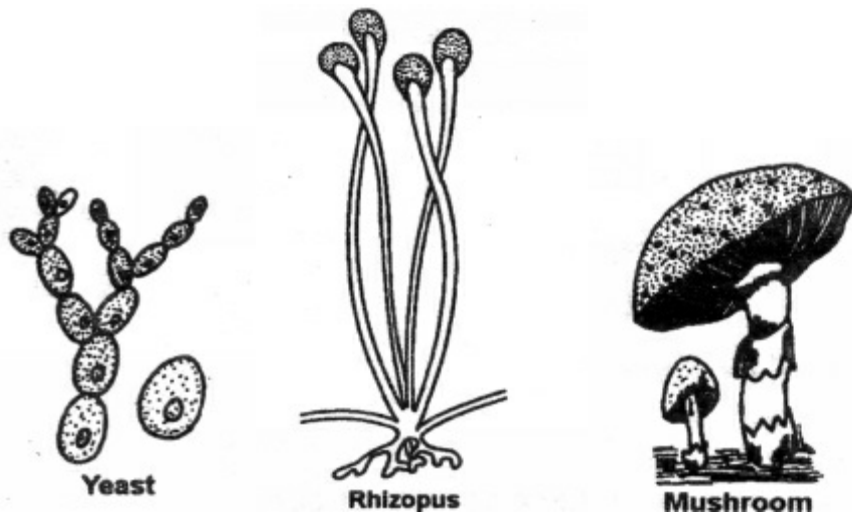
**Characters :**

- These are aquatic or terrestrial, fresh water or marine. Autotrophic, photosynthetic containing various pigments like chlorophyll, carotenoids, xanthophylls etc.
- Unicellular, colonial, filamentous.
- Cell wall of cellulose, e.g. blue green algae (Nostoc) , Green algae (Ulothrix, Spirogyra) Brown algae, red algae etc.

(B) Class Fungi :

**Characters :**

- These are heterotrophic.
- They lack chlorophyll but have cell wall of chitin (fungus cellulose)..
- They can be parasitic or saprotrophic
- Their body is filamentous called as mycelium.
- Reserve food material consists of glycogen. E.g. moulds (Rhizopus)  
, Yeasts (Saccharomyces)  
Mushroom, (Agaricus)..







(C) **Lichen :**

**Characters:**

It is symbiotic relationship between algae and fungi.

Algal part is Phycobiont and fungal part is mycobiont.

They grow on rocks, tree trunks, grounds

etc. e.g. parmellis, Alectoria etc.

(ii) **Division Bryophyta :**



Liverwort

Bryophytes are called terrestrial amphibians (amphibians of plant kingdom) because they require moist soil surface for swimming of their sperm & supply of water to all parts.

They are the first amongst land plants which occur in damp & shady habitat

Plant body is of primitive form i.e. differentiated only in stem & leaves.

Vascular tissue & mechanical tissue are absent in them.

Male gamete is flagellated.

Sex organs are jacketed & multicellular.

Fertilization produces embryo.



Equisetum (Horsetail)

They show heteromorphic type of alternation in generation. E.g. liverworts (Riccia, Marchantia), hornworts (Anthoceros) and mosses (Funaria).

(iii) Division Pteridophyta :

### **Characters:**

They are seedless vascular plants, primitive tracheophytes or vascular cryptogams.

Plant body is differentiated into true stem, leaves & roots.

Vascular tissue are present.

Sperms are flagellated.

Embryo stage is present.

Gametophytes are small, exosporic or endosporic.



Cycas

Sex organs are jacketed & multicellular, e.g. ferns (Dryopteris, Pteris), club moss (Lycopodium), Horsetail (Equisetum).

(b). Sub kingdom: Phanerogamae: (phaneros = visible: gamous =

marriage.)

These are higher plants having flowers and seeds both.

Body differentiated into true stem, leaves and root.

Vascular system is well developed.

Sex organs are multicellular.

Embryo develops from fertilized egg.

It is divided into two divisions :

(i) Division Gymnospermae :

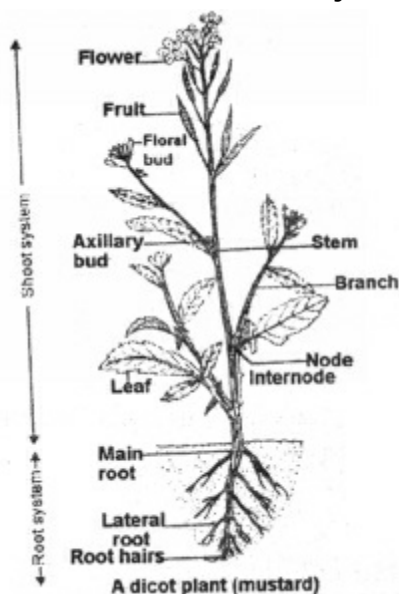
**Characters:**

**Seeds are not enclosed in fruits. These are naked seeded.**

**They have well developed vascular system but xylem lacks vessels and phloem lack companion cells.**

**They occupy an intermediate position between the pteridophytes and the angiosperms.**

**Plants are commonly tall trees or shrubs.**



**The flowers are represented by unisexual**

**cones, often both being present on the same plant. E.g. Cycas, pinus (commonly known as pine)**

(ii) Division : Angiospermae :

**Characters:**

These are seed bearing.

These are represented by trees, herbs, shrubs.

Body well differentiated into root, system.

Seeds remain enclosed in ovary.

It is divided into two classes on the basis of

number of

cotyledons.

(A) Class : Dicotyledonae :

Their seeds have 2 cotyledons in the embryo.

Leaves are dorsiventral and show reticulate venation.

Tap root is present. E.g. neem, Peepal,



Mango, pea, Mustard.

(B) Class : Monocotyledonae

Their seeds have one cotyledon in embryo.

Leaves are isobilateral, with parallel venation.

Fibrous root system is present, e.g. wheat, Maize, Onion.



## EXERCISE

### OBJECTIVE DPP – 9 .1

- . Classification reflecting the evolutionary interrelationships of organisms is called
  - (A) Phylogenetic classification
  - (B) artificial classification
  - (C) Natural classification
  - (D) numerical classification
- . Principles and rules of classification are studied under
  - (A) systematics
  - (B) natural classification
  - (C) nomenclature
  - (D) taxonomy
- . Two kingdom classification was given by
  - (A) Linnaeus
  - (B) Haeckel
  - (C) Copeland
  - (D) Whittaker
- . Three kingdom classification was proposed by
  - (A) Linnaeus
  - (B) Haeckel
  - (C) Whittaker
  - (D) Lamarck
- . Five kingdom Whittaker was proposed by
  - (A) Linnaeus
  - (B) Whittaker
  - (C) John Ray
  - (D) Lamarck
- . Thallophyta includes
  - (A) fungi and bacteria
  - (B) algae, fungi, animals and lichens
  - (C) Algae, fungi and lichens
  - (D) algae and fungi
- . Flowering plants are included under
  - (A) cryptogams
  - (B) phanerogams
  - (C) bryophytes
  - (D) pteridophytes
- . Which of the following has an embryo but lacks vascular tissue ?
  - (A) Bryophyta
  - (B) Pteridophyta
  - (C) Gymnosperms
  - (D) angiosperms
- . Algae are characterized by (or) algae differ from bryophytes in

- body (A) aquatic habit (B) Thalloid plant
- (C) Pyrenoids (D) unicelled sex organs
1. The most primitive vascular plants are –
- (A) bryophytes (B) pteridophytes
- (C) Gymnosperms (D) angiosperms

### **SUBJECTIVE DPP – 9 . 2**

#### **VERY SHORT ANSWER TYPE QUESTIONS**

- . What is classification?
- . What is the lowest category of classification?
- . What is meant by nomenclature?
- . Name the scientist who proposed the binomial system.
- . Define taxon.

#### **SHORT ANSWER TYPE QUESTIONS**

- . What are thallophytes?
- . What are phanerogams?
- . What are the advantages of classification organisms?

#### **LONG ANSWER TYPE QUESTION**

- . Draw an outline of Eichler classification.

## **DIVERSITY OF LIVING ORGANISMS**

## ANIMAL KINGDOM

### (a) Basis of Classification :

- Organization and differentiation of cells to form tissues and organs.
- Body symmetry.
- Formation to body cavities and blood vascular system.
- Features of embryonic development.



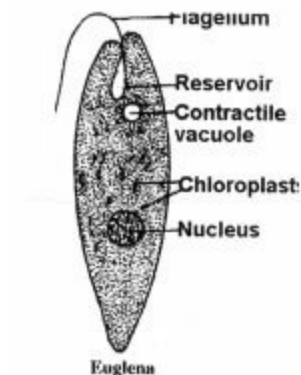
Amoeba

**ON THE ABOVE BASIS ANIMAL KINGDOM IS DIVIDED INTO 11 PHYLA**

### (a) Phylum Protozoa :

#### Characters:

- They are unicellular, eukaryotes
- These are the simplest & the most primitive animals.  
their body organization is  
of “Protoplasmic Level”.
- They are of different shapes i.g. irregular elongated or rounded.

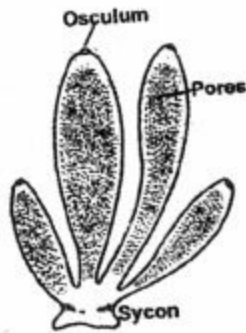


Euglena

- They have different types of locomotory organs like cilia, flagella, pseudopodia (false feet) etc.



- Nutrition is of different types like holozoic, holophytic, mixotrophic.
- Digestion is intracellular & it : takes place in food vacuole.
- Excretion & respiration occurs through general body Surface by the process of simple diffusion.
- Reproduction may be sexual or asexual.



- Alternation of generation is found. E.g., Amoeba, Entamoeba, plasmodium, Euglena, Paramecium.

### **(b) Phylum Porifera :**

#### **Characters:**

- These are pore bearing organisms i.e. with porous body.
- Also called as sponges.
- Aquatic, mostly marine.
- These are sessile and sedentary (attached to substratum).
- Occur in different shapes i.e. vase-like, rounded, sac like etc.
- Body perforated by numerous pores called ostia which open into a canal system having canals and chambers lined with coenocytes (flagellated) and have a large size water outlet called oscula.

Their cavity is called spongocoel.

Endoskeleton is made of needle like spicules made of calcium carbonate and silica or spongocoel.

Hermaphrodite, Asexual reproduction by budding. E.g., Sycon, Spongilla, Euplectella.



**(c) Phylum – Coelenterata or Chidaria :**

**Characters:**

These are sac like structures. They have a body Cavity called gastrovascular cavity or coelenteron. It has single opening for ingestion and egestion both. Aquatic, mostly marine.

Multicellular, diploblastic, radially symmetrical.

They have special organs called tentacles, chidoblast.

Or nematocyst cells. They are specialized for stinging.

They paralyse the prey by releasing poison.

These are polymorphic i.e. they occur in two forms.

(i) Polyp is asexual, cylindrical, sedentary and diploid.

(ii) Medusa is sexual, umbrella shaped, free swimming and diploid.

Asexual reproduction by budding and sexual reproduction by gametes.

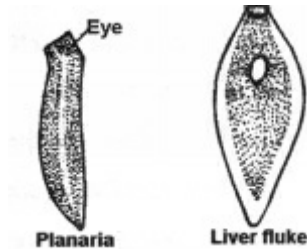
Some of them have exoskeleton of  $\text{CaCO}_3$  . they are called Corals, they live in colonies and when they die they form coral reefs, or islands. E.g. hydra, jelly fish.

**(d) Phylum – Ctenophora :**

**Characters:**

Body is transparent with radial symmetry.

They possess comb plates that are ciliated and 8 in no. these help in locomotion. They also possess tentacles.



Marine, solitary and free swimming. E.g. cestum.

**(e) Phylum – Platyhelminthes : (Platys = Flat; helminth = worm)**

**Characters:**

Generally called as flatworms.

Bilaterally symmetrical, triploblastic, dorsoventrally flattened.

Acoelomates.

Their digestive cavity has a single opening with mouth only and anus is absent.



Ascaris

They possess hooks and suckers.

They have flame cells or protonephridia for excretion.

Mode of nutrition is parasitic.

Reproduction is of both types i.e. asexual and sexual

These are hermaphrodite. E.g. Planaria, Fasciola (liver fluke)

**(f) Phylum – Nematoda (Aschelminthes) :**

**Characters:**

Also called as roundworms.

Bilaterally symmetrical, unsegmented triploblastic.

These are pseudocoelomic.

Their alimentary canal is tubular having both mouth and anus.

Most are free living, some live in moist soil, some are fresh water while some are marine.

Some are parasites on plants & animals.

They lack circulatory system.

Reproduction is sexual and sexes are separate. E.g.

Ascaris (round worm), filarial worm.

**(g) Phylum – Annelida** (Annulus = ring ; segments)

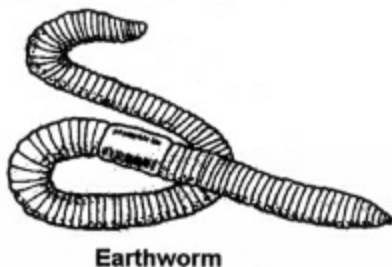
**Characters:**

Their body is triploblastic, bilaterally symmetrical, soft, elongated, vermiform, cylindrical and dorsoventrally flattened.

Body is metamerically segmented. Head is formed by joining of some anterior body segments.

Exoskeleton is absent, body is covered by thin cuticle.

Eucoelomata i.e. They have true body cavity which first appeared in this phylum.



Well developed alimentary canal is present.

They have closed circulatory system.

Locomotion is with the help of chitinous projections

Called chastae (setae).

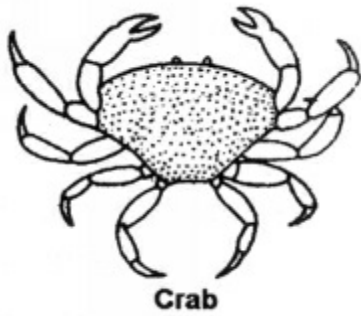
Excretion by nephridia.

Nervous system has dorsal brain.

Most are aquatic, marine or fresh water, some are terrestrial.

They reproduce sexually e.g. Earthworm, Leech.

**(h) Phylum – Arthropoda** (Arthros ◇ jointed, poda = legs)



**Characters:**

These are the organisms with jointed appendages.

This is the largest phylum in animal kingdom.

body triploblastic, bilaterally symmetrical and metamerically segmented.

They have an exoskeleton made up of protein and Chitin (Moult ◇ Periodic shedding off of the exoskeleton to induce the growth).

They have a complete alimentary canal with mouth & anus.

Respiration occurs through general body surface, gills, trachea and book lungs.

They have open circulatory system with dorsal heart & arteries.

Body cavity is called haemocoel.

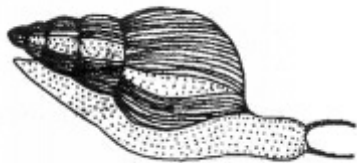
Excretion by coelomducts, malpighian tubules, green glands, coxal glands.

Sexes are separate .

Each segment has paired lateral and jointed appendages. E.g. Palaemon (prawn) ,

Cancer (crab) ,Periplanata (cockroach) , Anopheles (mosquito) & Aranea (spider) etc.

**(i) Phylum Mollusca :**



Snail

### Characters:

It is second largest group of animals, body soft, Unsegmented, bilaterally symmetrical and without Appendages.

Body divided into a head, foot and visceral mass. A Thin skin covering the body is called as mantle, which Secretes a calcareous shell.

Body cavity is haemocoel.



Octopus

Respiration by gills (Ctenidial) in aquatic forms but in terrestrial forms space between mantle and body wall called as mantle cavity act as lungs.

For ingestion they have tongue like structure “radual”

They also possess a digestive gland called hepatopancreas

Open circulatory system.

Excretion by metanephridia present near heart.

Reproduction is sexual and sexes are separate.



Starfish

E.g. Chiton (8 Calcareous pieces) , Pila, Melix (torsion univalve) , Dentalium (tusk like shell) , Unio, Mytilus (Bivalve) , Octopus.

**(j) Phylum Echinodermata :**

**Characters:**

These are marine animals, their body is triploblastic, Eucoelomata, unsegmented.

Their body has spines arising from exoskeleton of Calcium.

Adults are radially symmetrical while larvae are Bilaterally symmetrical.

Head is absent, oral and aboral surfaces have five Radial ambulacra.

Excretory organs are absent.

A complex system of water containing tubes and Bladders passing through pores of skin called water

Vascular system is present. From this tube like structure Arise, these tubes look like feet and are called as tube Feet that helps in locomotion

Reproduction can be asexual, sexual or by regeneration. E.g. Asterias (star fish) , echinus (sea urchin) , Holothuria (sea cucumber) , Antedon (feather star).

# EXERCISE

## OBJECTIVE DPP – 10 .1

- . A branch of biology which deals with the identification, nomenclature and  
Classification of organisms is called  
(A) Morphology (B) Ecology (C) Taxonomy  
(D) Phytogeography
- . Who is known as father of taxonomy?  
(A) Mendel (B) Linnaeus (C) Darwin (D) Crick
- . Binomial nomenclature was introduced by  
(A) John Ray (B) A.P. de Candolle (C) A.L. de Jussieu  
(D) Carolus Linnaeus
- . The basic unit of classification is  
(A) Variety (B) species (C) genus (D) family
- . A group of freely interbreeding organisms constitutes a  
(A) species (B) genera (C) family (D) class
- . According to binomial nomenclature, the scientific name of an organism must  
consist of two words. These are  
(A) species and tribe (B) genus and species (C) order and family  
(D) genus and family
- . Which taxonomic term may be substituted for any rank in the classification?  
(A) class (B) Genera (C) Species (D) Taxon
- . Cryptogams include  
(A) thallophytes (B) bryophytes (C) pteridophytes (D) all of the above
- . Algae are characterized by  
(A) Pyrenoids (B) aquatic habitat (C) unicellular sex organs



(D) all of the above organs

1. In Whittaker's classification, unicellular organisms are grouped under  
(A) protista                      (B) porifera                      (C) fungi  
(D) protozoa

---

### **SUBJECTIVE DPP – 10. 2**

#### **VERY SHORT ANSWER TYPE QUESTIONS**

- 1. Which is the largest phylum of kingdom animalia ?
- 2. Name the phylum in which animals have segmented body, coelom, and bilateral symmetry.
- 3. Name the phylum in which animals have segmented body, jointed appendages and compound eyes.
- 4. Write the binomial name of any one organism.
- 5. Name the code which governs the naming of organism

#### **SHORT ANSWER TYPE QUESTIONS**

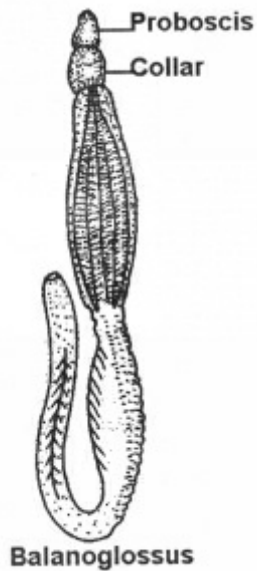
- 1. Write down four main features of protozoa.
- 2. Mention the characteristic features of arthropod.
- 3. How do poriferan animals differ from coelenterate animals?

#### **LONG ANSWER TYPE QUESTION**

- 1. What is five kingdom classification and who proposed it ?

# **DIVERSITY OF LIVING ORGANISMS**

## **PHYLUM HEMICHORDATA**



### **Characters:**

↑↑ They are placed in between  
 no chordates and Chordates as they possess  
 some characters of both.

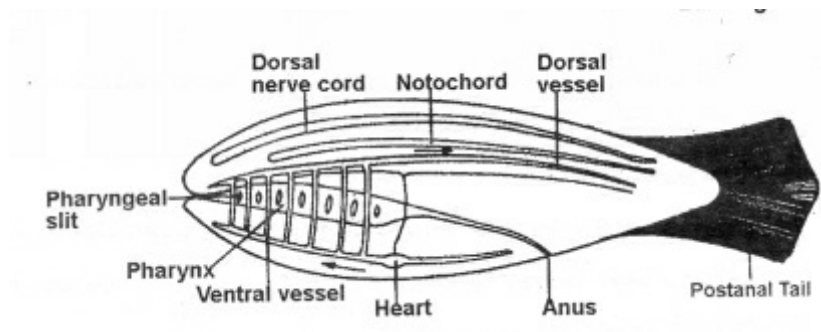
↑↑ They include worm like, unsegmented,  
 bilaterally Symmetrical animals which are  
 exclusively marine.

↑↑ Their body is divided into three regions  
 proboscis, Collar & trunk.

↑↑ They do not possess notochord, which  
 is a flexible, Rod like structure running  
 through the length of the body, Above  
 alimentary canal.

↑↑ They possess gill slit or gill cleft which  
 is meant for Respiration.

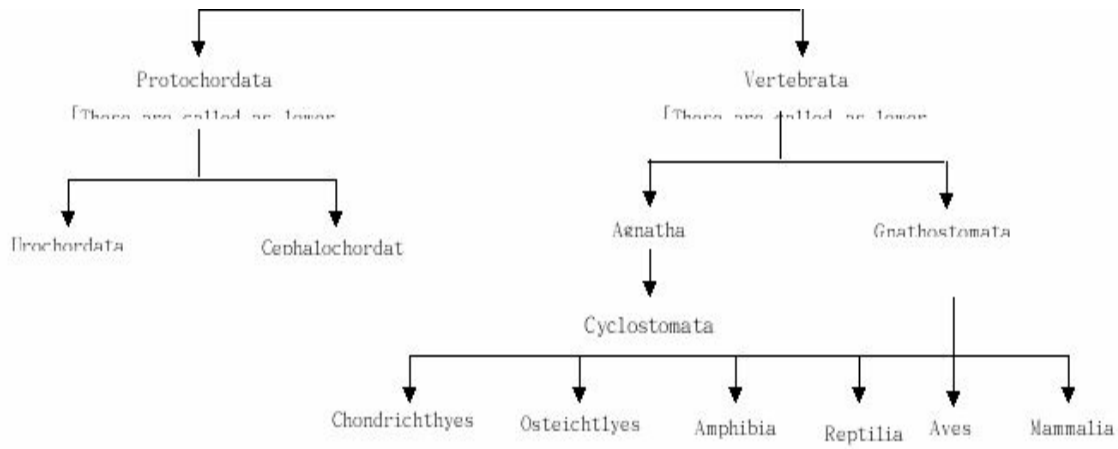
↑↑ They possess nerve cord in collar  
 region but it is not a true dorsal cord. E.g.  
 Balanoglossus (tongue Worm).



### Characters:

- ↑↑ This is the most advanced group of animals.
- ↑↑ Notochord is present at some stages of life, supported by a tubular hollow dorsal nerve cord.
- ↑↑ In higher chordates i. E. Vertebrates, the notochord is replaced by vertebral column.
- ↑↑ A set of gill slits is also present at certain stage of life, also called as pharyngeal gill clefts.
- ↑↑ Tail is also present behind the anal aperture that is post anal tail.
- ↑↑ They also possess a proper circulatory system.

## CHORDATA IS FURTHER DIVIDED AS FOLLOWS



### (a) Protochordata :

#### Characters:

↑↑ They are termed as lower chordates.

↑↑ They do not possess brain, cranium, vertebral column, jaw and paired appendages.

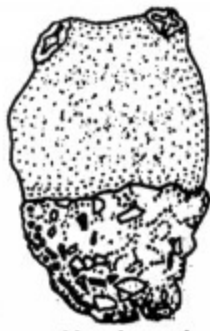
↑↑ Notochord is present atleast in some stages along with other diagnostic chordate characters (dorsal hollow nerve cord, gill slits, post anal tail).

↑↑ They are triploblastic, bilaterally symmetrical, enterocoelomic, organ system level organization.

↑↑ They are marine animals.

↑↑ Protochordata are further divided into two groups :

### (i) Subphylum : Urochordata



**Herdmania**

### **Characters:**

They are exclusively marine animals where pharynx possess several gill slits.

↑↑ They are commonly known as tunicates.

↑↑ The notochord is present in the tail of the larva and disappears in the adult.

↑↑ The dorsal hollow nerve cord is present in the larva only. it is replaced by a dorsal ganglion in the adult.

↑↑ The pharynx has gill slits.

↑↑ The larva (tadpole) undergoes retrogressive metamorphosis, i.e., changes from a better developed larva to a less developed adult. e.g. Herdmania (sea squirt), **Doliolum**, **Pyrosomea**.

**(ii) subphylum : Urochordata**



**Amphioxus**

### **Characters:**

↑↑ Animals are fish like without a head.

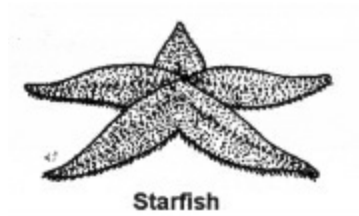
↑↑ Animals possess all the characters of chordates i.e.,

↑↑ A notochord which extends upto the entire length of the body and persists throughout the life.

↑↑ A nerve cord (without a distinct brain).

↑↑ Numerous well developed gill slits

↑↑ A post anal tail throughout life. e.g. **branchiostoma** (**Amphioxus; Lancelet**)



↑↑

larvae are bilaterally symmetrical.

Adults are radially symmetrical while

↑↑

Head is absent, oral and aboral surfaces have five radial ambulacra.

↑↑

Excretory organs are absent.

↑↑

A complex system of water containing tubes and bladders passing through pores of skin called water vascular system is present. from this tube like structure arise, these tubes look like feet and are called as tube feet that helps in locomotion

↑↑

Reproduction can be asexual, sexual or by regeneration. e.g. Asterias (star fish), Echinus (sea urchin), Holothuria (sea cucumber), Antedon (feather star),

## EXERCISE

### OBJECTIVE DPP – 11 .1

- . The mode of nutrition in all fungi is characteristically
 

(A) Symbiotic	(B) autotrophic	(C)
holozoic	(D) saprotrophic	
- . The reserve food in fungi is
 

(A) starch		(B)
cyanophycean starch		
(C) glycogen	(D) glycogen and	
fat		
- . The algal partner of a lichen is called as
 

(A) Mycobiont	(B) Phycobiont	
(C) Both of the above	(D) None of the	
above		
- . Pteridophytes are known as
 

(A) sea plants		(B) vascular
cryptogames		
	(C) club	
mosses	(D) horse tails	
- . Gymnosperms are characterized by
 

(A) non-motile male gametes	(B) naked seeds	
	(C) Winged seeds	
(D) true fruits		
- . Which one is mismatched?
 

(A) Flagella ..... Euglena		(B)
Pseudopodia ..... Amoeba		
(C) Cilia ..... Paramecium		(D)
Flagella ..... Plasmodium		
- . Contractile vacuole is present in
 

(A) Amoeba	(B) Euglena	
(C) Paramecium	(D) All of the above	
- . 'Venus flower basket' is the dried skeleton of

- (A) Euspongia (B) Euplectella (C) Spongilla (D) Leucosolenia
9. Choanocytes are unique to (A) Protozoa (B) Porifera (C) Mollusca (D) Echinodermata
10. Cnidaria is characterised by (A) nematoblasts (B) coelenteron (C) tissue level of organisation (D) all of the above

## SUBJECTIVE DPP - 11.2

### VERY SHORT ANSWER TYPE QUESTIONS

- . Who is the father of taxonomy?
- . What is taxonomy ?
- . Given one point of difference between bilateral and radial symmetry.
- . Give an example of hemichordata.
- . Herdmania is classified in which subphylum.

### SHORT ANSWER TYPE QUESTIONS

- . Write down the distinct features of chordata.
- . Write down the unique features of hemichordata.
- . What are the main characteristic features of Protochordata?

### LONG ANSWER TYPE QUESTION

- Draw an out line of classification of chordates.

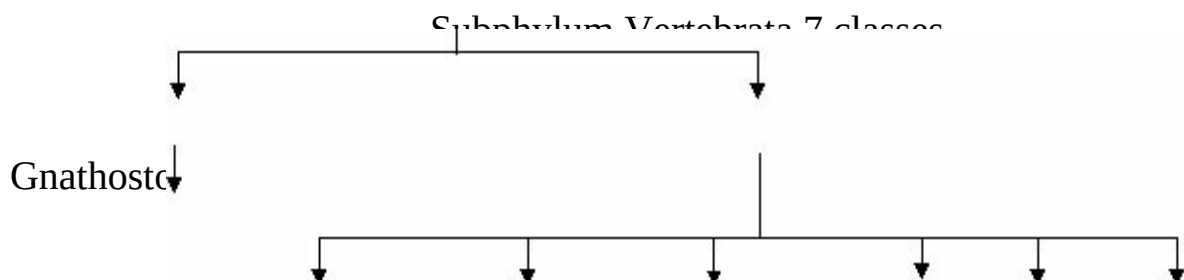


# DIVERSITY OF LIVING ORGANISMS

## SUBPHYLUM VERTEBRATA OR CRANIATA

- ↑↑ Majority of chordates are included in this phylum.
- ↑↑ Characters:
- ↑↑ They are advanced animals, having a cranium (brain box) around the brain. Nervous system is well developed.
- ↑↑ Notochord is replaced by a vertebral column (backbone) in the adults. Endoskeleton is highly developed.
- ↑↑ There are two pairs of limbs or appendages.
- ↑↑ Head is well differentiated.
- ↑↑ The heart is situated ventrally. The circulatory system is closed consisting of **bold** vascular system and lymphatic system. Red Coloured pigment hemoglobin is present in red blood corpuscles.
- ↑↑ Respiratory organs may be gills (in aquatic animals), skin, buccopharyngeal cavity (in amphibians) or lungs (in land animals).
- ↑↑ Excretion occurs through kidneys.
- ↑↑ Sexes are separate.

**This subphylum is subdivided into seven classes. They are:**



(Jawless vertebrates)  
developed jaws)

(Vertebrates with well

1. Cyclostomata

2. Chondrichthyes      3. Osteichthyes      4.  
Amphibians      5. Reptiles      6. Aves      7. Mammals

**(a) Class Cyclostomata :**



(Gr. Cyclos = circular, stome = mouth ; the circular Mouthed fishes) these are the most primitive Vertebrates.

**Characters:**

- ↑↑ Animals are jawless and possess a circular mouth.
- ↑↑ They are ectoparasites on fish and use mouth to stick to fish ; the mouth is therefore suctorial.
- ↑↑ Notochord is present in the form of a cylindrical rod.
- ↑↑ Head and brain are poorly developed.
- ↑↑ Cartilaginous endoskeleton is present.
- ↑↑ Respiration occurs through gills contained in pouches.
- ↑↑ Heart is two-chambered consisting of one auricle and one ventricle.
- ↑↑ Gonad is single and fertilization is external. e.g. petromyzon (lamprey), Myxine (hag fish).

**(b) Class Chondrichthyes :**

(Gr. Chondros = cartilage; ichthys = fish, the cartillagenous fish).

**Characters:**

↑↑ Skeleton is **cartilaginous**, hence the name Chondrichthyes is given.

↑↑ The body is either laterally compressed and spindle shaped, or dorso ventrally flattened and disc shaped.



Shark

↑↑ Mouth is ventral in position on the head.

↑↑ Jaws are well-developed.

↑↑ Respiration occurs through gills.

↑↑ The skin is covered with placoid scales (exoskeleton).

↑↑ Heart is two chambered, consisting of an auricle and a ventricle.

↑↑ Lung or air bladder is absent.

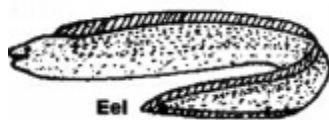
↑↑ They reproduce by laying eggs (oviparous) or produce eggs which hatch inside the mother's body (ovoviviparous).

↑↑ Fertilization is internal.

↑↑ Mostly marine and large in size (upto 10-20 meters long). e.g. sharks, rays and skates. Scoliodon (Indian shark, dog fish), Torpedo (electric ray), Trygon (sting ray), Rhinobatus (guitar fish).

**(c) Class Osteichthyes :**

**Characters:**



Eel



Flying fish

↑↑ Skeleton is cartilaginous, in the embryonic stage, but is replaced by bones in adult form (bony endoskeleton), hence the name osteichthyes is given.

- ↑↑ Body is generally spindle shaped.
- ↑↑ The exoskeleton, if present, consists of cycloid or ctenoid scales.
- ↑↑ The mouth is terminal (anterior) on the head.
- ↑↑ Gills are covered by bony flap called as the operculum.
- ↑↑ A swim bladder (or air bladder) is usually present. it helps in floating.
- ↑↑ Heart is two chambered.
- ↑↑ Fertilization is mostly external.
- ↑↑ They live both in fresh and sea water.
- ↑↑ In size, they vary from 10 mm to 4 meters. e.g. Labeo, Hippocampus (sea horse), Anabas (climbing perch), Muraena (eel), Protopterus (lung-fish).

**(d) Class Amphibia :**

(Gr. amphi = both, bios = life, the vertebrates leading two lives/ dual life)

- ↑↑ The amphibians are the first land vertebrates, Amphibious partly terrestrial and partly aquatic.

**Characters:**

- ↑↑ They are amphibious in nature ; found in fresh water and moist places.
- ↑↑ Skin is smooth or rough, rich in glands which keep it moist ; skin with pigmented cells, i.e., chromatophores.
- ↑↑ Body is without scales.
- ↑↑ Endoskeleton is mostly bony, notochord does not persist in adults.
- ↑↑ Head and trunk are distinct ; neck and tail may or may not be present.
- ↑↑ Limbs tetrapods(four-limbed), pentadactyl type (five-fingered).
- ↑↑ Respiration occurs by lungs, skin or buccal lining, are present at least during larval stage for respiration.
- ↑↑ Heart three chambered with two auricles and a ventricle, red

blood corpuscles are large, biconvex, oval and nucleated.

↑↑ Brain is not much developed, cranial nerves are 10 pairs.

↑↑ Sexes are separate, i.e., dioecious, male without copulatory organ.

↑↑ Eggs with gelatinous covering, usually laid in water.

↑↑ Fertilization is external.

↑↑ Development is indirect with a tadpole larva which undergoes metamorphosis to become adult.

E.g. Salamanders, newts, frogs and toads. Salamandra (salamander) ,  
ecturus (mud puppy), **Triturus** (newt), Rana (frog), Bufo (toad).

### **(e) Class Reptilia :**

(L. reptare = to creep ; creeping vertebrates).

↑↑ These are first truly terrestrial animals living in warmer regions.

#### **Characters:**

↑↑ Body is divisible into head, neck and trunk. tail is well developed in some, while it is reduced in others.

↑↑ Two pairs of pentadactyl limbs are present ; but in snakes limbs are reduced or absent.

↑↑ Body is covered with epidermal horny scales.

↑↑ Skin is dry, impermeable and devoid of glands.

↑↑ Respiration takes place by lungs only. gills are absent.

↑↑ Heart is incompletely four- chambered, having two auricles and incompletely divided ventricle. in crocodile, heart is completely four chambered.

↑↑ Sexes are separate.

↑↑ Fertilization is internal(characteristics of land animals).

↑↑ The embryo always lies in a fluid filled sac called amnion.

↑↑ They is no larval stage in development. e.g. Testudo(tortoise), Chelone(turtle) Draco (flying lizard), Chameleon, Hemidactylus (wall lizard), Naja (cobra) etc.

### **(f) Class Aves :**

(L. Aves = birds).

↑↑ The birds are described as ‘feathered reptiles’ that have developed

the power of flight.

**Characters:**

- ↑↑ The body is covered with soft feathers (feathery exoskeleton).
- ↑↑ The body is divisible into head, neck, trunk and tail.
- ↑↑ There are two pairs of limbs. the fore limbs are modified to form wings (in flying birds) or are reduced (as in non-flying birds). Hind limbs are strongly developed for perching, walking.
- ↑↑ Endoskeleton is light. the bones have got air cavities. this makes the bird light.
- ↑↑ Jaws are modified to form a strong beak.
- ↑↑ Teeth are absent.
- ↑↑ Respiration is by lungs only. Lungs have additional bag like membranous extensions called as air sacs.
- ↑↑ Heart is completely four chambered.
- ↑↑ Sexes are separate.
- ↑↑ Birds are oviparous, i.e. egg laying.
- ↑↑ Fertilization is internal. Fertilized eggs are laid with a yolk (stored food) and with a hard calcareous shell.
- ↑↑ Like reptiles and mammals, they have the embryonic membranes namely the amnion, chorion, yolk sac and allantois.
- ↑↑ High degree of parental care is exhibited.
- ↑↑ There is no larval stage in development. e.g. Columba (pigeon), Pavo(peacock), Corvus (crow), Passer (sparrow), Struthio (ostrich), Kiwi and penguin are flightless birds.

**(g) Class Mammalia :**

(L. mamma = breast; the mammals)

- ↑↑ Mammalia is the most evolved group of organisms and are found in diverse habitats ranging from deserts, polar ice caps, oceans, mountains, forests and grasslands.
- ↑↑ They are named mammals as all of them possess mammary glands (milk producing glands) . Mammals are the only animals which feed their young ones with milk.

### **Characters:**

↑↑ Skin is covered with an exoskeleton of hair. Hair are provided with sweat glands which help in the regulation of body temperature. in aquatic mammals, hair being negligible, the subcutaneous layer of fats provides insulation.

↑↑ Mammals have two pairs of pentadactyl limbs.

↑↑ The body cavity is unequally divided into two parts by a muscular partition called as diaphragm.

↑↑ Eyes are provided with movable lids.

↑↑ Ears have fleshy external ears or pinnae.

↑↑ Teeth are embedded in sockets (thecodont). Two sets of teeth develop in the life time of a mammals Milk teeth and permanent teeth (diphyodont).

↑↑ Teeth are of different types (heterodont).

↑↑ Respiration occurs by lungs.

↑↑ Heart is four chambered. R.B.Cs are non nucleated and usually circular.

↑↑ Sexes are separate. Gonads are paired. Testes lie commonly in the scrotal sacs outside the abdomen.

↑↑ Fertilization is internal. Eggs are small, microscopic without shells and are retained in uterus of female for development.

↑↑ Embryonic membranes (amnion, chorion, yolk sac and allantois) present.

↑↑ They give birth to living young ones and are called as viviparous. The young ones are fed on milk from mammary glands.

### **(h) Important Groups of Mammals :**

Mammals are divided into three main groups,

(i) Egg-laying mammals (monotremes) : These mammals show characters of both reptiles and mammals. They lay hard shelled eggs (oviparous) e.g. spiny ant eater, Duck – billed platypus

(ii) Marsupial mammals (pouched mammals) : Pouched or marsupial mammals (Latin marsupium = pouch) They are viviparous. The young

ones, when born, are only three cm. long. Hence they are cared in pouch called marsupium present on the mother's abdomen. in the pouch, they feed on the mother milk e.g. Kangaroo(Macropus), Kola bear,

(iii) Placental mammals (true mammals) : These mammals with true placenta. The embryo is retained in the uterus. These are the very successful group of land animals, occurring in diverse climatic condition. e.g. Mole, bat, lion, tiger, camel, giraffe, whale, dolphin, monkey, humans etc.

## EXERCISE

### OBJECTIVE DPP – 12 .1

- . Mesoglea is characteristic of  
(A) Platyhelminthes (B) Aschelminthes (C) Cnidaria  
(D) Mollusca
- . True jelly fish (e.g., Aurelia) belongs to class  
(A) Hydrozoa (B) Anthozoa (C) Scyphozoa (D)  
Both B and C
- . Polymorphism is exhibited by  
(A) Hydra (B) Physalia (C) ) Octopus (D)  
Crab
- . Comb jellies belong to  
(A) Scyphozoa (B) Hydrozoa (C) Ctenophora  
(D) Both A and B
- . Platyhelminthes are called  
(A) round worms (B) flat worms (C) blind worms (D)  
none of the above
- . In Platyhelminthes, the excretory organs are.  
(A) nephridia (B) malpighian tubules  
(C) flame cells (solenocytes) (D) green  
glands
- . Platyhelminthes are  
(A) coelomates (B) pseudocoelomates (C) )  
haemocoelomates (D) Acoelomates
- . The common name for Ascaris is





Q	1	2	3	4	5	6	7	8	
A.	A	D	A	B	B	C	B	A	

**(Objective DPP # 10 .1 )**

Q	1	2	3	4	5	6	7	8	
A.	C	B	D	B	A	B	D	D	

**(Objective DPP # 11 .1 )**

Q	1	2	3	4	5	6	7	8	
A.	D	D	B	B	B	D	D	B	

**(Objective DPP # 12 .1 )**

Q	1	2	3	4	5	6	7	8	
A.	C	C	B	C	B	C	D	D	

# WHY DO WE FALL ILL

## **HUMAN HEALTH & DISEASE**

Every living organism, may be plant or animal, requires food (nutrition) for its survival, maintenance, growth and development. Nutrition is required in specific amounts. Proper dietary habits lead to sound health and proper mental development. A person is said to be healthy if one:

- ↑↑ has no symptoms of disease and anxiety.
- ↑↑ has no physical deformity.
- ↑↑ has no mental problems and social tensions.
- ↑↑ has no psychological tensions.
- ↑↑ has all the body organs functioning properly.
- ↑↑ has purposeful life.
- ↑↑ has sufficient balanced diet.

The most widely accepted definition is (1947) World Health Organization's description that states "Health is a state of physical, mental and social well being and not merely the absence of disease or infirmity".

### **(a) Significance of Health :**

Good health is "health 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 also make a man happy and cheerful. It allows a person to have the initiative for betterment. It makes living a joyful experience. It keep a person not only happy but also provides cheerfulness to the people. Good health is a condition for our purposeful existence in this world.

**(b) Community and Personal Health :-**

Health of a person depends upon his personal habits as well as his environment. One cannot remain healthy, if his environment is not clean. Good economic condition and job are needed for individual health, so that the person can have balanced diet and be healthy. Social equality and harmony in the community are also important to maintain individual's health. If neighbors of a person are healthy, but possess no civic sense (i.e., they are in the habit of throwing garbage in an open space and there), flies, mosquitoes, and other disease causing microorganisms will grow on the filth (foul matter) thrown by them. These microorganisms will infect nearby foodstuffs thereby spreading diseases. Thus, a person with his clean home, but unclean neighborhood will become sick. Similarly, the health of the whole community depends on the personal habits of various individuals who constitute the community. So community health can be defined as "All the personal health along with the environmental services for the improvement of health of community." It comprises of all efforts for maintaining, protecting and improving the health of the people. WHO is doing remarkable work in community health.

**(c) Difference Between Personal Health and Community Health :**

Personal Health	Community Health
The state of physical, mental and social well	It is maintenance, protection and improvement of health of the whole
Only the individual maintain his/her health.	Community. The whole community remains
An individual can maintain his health by. (a) Eating balanced diet. (b) Observing personal and	Healthy. Community health can be achieved by. (a) Provision for treated and

domestic hygiene.	safe drinking water.
(c) Consuming clean food, clean water and clean air.	(b) Proper disposal of sewage and wastes.
(d) Proper exercise, relaxation and good habits.	(c) Providing medical facilities.
	(d) Control of communicable diseases.
	(e) Health education.

The various activities involved in maintaining community health are as follows :

**(i) Maintaining proper sanitation of the environment by :**

- ↑↑ Providing cleans and safe drinking water.
- ↑↑ Providing good sewage and rain water disposal systems (through underground pipes).
- ↑↑ Proper garbage disposal.
- ↑↑ Strict enforcement of antipollution laws, management of different types of environmental pollution by Central and State Control Boards.

**(ii) Providing proper facilities for prevention and control of diseases such as :**

- ↑↑ Preventive vaccinations against a number of diseases like tuberculosis, diphtheria, whooping cough, tetanus, measles, hepatitis, polio, mumps, etc.
- ↑↑ Spraying mosquito and germ killing chemicals (insecticides, pesticides etc.) at regular intervals.

**(iii)**

**Providing health education :** to people about the mode of transmission of diseases and mechanism to control communicable diseases; importance of balanced diet; effects of bad habits Like alcoholism, addiction, etc.

**(iv) Establishment of health care services:** primary Health Centres, District Hospitals, Community Health Centres, Medical Colleges, All India institutes, Regional Hospitals, etc.

**(v) Prevention of food adulteration.**

**(vi) Providing maternity and child care centres:** so that mortality rate among children is reduced to a great extent. Provision of family planning advice and medical care to school going children.

## **WHAT IS A DISEASE?**

A disease is a condition of the body or a part of it in which functions are disturbed. Disease may also be defined as morphological (structural), physiological (functional) or psychological disturbance in the body of body parts caused by external agencies which may be nonparasitic e.g. Deficiency of nutrients or may be parasitic e.g. Caused by viruses, bacteria, fungi, etc. The term disease means dis-ease or discomfort or without ease. In short, it can be defined as “disease is disorder of body.”

### **(a) Distinction Between Healthy and Disease Free :**

The term disease is used when we find a specific and particular cause for discomfort. We may not be knowing the main cause of the discomfort, but still we can use the term disease. A person may not be suffering from any disease but may be in poor health. This is particularly true for social and mental health, where we can be in poor health without there being a cause in the form of an actual disease. 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.

<b>Difference's Between Healthy and Disease Free</b>	
<b>Healthy</b>	<b>Disease Free</b>
1. It is the state of physical, mental and social well being	it is the state of absence body discomfort.
2. It depends upon the person and one's environment	it depends upon the person
3. A person can be unhealthy even in the absence of disease.	a person would be disease the absence of discomfort.

### **(b) Manifestation of Diseases :**

There are number of tissue in the body, which aggregate together to form organ while a number of organs make up an organ system. Each organ system is performing a specific function. Each organ in the organ system also 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 excretion, bones and muscles hold the body parts together to form a musculoskeletal system that helps the body to move. When a person is suffering from any disease, then the physiological processes (functioning) or the appearance of organs in organ systems will change. These changes give rise to symptoms and signs of disease. symptoms are evidences of the patient's feeling of being wrong. For example, headache, loose motions or a wound with pus are symptoms which may indicate the occurrence of discomfort. Headache may be due to examination stress, meningitis. The symptoms give an indication of the presence of a particular disease. The physicians will also get laboratory tests done to identify the disease further.

### **(c) Acute and Chronic Diseases :**

The manifestations of diseases are different depending upon a number of factors. one of the factor is duration of disease. on the basis of duration serious disease can be acute or chronic.

↑ **Acute disease** : actual disease is the one which has a short duration by relatively severe course. most people with acute illness can expect to return to normal health. a case of cough and common cold is an example of an acute illness which lasts only for a few days. afterwards the patient becomes well without any bad effect, loss of weight, feeling of tiredness or short of breath.

↑ **Chronic disease** : chronic disease is the one which is long lasting is usually slow to develop, often having a major effect on health, reducing the person's ability to do work efficiently, learning in school or doing work. the patient will also weight and feel tired all the time. examples of chronic diseases include tuberculosis, diabetes, asthma, hypertension, kidney disease, depression, etc. in these diseases we can develop a treatment plan to manage symptoms and prevent complications with the help of doctor.

<b>Difference's Between Acute and Chronic Diseases</b>	

Acute Diseases	Chronic Diseases
1. They are short duration diseases of relatively severe course.	1. They are long lasting d debilitating (Weakening) effect.
2. The patient recovers completely after the cure.	2. The patient does no completely.
3. There is no loss of weight or feeling of tiredness.	3. There is often loss of weight or tiredness.
4. There is short duration loss of work and efficiency.	4. There is prolonged loss of efficiency.

#### (d) Causes of Diseases :

The various causes of diseases are

**(i) Pathogens :** They are disease causing organism like bacteria, viruses, fungi, protozoans, worms, etc. The pathogens are transferred to human being through air, contaminated food, water, soil and animals. Pathogens are primary cause of infectious diseases. However, every body does not suffer equally from infectious agents. There are some contributory causes that increase the proneness of an individual to catch the disease.

**(ii) Lack of nutrition diet:** it is a second level cause of disease as absence of nutritious diet makes a person unhealthy. Unhealthy persons are susceptible to various diseases in comparison to healthier persons. Another contributory cause can be poor heredity which increases proneness of individual to a particular disease.

**(iii) Lack of public services:** Government should provide clean drinking water, good sewage disposal, proper garbage disposal, etc. If the public services are poor, there are more chances of contamination of food and water. They are the third level cause of disease. Poor people, due to poverty, live in unclean surroundings where even basic amenities are lacking, there are three level causes of diseases. These are infection with pathogen (1<sup>st</sup> level), lack of nutrition diet and poor heredity (2<sup>nd</sup> level) and lack of public services (3<sup>rd</sup> level).

#### **TYPES OF DISEASES**



**(a) Congenital Diseases :**

Congenital diseases are present right from the birth. They are caused either due to genetic disorders or environmental factors during development or due to combination of these factors. These diseases pass on from generation to generation e.g. hemophilia, colour blindness, sickle cell anemia, Down 's syndrome, albinism etc.

**(b) Acquired Diseases :**

These disease are acquired by an organism after birth and are not

inheritable i.e., do not pass on from one generation to another. These are further classified into categories;

(i) **Communicable or infectious diseases:** These diseases are caused by pathogens/infectious agents such as bacteria, viruses, fungi, protozoans, worms, etc. These diseases can spread from diseased person to healthy person by means of air (droplet method), water, food, insects, physical contact, etc.,

**e.g. tuberculosis, malaria, diarrhea etc.**

(ii) **Non-Communicable or Non-Infectious diseases:** These diseases can't be spread through infected persons to healthy persons. e.g. Scurvy

**Table: Various Pathogens and Diseases Caused By Them.**

S.No	Type of pathogens	Common diseases caused by them
1	Viruses	Common Cold, Influenza, Measles, Mumps, Poliomyelitis, Rabies, Small Pox, Chicken Pox, Yellow Fever, Aids Etc.
2	Bacteria	Cholera, Typhoid, Tuberculosis, Tetanus, Diphtheria, Pneumonia, Syphilis, Gonorrhoea, Leprosy Etc.
3	Rickettsiae	Typhus Fever, Tick Fever Etc.
4	Protozoa	Malaria, Amoebic Dysentery, Sleeping Sickness Etc.
5	Fungi	Ringworm, Athlete's Foot Etc.
6	Worms	Filaria, Ascariasis, Cysticercosis, Pinworm
7	mites	Scabies

## EXERCISE

### OBJECTIVE DPP – 13 .1

- . Health is.
  - (A) Complete physical well being
  - (B) mental well being
  - (C) social well being
  - (D) all of the above
- . Dislocation is a disease caused by
  - (A) Biological agent
  - (B) mechanical agent
  - (C) physical agent
  - (D) chemical agent
- . A carrier is a human being that
  - (A) functions as a reservoir of infection
  - (B) possesses pathogen but is not harmed
  - (C) contains antibodies sufficient enough to balance the antigen
  - (D) all of the above
- . Droplet infection is a mode of.
  - (A) direct transmission
  - (B) indirect transmission
  - (C) pathogen spread through mosquitoes
  - (D) tomitic transmission
- . Specific defence mechanism against disease comprises
  - (A) physical barrier
  - (B) lysozyme
  - (C) phagocytes
  - (D) immune system
- . The antigen present in pathogen is
  - (A) a specific protein involved in metabolism
  - (B) polysaccharide synthesized by it in the host
  - (C) a specific protein or polysaccharide present on its coat
  - (D) any of the two, A, or B.
- . Pathogens are destroyed by
  - (A) kidneys
  - (B) liver
  - (C) tonsils
  - (D)

lymphatic tissues

- . A noninfectious unnatural and unusual reaction to a substance or condition is  
(A) immunity (B) allergy (C) infection  
(D) toxin
- . AIDS was first reported in.  
(A) Russia (B) France (C)  
U.S.A. (D) Germany
- l). A person has developed interferon in his body. He seems to carry infection of  
(A) Tetanus (B) Malaria (C)  
Measles (D) Typhoid

## **SUBJECTIVE DPP – 13. 2**

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### **VERY SHORT ANSWER TYPE QUESTIONS**

- . Define Health.
- . What are communicable diseases ?
- . Define the term disease.
- . Write the name of the vector of the disease malaria.
- . Define the following terms :
  - (i) Acute diseases
  - (ii) Chronic diseases

### **SHORT ANSWER TYPE QUESTIONS**

- . Define the following :
  - (i) Health
  - (ii) Disease
- . State two conditions essential for good health.
- . What are the two broad types of diseases?
- . Define communicable diseases and give three examples.
- . Define non-communicable and give three examples.

### **LONG ANSWER TYPE QUESTION**

- . A physician examines a number of sick people daily. But he normally does not fall sick himself. How this happens?



# WHY DO WE FALL ILL

## INFECTIOUS DISEASES

### (a) **infectious Agents :**

The various infectious agents are-bacteria, viruses, protozoans, helminthes (worms) and fungi.

(i) **Bacteria :** They are unicellular, prokaryotic, microscopic organism. they reproduce

very quickly. Some common diseases caused by bacteria are typhoid, cholera, tuberculosis, anthrax, diphtheria, tetanus, etc.

(ii) **Viruses :** They are submicroscopic organisms. They cannot reproduce by

themselves because they do not have their own metabolic machinery.

They utilise the metabolic machinery of the host cell and multiply. The various diseases caused by viruses are common cold, influenza, dengue fever, AIDS , measles, mumps,

polio, small pox, chicken pox, etc.

(iii) **Protozoans :** They are microscopic unicellular, eukaryotic organisms. The various

diseases caused by protozoa are malaria (caused by Plasmodium), kala-azar (caused by Leishmania), etc.

(iv) **Helminthes :** Helminthes are multicellular worms which are mostly present in

intestine. They cause taeniasis (caused by tapeworm), ascariasis (caused by worm), elephantiasis (caused by filariasis worm, hence also know as filariasis), etc.

(v) **Fungi :** They are also multicellular, eukaryotic, heterotrophic organisms. They

cause ring worm, athlete's foot and other skin infections.

**(b) Reason for Categorization of infectious Agents :**

it is important to categories infectious agents because each group of organisms have some common traits and many similar biochemical pathways. As a result, a drug that blocks one of the biochemical pathways peculiar to one group would be effective against many members. Antibiotics are used for killing bacteria. They inhibit wall synthesis (e.g. penicillin), inhibit ribosome function (e.g. erythromycin, streptomycin) or DNA replication (e.g., ciprofloxacin). However, antibiotics are not effective against viruses. Protozoan infections are treated by different types of drugs. Antifungal drugs are useful against all types of fungi. Vermicides are used for overcoming worm infection.

**(c) Means of Spread :**

Infection diseases are called **communicable diseases** because they can spread from affected persons to a healthy person. The means of communication or spread are different for different pathogens.

**(i) Direct transmission.** The pathogens are transmitted from an infected person

to a healthy person directly without an intermediate agent. It occurs in the Following ways:

**(A) 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, gonorrhea (both caused by bacteria) and AIDS (caused by virus) are transmitted by sexual contact from one partner (infected) to the other (healthy).

**(B) Contact with Soil :** The infectious agent of tetanus can enter the human body from soil through injuries.

**(C) Animal bites :** The rabies virus is injected in the human body by the bite of rabied dog or monkey.

**(D) Transplacental Transmission :** The diseases like AIDS, German measles and syphilis can also be transmitted from infected mother to the foetus though placenta.

**(E) Droplet infection :** Pathogens spread by way of sneezing, coughing, spitting and taking as in common cold, influenza, diphtheria,



tuberculosis, pneumonia etc.

(ii) **indirect transmission** : They pathogens of some diseases are carried through some intermediate agents. It occurs in the following ways :

(A) **Vectors** : They are living organisms which spread their pathogens from an infected person to a healthy person. Usually, a part of life cycle of the pathogen is passed in the body of the vector. Some animals like housefly transfer the pathogen without taking them in their bodies. They are called carriers. Housefly is carrier of cholera, dysentery, typhoid, diarrhoea, etc. Female mosquitoes of many species are vectors of several diseases. They require blood meal in order to obtain nutrients for laying eggs. Female Anopheles spreads malaria while Culex spreads Filaria.

(B) **Through contaminated food and water.** Cholera, hepatitis B, diarrhoea, ascariasis, etc. are some diseases which are transmitted through contaminated food and water.

(C) **Air borne diseases** : Infectious agents can get transferred from infected person to healthy person through air, dust and droplets (emitted on sneezing, coughing or spitting), e.g., common cold, pneumonia, tuberculosis.

(D) **Fomite borne** : Articles coming in contact with patients are a source of infection, e.g., door handles, taps, garments, currency, utensils, crockery.

(d) **Pathogenicity** :

Pathogens can harm their hosts in a number of ways such as by

- (i) destruction of body tissues and
- (ii) release of toxins or poisons which may be endotoxins. The entry of the pathogen in the

body is called infection. After entering into the body, the pathogens multiply till they produce enough toxins to make the symptoms of the disease appear. The interval between infection and appearance of first symptom of the disease is called incubation period.

## **MANIFEST ATION**

(a) **Organ or Tissue Specific Effects** :

A microorganisms enters the body through different points like nose, mouth, sex organs etc. Which decides the organ or tissue that micro

organism invades. At the same time the signs and symptoms of an infectious diseases also depends upon the tissue being invaded. e.g. If bacteria causing tuberculosis enters through nose, it invades respiratory passage and lungs and its symptoms are cough and breathlessness, but in some cases they may infect other organs also.

**Common Effects :**

This category includes effects like inflammation in which swelling, reddening and pain in infected area and increase in body temperature occurs. These effects arise due to the active involvement of immune system to provide defence to body by producing some specific chemicals from WBC's, against that microbe and this is not confined to a particular organ or tissue but seen in whole body.

**(b) Severity of Effects :**

It directly depends upon the no. of microorganisms. if microbes are smaller in number their effects are minor and can be overcome by our immune system in a lesser time but if the number of micro organisms inside the body is very high the effects are more severe and long lasting.

## **TREATMENT OF INFECTIOUS DISEASES**

The basic concept behind the treatment process is to target the biochemical pathways occurring inside an organism for this certain drugs like antibiotics are prepared to alter or stop the biochemical reaction of the microbes at some stage to stop them to produce infections, toxins or to kill them or to check their further growth and multiplication. There are two ways in which these diseases are treated they are :

(i) **Reducing the symptoms :** By this, infection is not cured but some of the symptoms like fever, pain, aches, inflammation can be reduced to make the patient full comfortable. this is done by medicines like pain killers etc.

(ii) **killing infectious agents :** this can be done by targeting the biochemical pathways of infectious agents using specific drugs.

**(a) Drugs :**

chemical compounds that targets a particular reaction among the chain of reactions involved in the biochemical pathway by reacting with some substrates of that reaction and resulting in an undesirable product so that reaction cannot proceed further and stop infections and can kill the

microbes. they do not affect human cells.

**(c) Antibiotics :**

Antibiotic are chemicals that kill or stop the growth of certain kinds of microbes. They help our body to fight against diseases. The development of antibiotics began with the discovery of penicillin by sir Alexander Flemming in 1928. Flemming noticed that an agar plate inoculated with bacterium *Staphylococcus aureus* had become contaminated with a mould. He future noticed the presence of a clear zone in the agar plate in which breakdown of the bacterial cells had occurred. Detailed studies led to the isolation of an inhibitory substance from the mould. As the mould was identified as *Pencillium*, Flemming called the antibiotic penicillin. Soon other antibiotics were isolated. Some well know antibiotics are streptomycin, gramicidin and tetracycline. the antibiotics have been obtained from either bacteria or fungi.

↑↑ These are the drugs specific for curing bacterial diseases. they either ceases the formation of cell wall or interferes in their metabolic activities like production of proteins. This kills or stops the growth of bacteria.

↑↑ Antibiotics are not effective for viruses or it is difficult to make antiviral diseases because Viruses are acellular entities which only have nucleic acid and protein but lacks cytoplasm, cell wall and cell organelles they do not have their own metabolic system but they use the host's metabolic machinery to grow & multiply so drugs are not effective for them.

## **PREVENTION OF INFECTIOUS DISEASES**

Preventive measures are categorized into two distinct groups:

**(a) General preventive measures :**

It includes:

(i) **Safe drinking water :** Drinking water should be filtered to remove suspended particles And boiled, ozonized and treated with chlorine before drinking to avoid water borne diseases like typhoid, cholera, hepatitis etc.

(ii) **Proper disposal of waste:** Garbage should not be dumped here and there rather it should be thrown in covered garbage cans and burnt or buried for disposal. Sewage carrying drains should be covered for proper

treatment of diseases of stomach and intestine.

(iii) **Control of vectors** : Growth and breeding of animals like mosquitoes, rats, flies,

Cockroaches should be controlled, by keeping surrounding clean, spraying insecticides, removing stagnant water from populated areas.

(iv) **Strong immune system**: It helps to defence our body against invading microbes and can be made strong by proper diet and nourishment.

↑↑ **Immune system**: our body possesses a special type of defence mechanism called immune **system**. it provides resistance against disease causing microorganisms. immunity is the ability of the body to resist the infections. **Two** specific types of cells are present in our body that provide immunity.

↑↑ They are WBC (leucocytes) in blood and lymphocytes in lymph when any foreign body attacks our body these cells are released to all parts of body, they isolate, engulf, kill and digest the infectious agents and thus defend our body against any type of infection.

**(b)** Specific Preventive Measures :

This can be done two ways :

(i) **Immunization**: Stimulating the body to produce antibodies by artificial means. our

Immune system is misleader, to develop a memory against particular infection by introducing something into the body that mimics the specific microbe. Specific prevention is provided by the immune system. it produces specific molecules called antibodies that fight against the invading microorganism or their products called antigens. Antibodies are pertinacious molecules made by WBC's and lymphocytes to fight against foreign bodies or other harmful chemicals. Antigens are also proteins or other harmful chemicals that are present on surface of invaders. Whenever there occurs attack of a foreign body specific Antibodies are produced corresponding to that antigen and an antigen antibody reaction occurs. it either engulfs and phagocyte it or makes it harmless and then makes them unable to grow and multiply. Besides this immune system also possesses memory. once antibodies are produced they remain in the body and at the second infection they recognize the antigens and show a

much faster response.

(ii) **Vaccination:** A vaccine is a suspension of disease- producing micro-organisms which is

Modified by killing or wreaking (attenuated) so that the suspension will not cause disease. Rather it stimulates the formation of antibodies upon inoculation. The antibodies remain in blood for long and when the germs of a particular disease enter the body, the antibodies destroy them. This is the basis of immunization.

↑↑ **Some common vaccines :**

↑↑ DPT vaccine, for protection against diphtheria, whooping cough and tetanus

↑↑ BCG vaccine, for protection against tuberculosis

↑↑ Polio (OPV) vaccine ↑↑ Typhoid vaccine ↑↑ Measles vaccine ↑↑ TT vaccine, against tetanus

Schedule of Immunisation			
Beneficiaries	Age	Vaccine	No. of doses
(a) pregnant woman	16-36 weeks	TT	2,at intervals of 4-8 weeks
(b) infants	3-9 months	DPT	3 does at intervals of 1-2 months
		Polio	-do-
		BCG	1
	9-12 months	Measles	1
	18-24 months	DPT	1(booster)
		polio	1(booster)
c)children	5-6 years	Typhoid	2
	10 years	TT	1(booster)
		Typhoid	1(booster)
	16 years	TT	1(booster)
		typhoid	1(booster)

↑↑ **Pulse polio programme:** The aim of this programme it to eradicate polio from our country. it was first held in our country in

December, 1995. Polio vaccine called Oral polio vaccine (OPV) is given to children orally (through the mouth), as per the National Immunisation Schedule (NIS),

### **NON INFECTIOUS / NON COMMUNICABLE DISEASES**

These diseases which remain confined to a person. they are neither present at birth nor spread from one person to another. The diseases are caused due to some specific factors. They may be caused due to improper functioning of an organ (short sighted, hypertension, arthritis), hormonal imbalance (diabetes, dwarfism), allergy, cancer, inadequate diet (anaemia, goitre), etc.

↑↑ **These diseases are of following types :**

↑↑ **Deficiency diseases :** caused due to lack of some nutrient materials in our body like Vitamins, minerals, protein etc.

↑↑ **Degenerative diseases :** caused due to ageing or malfunctioning of any organ or part of Body.

↑↑ **Allergies :** caused due to hypersensitivity of an organism to certain type of material like  
Pollen grains, dust etc.

↑↑ **Uncontrolled growth of cells:** this can cause cancer and tumor.

↑↑ **Mental disorders**

↑↑ **Occupational diseases**

↑↑ **Addiction:** caused due to excessive intake of drugs tobacco, alcohol etc.

### **COMMUNICABLE DISEASES**

Disease	Causative Organisms	Mode of Transmission	Symptoms	C
<b>Bacteria</b>				
1. Cholera	Vibrio cholerae	Contaminated food And water	Watery diarrhoea, Vomiting,	Antib ORS Or Sa

			Dehydration, muscle Cramp, weight loss.	soluti
2. typhoid	Salmonella typhi	Contaminated food	Headache, fever in afternoon, slow Pulse, erruption of Spots & rashes on Abdomen, diarrhoea.	Antib
3. tuberculosis	Mycobacterium Tuberculosis	Droplet infection	Loss of appetite, Weakness, typical Fever pattern, night Sweat, chest pain Breathlessness.	Antib Antitu Thera (ATT)
4. diarrhoea	Salmonella, Shigella	Contaminated food And water	Loss of water, Vomiting, headache, Fever, abdominal Pain.	Antib like Penici
5. syphilis	Treponema Pallidum	Sexual contact, From mother to child	Painless ulcers, Swollen lymph Glands and joints, Paralysis, heart Trouble etc.	Antib
6. Gonorrhoea	Neisseria Gonorrhoeae	Sexual contact, use Of common toilets	Pus containing Discharge, burning Sensation in sex Organs, arthritis	Antib

Disease	Causative Organisms	Mode of Transmission	Symptoms	Cure
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Virus				
1.Hepatitis A	Hepatitis A virus	Contaminated food And water	High temperature, Headache, joint Pains, dark yellow Urine, fatigue. It is Also called jaundice	Interferon injection, Adequate rest
2. Hepatitis B	Hepatitis B virus	Infected blood, Inoculation, from Mothers to their Child, sexual route	Progressive liver Disease, chronic Active Hepatitis , Hepatocellular Carcinoma (cancer)	Interferon injection, Adequate rest
3. Rabies	Rabies virus	Bite of Dog, Monkey, etc.	High fever, painful Contraction of Muscles of throat And chest. Patient Develops fear of Water so it is also Called hydrophobia.	A course 5 anti Rabies vaccines at Regular intervals Within 7 days is Given
4. Influenza	Influenza virus	It is spread from Person to person Contact, Droplet Infection.	Sneezing, fever, Headache, muscular Pains, coughing, Discharge from nose	Amanatadine and Rimantadine are Used
5. AIDS	HIV Virus [Human immunodeficiency virus]	1.spreads through Unprotected sexual contact	Swollen lymph Nodes, regular	--



	Deficiency virus]	Sexual contact with An infected Persons 2. Spreads through The transfusion Of blood Contaminated with AIDS virus 3. Spreads through The use of infected Needles for Injection 4.AIDS infected Mother can Transmit the virus	fever, Weight loss, loss of Immunity.	
<b>Protozoans</b>				
1.malaria	Plasmodium	It spreads though The bite of female Anopheles Mosquito	Headache, Muscularpain, higher fever, feeling cold and shivering, Patient feels weak And becomes anaemic	Quinine should be Used
Amoebiasis	Entamoeba Histolytica	Contaminated food And water.	Diarrhoea	--

## NON COMMUNICABLE DISEASES

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Cause	Name of Disease	Symptoms
Deficiency		
1. protein (PEM)	Marasmus(infants below 1 year)	Shrivelled appearance, thin limbs, Prominent ribs, retarded physical mental Growth, digestive disorder, and diarrhoea.
2. protein(PEM)	Kwashiorkor(1 to 3 year age)	Loss of appetite, stunted bulging eyes, Enlarged stomach, long thin curved legs.
3. iron	Microcytic anaemia	Become pale, lose appetite, fever
4. vitamin B12	Pernicious anaemia	Become pale, lose appetite, fever
5. folic acid	Megaloblastic anaemia	Become pale, lose appetite, fever
6. Iodine	Goitre	Abnormal enlargement of swelling in the Neck, reduced thyroid function retarded growth.
7.vitamin A	xerophthalmia	night blindness, dryness of conjunctiva
8. Vitamin D	Rickets(children), osteomalacia (adults)	Twisted, thin, soft, bent deformed ribs.
9. Vitamin B-1	Beri-Beri	Muscular dystrophy, nervous disorders
10. Vitamin B5	Pellagra	'4D' syndrome, dermatitis, dementia, death.
11. Vitamin – C	Scurvy	Bleeding gums, loosening and falling out of teeth, Loss of weight
12. Degeneration	Heart attack, liver failure, kidney failure	Hypertension, liver megaly etc.
13. Hyper sensitivity	Allergy	Sneezing, coughing, watering eyes asthma, Hay fever
14. Uncontrolled growth of cells	Cancer and tumour	Loss of weight, person becomes cachectic can lead To death or destruction of organ



# EXERCISE

## OBJECTIVE DPP – 14 .1

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- . AIDS day.  
(A) May 1 (B) December 20 (C) June 1  
(D) December 1
- . Antibodies are.  
(A) lipids (B) genes (C) proteins  
(D) carbohydrates
- . Which of the following statements is correct ?  
(A) Degenerative diseases are non communicable (B)  
Allergy is caused by droplet infection  
(C) Cholera is a viral disease (D) AIDS can be  
prevented by vaccination.
- . Remain healthy means  
(A) free of infection by pathogen (B) tension free mental status  
(C) Living in a pollution free environment (D) All of the above
- . Diseases occurring due to infected articles of a patient are called  
(A) Air borne (B) Water borne (C) Fomite borne (D)  
Food borne
- . World Health Day Is On.  
(A) 1<sup>ST</sup> May (B) 7<sup>TH</sup> April (C) 30<sup>th</sup> June (D)  
5<sup>th</sup> December
- . Which are intimately related.  
(A) Diseases and health (B) Body and  
health  
(C) Body and mind (D) Body and  
spiritual health
- . Pulse polio programme is organised in our country for.  
(A) curing polio (B) eradicating polio (C)

- spreading polio (D) non of the above
- . Community health aims at.
  - (A) better health and family planning (B) better hygiene and clean environment
  - (C) removing communicable diseases (D) all of the above
- . Head quarter of work Health Organisation(WHO) is located at.
  - (A) New York (B) Geneva (C) London
  - (D) Paris

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## **SUBJECTIVE DPP - 14 .2**

### **VERY SHORT ANSWER TYPE QUESTIONS**

- . Write the name of causative organism of the following diseases.
  - (i) Tuberculosis (ii) Cholera
  - (iii) Hydrophobia
  - (iv) Influenza (v) AIDS
- . Write the difference between acute and chronic disease.
- . Why do malaria patients suffer from anaemia?
- . Name any three water borne diseases and their causative organisms.
- . Define interferons.

### **SHORT ANSWER TYPE QUESTIONS**

- . How are diseases diagnosed by physicians?
- . How are diseases manifested?
- . Name three acute and three chronic diseases.

### **ANSWER TYPE QUESTION**

- . Under which of the following conditions are you most likely to fall sick ?  
Give reasons in support of your answer.
  - (i) When you are traveling by bus.
  - (ii) When you are talking with your teacher.
  - (iii) When you visit a friend who is suffering from measles.

# EXERCISE

(Objective DPP # 13 .1)

Q	1	2	3	4	5	6	7	8	
A.	D	C	D	A	D	C	D	B	

(Objective DPP # 14 .1)

Q	1	2	3	4	5	6	7	8	
A.	D	C	A	D	C	B	D	B	

# NATURAL RESOURCES

## NATURAL RESOURCES

It indicates the potential wealth of a country. The variety of substance that man gets from earth and nature to meet his basic needs are called natural resources. The word resource means a source of supplying a material generally held in reserve. Natural resources are both living and non-living. Some of these resources are found in abundance, while others are found in limited quantities and that too in some restricted parts of our land. For this reason, the natural resource have to be wisely used. However, in reality it is not so. They are being used indiscriminately.

### (a) Types of Natural Resources :

Depending upon the abundance and availability, the natural resources are categorized into two types, i.e.

(i) inexhaustible natural resources

(ii) exhaustible natural resources.

#### Natural Resources



#### Exhaustible

- (i) Resources that are in limited quantity .
- (ii) Resources that are likely to be exhausted

#### Inexhaustible

- (i) Resources that are in unlimited quantity.
- (ii) Resources that are not likely to be exhausted by human activity or their use.

Renewable	Non-Renewable
(i) Can replenish themselves by quick Recycling and replacement within a reasonable time .	(i) Cannot replenish themselves by recycling and replacement.
(ii) Not likely to be exhausted .	(ii) These may be exhausted.
	(iii) Examples : Minerals, Fossil fuels

## AIR OR ATMOSPHERE

The multilayered, transparent and protective envelope of gases surrounding the planet earth is called atmosphere. In other words atmosphere is the layer or air above the earth's surface and air is a mixture of several gases. About 95% of total air is present up to the height of 20 km above earth's surface. Remaining 5% is up to the height of 280 km.

### (a) Composition of Air :

Gas	relative percentage / volume
Nitrogen	78.08%
Oxygen	20.94%
Argon	0.9%
Carbon dioxide	0.03%
He, Ne, Kr, Xe, Ch <sub>4</sub> .O <sub>3</sub>	in trace amounts

Besides these gaseous components air also possesses water vapour, industrial gases, dust, smoke particles, microorganisms, pollen grains, fungal spores etc.



**(b) The different zones of Atmosphere or Air :**

(i) **Troposphere:** It is the basal part that extends about 20 km above the earth's surface. (Upto 8 km on poles), in this layer important climatic events occur like cloud formation, lightening, thundering etc. in this region air temperature gradually decreases with height.

(ii) **Stratosphere:** It lies next to troposphere and is 30 km high. in this layer temperature rises. there is a formation of ozone layer in this region which can absorb the harmful ultra violet rays coming from sun.

(iii) **Mesosphere:** It lies next to stratosphere and is 40 km in height. Temperature decreases in this region.

(iv) **Lonosphere:** It lays upto the height of 300 km above earth's surface. In this layer gaseous components become ionized to sun's energy and remain there as ions.

**(c) Role of Air or Atmosphere :**

↑↑ It acts as medium for movement of insects, birds etc.

↑↑ It protects the life on earth from harmful ultra violet rays.

↑↑ It is a source of oxygen, carbon dioxide and nitrogen required for various metabolic activities of living beings.

↑↑ It helps in dispersal of spores, pollen, seeds etc.

↑↑ It maintains temperature on earth required for life.

↑↑ It transmits sound for communication.

↑↑ Ionosphere reflects the radio waves back to earth for long distance communication due to presence of ions and free electrons.

↑↑ Burning (combustion) takes place in presence of oxygen and produces carbon dioxide.

↑↑ Specific climatic conditions and water cycle is maintained due to circulation of air.

↑↑ Eukaryotic cells and many prokaryotic cells require  $O_2$  for break down of glucose to get energy through respiration, they release  $CO_2$ .

**(d) The Role of Atmosphere in Climate Control :**

Climate is an average weather of an area. Temperature, light and rainfall

are important factors that determine climate of an area. Atmosphere plays a crucial role in its control :

↑↑ It acts like a blanket covering the whole earth.

↑↑ It keeps the temperature of earth steady. It acts as bad conductor of heat thus prevents the sudden increase in temperature during the day as well as slows down the escape of heat into the outer space during night.

↑↑ The role of atmosphere on earth, when compared with moon (with no atmosphere), temperature range varies at moon from  $-190^{\circ}\text{C}$  to  $110^{\circ}\text{C}$ . Although both lie at same distance from sun.

### **(e) Wind :**

Air in called wind. Speed of wind can be determined by :

☐☐ Heating of air

☐☐ Formation of

water vapour

Atmosphere can be heated from below by radiations, such radiations are reflected back. Convection currents appear in air on being heated. When the air gets hot due to radiations emitted from land or water, it rises. Air over land get heated speedily as compared to air above water bodies because, land gets heat faster. Wind occurs because of horizontal and vertical differences in atmospheric pressure. During daytime in coastal regions, air on lands rises due to heating at faster rate. Air over sea moves into the space of low pressure created due to rising of air above land. This creates wind. During day time, thus air moves from to land. Sea and land both become cool during night hours. Cooling of water is slower than land, thus air above water becomes warmer. Thus air will move from land sea.

### **(i) Factors controlling movement of air**

**(A)** rotation of earth.

**(B)** in the path of wind, mountain ranges may come across. The general pattern of winds over earth is known as general circulation and specific winds are named for the direction from which they originate (e.g. wind blowing from west to east is westerly). Wind speeds are often classified

according to Beaufort scale.

**(f) Rain :**

The warm, moist and rising air cools and forms clouds in the sky. This happens due to heating of water bodies during day time which get mixed with atmosphere. The air rises, it expands and cools. cool air in the atmosphere sinks towards the ground. Due to cooling water vapours present in air get facilitated. These tiny droplets become bigger and bigger due to condensation. When they become heavy, they fall down in the form of rain. Four main types of precipitation are as follows:

**(i) rain.** Precipitation in the form of liquid

**(ii) sleet.** Rain which freezes.

**(iii) snow.** Small ice crystals that form around dust or salt particles.

**(iv) hail.** Frozen rain that is circulated up and down in a cloud until, it is hard frozen ball of ice.

↑↑ Cloudy, wet, changeable weather is common in low pressure zones with rising

unstable areas. Such conditions are found at temperate latitudes, where warm air along polar fronts. Here spiraling low pressure cells known as depressions (mid-latitude cyclones) are formed. In India mostly rains are brought by usually southwest or northeast monsoon. Depressions in Bay of Bengal also cause rain at some places of India.

## **POLLUTION**

Any undesirable change in physical, chemical or biological characteristics in the air, water and land which is harmful to the men directly or indirectly through animals, plants,

industrial units or raw materials is called as **pollution**. **pollution** is mostly man made. But it can also be natural.

**(a) Pollutants :**

Any material or act of man, or nature which leads to pollution is called as pollutants. The pollution is usually brought about by the addition to the environment of waste products of human activity. When the waste

products are not efficiently assimilated, decomposed or otherwise removed by natural, biological and physical processes (recycling) and the system is unable to utilize them properly, so that the balance of the system breaks down. Therefore such type of pollutants can stimulate or inhibit the biological reactions or change in their capacity. Therefore changes also take place in the ecosystem. The amount, numbers and types of pollutants are increasing with the growth of the population.

**(b) Air Pollution :**

Air pollution is caused due to the addition of the unwanted substances or gases. The atmospheric pollution is mainly caused by the activities of man and concentrated to the inhabited and the industrial complexes in cities. There are two main categories of air pollutants.

- (i) Gaseous: The gaseous materials include various gases and vapours of volatile substances or the compound with a boiling point below 200°C.
- (ii) Particulate: Dust particles, carbon particles, particles of other materials etc.

**(c) Major air Pollutants and Their Effects :**

- (i) **carbon monoxide (CO)** : this is the main air pollutant. Carbon monoxide is a highly toxic as which is colourless and odourless in nature. It combines with hemoglobin of the blood and blocks the transportation of oxygen. Thus, it impairs respiration and it causes death.

(ii) **Unburnt hydrocarbons** : Out of them 3, 4 – benzpyrene is the main pollutant. This causes cancer in lungs.

(iii) **Ethylene**: The falling of leaves without particular reason, falling buds etc. Effects are seen in plants are due to ethylene.

(iv) **Oxides of nitrogen**: these oxides form photochemical smog in the atmosphere and release ozone. Ozone causes harm to mucilaginous membrane. The oxide pollutants of nitrogen are nitric oxide (NO), and nitrogen di oxide (NO<sub>2</sub>). These oxides and ozone are very harmful for the plants. The entry of these pollutants causes various diseases in animals like- respiratory trouble such as emphysema, bronchitis, swelling of lungs and lung cancer etc.

(v) **smoke** : Many constituents are present in smoke such as **sulphur dioxide(SO<sub>2</sub>)**, Sulphur trioxide (SO<sub>3</sub>), Sulphuric acid (H<sub>2</sub>SO<sub>4</sub>), Ozone (O<sub>3</sub>), Carbon dioxide (CO<sub>2</sub>), PAN (Peroxyacetylene nitrate), Arsenic and Fluoride etc. the distribution area of lichen and mosses are the indicators of SO<sub>2</sub> pollution because lichen and mosses cannot grow in the industrial regions or the regions containing SO<sub>2</sub> pollutants. The higher concentration of ozone produces harmful effects. But normally, ozone layer absorbs U.V. rays which are harmful for the living things.

(vi) **aerosol** : The aerosol like C.F.C. (chloro fluoro carbon) release into the atmosphere from the refrigerators, air conditioners and jet planes deplete or reduce the ozone layer. This thin layer of ozone is also known as ozone hole results in the increase in temperature of the earth.

**(d) Measures to Control Air Pollution :**

↑↑ Barium compounds should be mixed with petrol which reduce the smoke.

↑↑ It is also very essential to check the quality of gases released from the factories.

↑↑ Industries should not be established at one place.

↑↑ The smoke should be released into the atmosphere after filtration and purification (by cyclone collector or electrostatic precipitators).

## **WATER (HYDROSPHERE)**

It is renewable resource which is essential for sustenance of life. It covers  $\frac{3}{4}$  th of the earth's surface. Of the total water present in hydrosphere 97% is present in oceans which is not utilizable by living beings. Only 3% water is fresh water. Among this 3%, 72.2% is stored in glaciers and ice caps (frozen), 22.4% is ground water and soil moisture. Remaining 0.36% is found in lakes, rivers, streams and swamps.

### **(a) Types of Water Resources :**

**(i)** Fresh water resource : It consists of ponds, lakes, large rivers. It can be recycled. It is essential for life on earth as well as for survival. It can be obtained by three different types of natural resources.

**(A)** Rain water : India receives 3 trillion  $m^3$  of water from rainfall or precipitation. Its intensity is different in different zones, on this basis zones are classified as :

↑↑ Wet zone : with very high rainfall     $\frac{2}{8}$  intermediate zone : with heavy rainfall

↑↑ Semi arid zone : with moderate rainfall     $\frac{2}{8}$  Arid zone ; with low rainfall.

↑↑ There are 14 major river systems with plenty of lakes, ponds etc.

↑↑ It is the water which percolate into the ground. There is a certain level below the surface where the rocks are saturated with water and this level is known as the zone of saturation. The upper level of the zone of saturation is called the **water table**. **However**, the vertical distance from the surface from the surface of a region of the water table is called the **water level**.

**(ii) Salt water resource :** It consists of oceans, seas etc. it cannot be used by living beings for drinking.

### **(b) Role of Water or Hydrosphere :**

↑↑ Water is the main constituent of protoplasm.

↑↑ It is the universal solvent. Through which mineral salts are

transported from one part of the plant to the other.

↑↑ Various metabolic reaction take place in the medium containing water.

↑↑ It acts as a reactant in numerous metabolic reactions.

↑↑ During photosynthesis, water releases oxygen.

↑↑ Turgidity of the growing cells is maintained with water.

↑↑ Various movements of plant organs like movements in sensitive plant (touch-me-not) are controlled by water.

↑↑ The growth of the cells during elongation phase is mainly depends upon absorption of water.

↑↑ Metabolic end product of respiration is water.

↑↑ It acts as a temperature buffer as its specific heat is highest (only exception – liquid ammonia).

↑↑ It show the properties of cohesion and adhesion which account for the capillary action of water.

### **(c) Water pollution :**

**The water pollution is caused by the addition of organic and inorganic chemicals as well as the biological materials which change the physical and chemical properties of water. This harmful process is called as water pollution. The water pollution is caused by many sources such as sewage matter, industrial wastage, agricultural wastage, domestic wastage, not water of thermal plants and nuclear reactors etc. water pollution can be caused by the following man made sources :**

**(i) Household detergents :** The household detergents include the compounds of phosphate, nitrate, ammonium and alkylbenzene sulphonate etc. harmful substances which are gathered in water. Alkyl benzene sulphonate (ABS) is not degradable, so that its concentration increases which is harmful for aquatic life.

↑↑ **Control measures :** For the control of this pollution lime, ferric

chloride etc. are used to precipitate the phosphate. Zirconium is considered best for this purpose.

**(ii) Sewage :** Sewage contains highest amount of carbonic materials and biological materials. These carbonic materials increase the number of decomposers like bacteria and fungus. The rate of reoxygenation reduced as compared to deoxygenation in a water reservoirs. The acceleration of microbial activity increases the BOD of water. BOD is very less in pure water. The higher BOD is the indication of water pollution and the water of polluted reservoir can not be utilized and produces a very bad smell spreading around the locality. The infection or disease also takes place. Daphnia and some fishes are sensitive to water pollution and show the intensity of water pollution.

↑↑ **Control measures :** To control the water pollution of sewage water it should be left into reservoir after the primary and **secondary treatment**. The big particles are mainly separated in primary treatment through floatation and sedimentation. Micro organisms are used for secondary treatment such as oxidation chamber or activated sludge process. Oxidation chamber is a shallow reservoir in which the sewage is stored. Algae and bacteria grow very well because of the higher amount of carbonic materials in it. Bacteria decomposes the organic materials and produce  $\text{CO}_2$  which is utilized by the algae in photosynthesis. Oxygen released by photosynthesis protects the water pollution. Therefore oxidation pond is the example of symbiosis in between algae and bacteria. The infectious bacteria are destroyed during the activity (reactions) in the oxidation pond. So that the simple substances are left after decomposition of organic matter.

**(iii) Industrial wastes :** the wastes of industries are discharged into the running water, rivers and canals, industrial wastes mainly contain inert suspended particles such as dust, coal, toxins like acid, base, phenols, cyanides, mercury, zinc etc., inorganic materials like-ferrous salts, sulphides, oils and other residues of organic material and hot water. The water polluted by mercury, lead etc. causes disorganization of nervous



system. It means it produces insanity. The minamata disease is caused in Japan by eating of mercury polluted fishes. So many people died because of this disease.

↑↑ **Control measures:** The industrial wastes and toxic components should be made pure before releasing into rivers, lakes, ponds or sea. So that the water pollution of industrial effluents can be controlled by suitable treatment to remove the pollutants.

↑↑ **Bioaccumulation of pesticides:** Pesticides like DDT are poisonous chemicals sprayed on crops to protect them from pests and diseases. This increase in concentration of harmful non-biodegradable chemical substances in the body of living organisms at each trophic level of a food chain is called biological magnification.

↑↑ **Eutrophication:** the discharger of sewage water and detergents in water bodies promotes excessive growth of phytoplanktons (minute aquatic algae). This excessive growth causes reduction in oxygen level of water. The excessive growth of phytoplanktons brings about a reduction in dissolved oxygen which affects other aquatic organisms. Consequently potential sources of food are highly reduced.

## **LITHOSPHERE**

**Lithosphere is the main life supporting system. Top layer of earth is called soil. It is the main natural resource essential for survival and development.**

### **(a) Structure and Formation of Soil :**

Soil is formed due to interaction between weathering of rocks, rain, wind, temperature (physical components) and plants, animals and microbes (biological components). It is formed by combined action of climatic factors such as temperature, rainfall, light etc. and biotic factors such as plants and microbes on earth crust.

### **(b) Constituents of Soil :**

**Soil contains:** (a) inorganic constituents of parent rocks (b) organic products of living organisms; (c) living organisms including microorganisms (d) air in the pores. There are four important components

of soil. They are

(i) Mineral matter	50-60%
(ii) Organic matter	10%
(A) Living organisms	(B)
decomposed matter	
(iii) Soil water	25-35%
(iv) Soil air	15-25%

**(c) Types of Soil :**

On the basis of its nature and composition, soil is mainly of six types ----

(i) Alluvial soil: rich in loam and clay. (ii) **Black soil-which has clay.**

(iii) Red soil: which is sandy to loam. (iv) **Mountain soil-which is a stony and sandy soil.**

(v) Desert soil- which is sandy. (vi) **Laterite soil- which has porous clay.**

Outer most layer of earth is called crust. Many types of minerals are found in crust. They provide many types of nutrients to living beings.

### **Factors / Processes Responsible for Formation of Soil :**

(ii) **Sun:** rocks get expanded due to heat produced by sun during day time. At night, The rocks cool down and contract. Due to this unequal expansion and contraction of rocks, cracks in rocks appear. This leads to formation of smaller pieces of rocks.

(iii) **Water :** due to continuous movement of rain and fast flowing river water, rock Pieces collide and break down in still finer particles due to their abrasive effect.

(iv) **Wind:** wind has abrasive effect on rocks. Finer rock particles are blown away and get deposited at other distant places.

(v) **Living organisms :** the step of weathering is brought about by plants and animals. Lichens are first to appear on bare rocks. They produce acids which corrode the rocky surface to produce fine particles. Now plants like mosses can appear on it. In such type of soil, certain microbes, algae, insects and worms appear and die. Organic matter gets accumulated. Roots of some plants grow into the cervices of rocks.

#### **(d) Soil pollution :**

Soil is also polluted through the polluted water and air. These pollutants are mixed into the soil through the rainy water. Such as  $\text{H}_2\text{SO}_4$  acid is formed by mixing of  $\text{SO}_2$  with rainy water in the air. The fertilizers are used to increase yield of the crops. Various types pesticides and weedicides etc. are sprayed over the crops. All these mixed with soil to produce harmful effects. The growth of plants inhibited or reduced due to this type of pollution and sometimes death also takes place. Excluding to these soil pollution is also caused by the disposal of house hold detergents, sewage, flowing oils, radioactive substances and hot water etc. the main substances of pesticides in soil pollutants are D.D.T. and weedicides 2, 4-D (2,4 di-chlorophenoxy acetic acid) 2,4,5-T (2,4,5, tri-chlorophenoxy acetic acid).

(i) **Control measures:** soil pollution can be controlled through biological degradation of waste materials. The various carbonic materials are of agricultural waste, cattle dung etc. which can be minimized by the use of biogas plants which can produce energy also. Inspite all measures pesticides and weedicides should be used in limited quantity only when

they are required. Bhopal Gas Tragedy is the best example of human hazard which took the life of many persons the tank of methyl isocyanate burst during the manufacturing of savin insecticide on 3<sup>rd</sup> **December 1984.**

**(ii) Soil erosion :**

☐☐ Fertility of soil depends on

(A) Presence of organic matter(humus) and nutrients, (ii) capacity of soil to retain water and air. A loamy soil is the best-suited for plant growth.

(B) The fertility of soil is threatened due to various activities of humans. The main threat to the fertility of soil is from soil erosion, which is the loss of soil due to wind or water flow.

**(e) Methods of Preventing Soil Erosion :**

Prevention of soil erosion can be brought about by controlling the factors which cause soil erosion. The methods would thus be follows:

☐☐ Deforestation should be stopped, rather, trees should be planted (afforestation). Afforestation should be undertaken not only in areas already cut, but additional areas should be brought under plantation.

☐☐ To reduce the effect of strong wind in the fields, the boundaries of the fields should be planted with trees in two or three rows.

☐☐ To maintain the soil in its natural condition, it is advisable to grow different crops. Crop rotation helps to maintain the fertility of the soil. The water – holding capacity of the soil is also maintained by this method.

☐☐ Proper drainage and irrigation arrangements should be made in the fields.

☐☐ On the sloping areas in hills, strip cropping should be practiced, thereby reducing the steepness of the slopes and checking soil erosion.

☐☐ **Strip – cropping** means the planting of crops in rows or strips to check flow of water.

# EXERCISE

## OBJECTIVE DPP – 15 .1

- . Soil is a part of  
(A) atmosphere (B) lithosphere (C) hydrosphere  
(D) ionosphere
- . Maximum air in which we breath is present at  
(A) troposphere (B) stratosphere (C) ionosphere (D) mesosphere
- . Biogeochemical cycles are also known as  
(A) sedimentary cycles (B) gaseous cycles (C) material cycles  
(D) cycles of water
- . Which of the following is a free living nitrogen fixing bacteria present in soil ?  
(A) Azotobacter (B) Nitrosomonas (C) Rhizobium (D) pseudomonas
- . CO<sub>2</sub> and O<sub>2</sub> balance in atmosphere is due to  
(A) Photosynthesis (B) respiration (C) leaf anatomy (D) photorespiration
- . Nitrogen fixation is  
\_\_\_\_\_ (A) Nitrogen Ammonia (B) Nitrogen nitrates  
\_\_\_\_\_ (C) Nitrogen Amino acid (D) Both A and B
- . Soil erosion can be prevented by  
(A) deforestation (B) afforestation (C) overgrazing (D) removal of vegetation
- . A renewable source of energy is

- (A) petroleum                      (B) coal                      (C) nuclear fuel                      (D) trees
- . Percentage of nitrogen in air is  
(A) 77.02%                      (B) 78.09%                      (C) 76.08%  
(D) 74.09%
- l. Ozone layer is present in atmosphere in  
(A) troposphere                      (B) stratosphere                      (C) mesosphere  
(D) thermosphere

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### **SUBJECTIVE DPP - 15 .2**

#### **VERY SHORT ANSWER TYPE QUESTIONS**

- . Define the term biosphere.
- . Mention the components of biosphere.
- . Name any two inexhaustible and exhaustible natural resources.
- . Write about the cause of wind.
- . Name three natural resources of water.

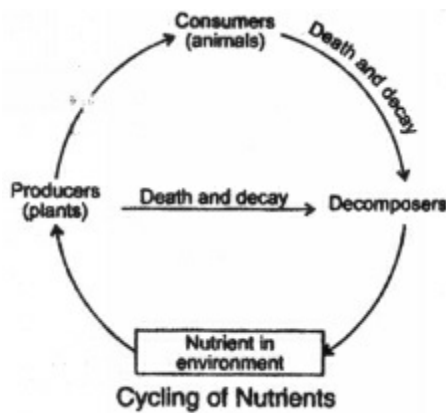
#### **SHORT ANSWER TYPE QUESTIONS**

- . Explain the composition of air ? What is the role of atmosphere in climate control?
- . Write a short note on wind.
- . Write the causes and effects of air pollution.

#### **ANSWER TYPE QUESTION**

- . What is green house effect? Name the different green house gases.

# **NATURAL RESOURCES**



## BIOGEOCHEMIC CYCLES

These are the cyclic pathways through which chemical elements move from environment to organisms and back to the environment. Such cycling is essential as the earth and its environment, with reference to these elements, are considered as closed system and there is no inflow of such elements from outside the earth and their amount is limited.

Two types of biogeochemical cycles are :  
 Gaseous cycles  
 Sedimentary cycles



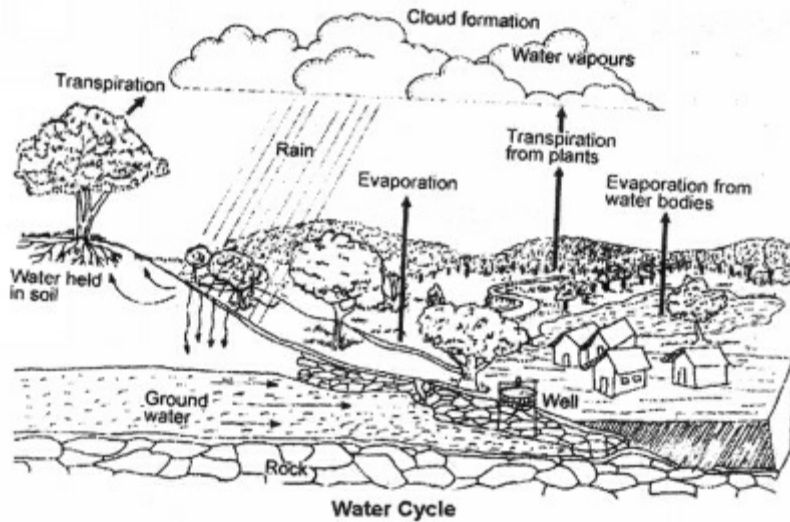
Table: Differences between gaseous and sedimentary cycles		
Characters	Gaseous cycles	Sedimentary Cycles
Reservoir pool	Air or water	Rocks
Speed	Faster	Slower
Examples	Carbon, nitrogen	Calcium, phosphorous

and oxygen cycles

sulphur cycles.

**(a) Water Cycle :**

Water is the most abundant (60-90%) component of protoplasm. It acts as a habitat for hydrophytes and many aquatic animals, a good ionizer, good solvent, temperature, buffer and perform transportation of materials. It also helps in digestion of organic compounds and in photosynthesis of plants.





**(i) Types of water cycles are:**

**(A) Global water cycle :** does not involve living organisms and involves the interchange of water between the earth's surface and the atmosphere via the processes of precipitation and evaporation. Ocean is the biggest store house of water. Evaporation involves the conversion of liquid and solid forms of water into vapours and later form the clouds. Precipitation involves the rainfall, hail, snow, etc. energy for global water cycle is provided by sunlight.

**(B) Biological water cycle :** it is the interchange of water between Abiotic and biotic components of environment e.g. the plants absorb water from water bodies and soil while loose most of the water by the process of transpiration, animals consume water from water bodies or the food ingested, while release water via the processes of respiration and excretion.

**(b) Nitrogen Cycle :**

Nitrogen is an essential component of amino acids, proteins, enzymes and nucleic acids of the protoplasm. Reservoir pool of nitrogen is atmosphere which contains about 78.08% of nitrogen in gaseous state. But it cannot be used directly and is changed into nitrites and nitrates and then utilized.

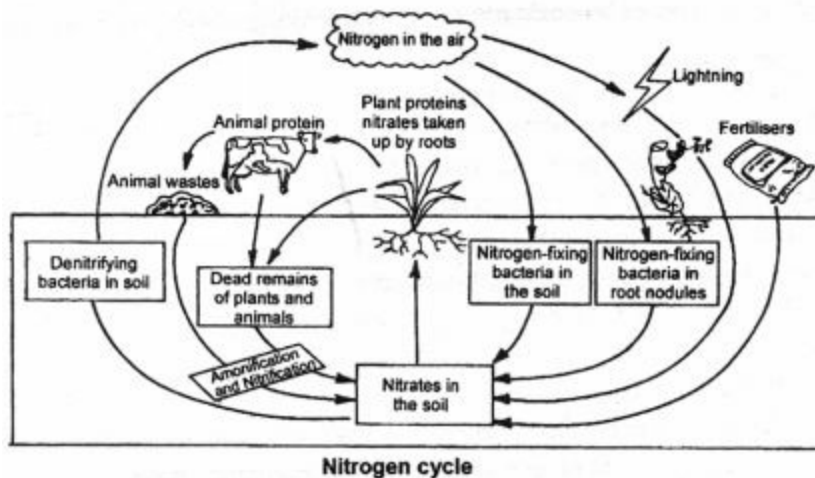
**(i) Steps of nitrogen cycle are:**

**(A) Nitrogen fixation:** it involves the conversion of free diatomic nitrogen ( $N_2$ ) into nitrites and nitrates. It occurs in three ways :

☐☐ Atmospheric nitrogen fixation in the presence of photochemical and electrochemical reactions induced by thundering and lightening.

☐☐ Industrial nitrogen fixation in the industries at night temperature and high pressure.

☐☐ Biological nitrogen fixation in the presence of certain living organisms as



□□  
□□  
□□  
□□

**Rhizobium** bacterium in the root nodules of legumes.

**Azotobacter** bacterium in the soil.

**Anabaena** (blue green algae) in water in the paddy fields.

**Azospirillum** bacterium in loose association with the roots of maize, sorghum, etc.

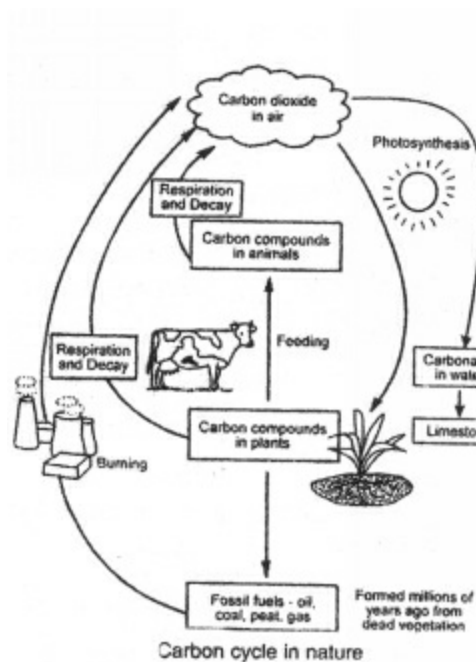
**(B) Ammonification:** it involves the decomposition of proteins of dead plants and animals to ammonia in the presence of ammonifying bacteria like *Bacillus ramosus*.

**(C) Nitrification:** it involves the oxidation of ammonia to nitrites ( $\text{NO}_2$ ) and nitrates ( $\text{NO}_3$ ) in the presence of nitrifying bacteria like *Nitrosomonas* (Ammonia to nitrite), *Nitrobacter* (Nitrite to nitrate), etc. plants absorb the nitrites and nitrates from the soil through their roots and convert them into organic compounds(e.g. proteins) of protoplasm by the process called nitrogen assimilation.

**(D) Denitrification:** it involves reduction of ammonium compounds, nitrites and nitrates to molecular nitrogen in the presence of denitrifying bacteria like *Thiobacillus denitrificans*.

### (c) Carbon Cycle :

Carbon is the basic component of all the organic compounds like carbohydrates, proteins, lipids, enzymes and nucleic acid of the protoplasm. In atmosphere, it is present as carbon dioxide. It involves two types of processes, one involving  $\text{CO}_2$  utilization and another involving  $\text{CO}_2$  production. They are expressed as follows:



(i)

**CO<sub>2</sub> utilization :** carbon dioxide

is utilized by the

Photosynthetic organisms like green plants,

Photosynthetic bacteria, diatoms and blue green algae

In the presence of Photosynthesis, it occurs in the

Presence of chlorophyll and radiant energy of

Sunlight. Glucose synthesized in photo synthesis is

Used to synthesize other organic compounds.

(ii) **CO<sub>2</sub> production :**

☐☐

CO<sub>2</sub> is released during respiration of both producers

And consumers.

☐☐

During decomposition of organic compounds of dead

Bodies.

☐☐

During burning of fossil fuels like wood, coal,

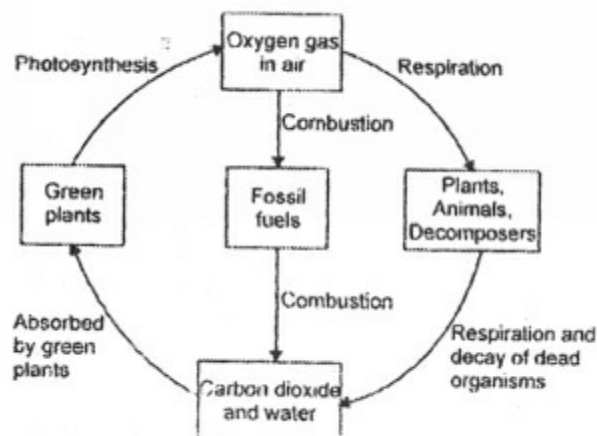
Petroleum, etc.

☐☐

Volcanic eruptions and hot springs.

☐☐

During weathering of rocks by acids produced by microorganisms and roots of higher plants.



Oxygen Cycle in nature

### Oxygen Cycle :

(d)

Oxygen is present in water and from 20% of air in Atmosphere. All living beings need it for respiration. Oxygen content of atmosphere has remained constant For the last several million years. Most of  $O_2$  lost is Replenished by photosynthesis. During photosynthesis  $CO_2$  is used by plants to form food along with release Of oxygen. The oxides can be reduced both chemically And biologically to produce oxygen. Microbial oxidation can also occur. Due to burning materials oxygen form carbon dioxide. When oxygen combines with nitrogen, it forms oxides of nitrogen, amino acids, proteins etc. these compounds on breakdown release the oxygen in atmosphere.

### GREEN-HOUSE EFFECT

Usually carbon dioxide is not considered as pollutant, but its higher concentration forms the thick layer above the earth surface which checks the radiation of the heat from the earth surface. Because of this the temperature of the earth surface increases. This is called as “Green house effect”.

The various green house gases are  $CO_2$  (Warming effect 60%) ,  $CH_4$  (Warming

effect 20%), chlorofluoro carbon or CFCs(14%) and Nitrous oxide( $N_2O$ 6%) :

Even  $2-3^{\circ}C$  rise in Temperature will lead to melting glaciers and Ice caps of polar regions & consequently Causes floods in rivers, rise in sea level and Changes in cycle of rain. Islands may be Emerged in sea water. The present growth rate Is continued then the amount of  $CO_2$  will be double upto 2020.

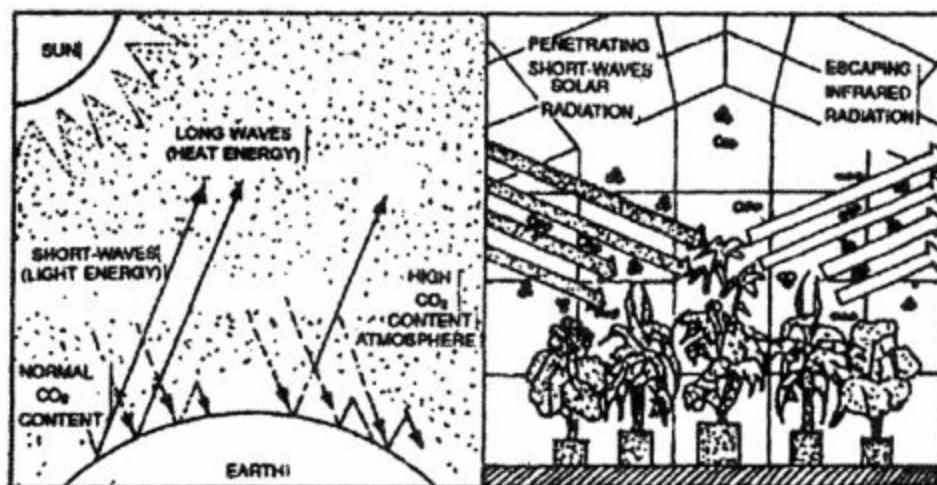


Fig : Green House effect

### (a) Global warming :

Global warming is the increase in average global temperature due to increase in amount of GHGs in earth's atmosphere.

#### ☐☐ consequences of global warming :

(i) **Increase in the sea level :** Global warming will melt polar ice caps. If all the ice on the earth will melt, about 200 feet of water would be added to surface of all oceans. Thus low lying coastal cities like shanghai, Kolkata, Bangkok, Dhaka, Venice, etc. will be inundated.

(ii) **Increase in global temperature :** If present input of GHGs will be continued, the earth's global temperature will rise.

(iii) **Effect on agriculture :** Grain production will be reduced. India's annual monsoon rains may even cease together. One third of global forest might be swept away. Deserts are likely to increase

(iv) Chances of hurricanes, cyclones and floods will be more.

(v) Increased temperature and humidity caused by global warming

will lead to spread of diseases like malaria, filariasis etc. due to spread of vectors. Incidences of respiratory and skin diseases are likely to increase.

## **OZONE DEPLETION**

Between 320 And 26 Km Above The Sea Level It Occurs Ozone Layer And The Part Of Atmosphere Containing It Is Called Ozonosphere (Stratosphere). This layer is established due to an equilibrium between photo-dissociation of ozone by UV-radiation and regeneration of ozone. The thickness of this ozonosphere averages 5km. the ozone layer acts as a shield and absorbs the harmful UV-radiations of the sunlight so protects the earth's biota from the harmful effects of strong UV-radiations. So this layer is very important for the survival and existence of life on earth.

### **(a) Causes of Thinning of Ozone Layer :**

The decline in spring-layer thickness is called ozone hole is largest over Antarctica and was just short of 27 million sq.km. during September 2003. main chemicals responsible for destruction of ozone-layer are : chlorofluorocarbons(CFCs), halogens (used in fire extinguishers) methane and nitrous oxide. Out of these, most damaging is the effect of CFCs which are a group of synthetic chemicals and are used as coolants in refrigerators and air conditions; as cleaning solvents, propellants and sterilants etc. these CFCs produce "active chlorine" (Cl and ClO radicals) in the presence of UV-radiations. These active chlorine radicals catalytically destroy ozone and convert it into oxygen.

☐☐ Nitrous oxide : It is produced by industrial processes, forest fires, solid waste disposal, spraying of insecticides and pesticides, etc. methane and nitrous oxide also cause ozone destruction.

### **(b) Effects of Ozone Depletion :**

The thinning of ozone layer results in an increase in the UV radiation (in the range of 290-320nm) reaching the earth's surface. It is estimated that a 5 per cent loss of ozone results in a 10 per cent increase in UV-radiations. These UV-radiations :

- (i) Increased incidences of cataract and skin cancer.
- (ii) Decrease the functioning of immune system : due to killing of

melanin- producing cells of the skin.

(iii) Inhibit photosynthesis in most of phytoplanktons so adversely affecting the food chains of aquatic ecosystems.

(iv) Damage nucleic of the living organisms.

☐☐ **Strip-cropping** means the planting of crops in rows or strips to check flow of water.

# EXERCISE

## OBJECTIVE DPP – 16.1

- . Nodules in the roots of legume plants contain  
(A) nitrogen fixing bacteria (B) sulphur fixing bacteria  
(C) potassium fixing bacteria (D) none of the above
- . Which gas is mainly responsible for the depletion of ozone layer ?  
(A) oxygen (B) CFC (C) Nitrogen dioxide (D) All of the above
- . Acid rain mainly contains  
(A) nitric acid (B) hydrochloric acid  
(C) Sulphuric acid (D) (A) and (C)
- . Plants and animals are known as  
(A) biotic resources (B) Abiotic resources (C) machines (D) none of these
- . Coal is an / a  
(A) exhaustible resource (B) inexhaustible resource  
(C) potential resource (D) none of these
- . Ozonosphere occurs at height of  
(A) 8-10km above poles (B) 8-10km above equator  
(C) 20-26 km above the earth surface (D) 11-16km above equator
- . Biosphere is made of



- (A) living beings and their remains
  - (B) living beings, lithosphere, hydrosphere and atmosphere
  - (C) living beings and lithosphere
  - (D) living beings, lithosphere and hydrosphere.
- . Soil erosion can be prevented by
    - (A) deforestation                      (B) afforestation                      (C) overgrazing                      (D) removal of vegetation
  - . Which one of the following is renewable resource ?
    - (A) water                      (B) Metals                      (C) Fossil fuel                      (D) All of these
  - . Which gas is responsible for the global warming
    - (A) O<sub>2</sub>                      (B) N<sub>2</sub>                      (C) H<sub>2</sub>                      (D) CO<sub>2</sub>

### **SUBJECTIVE DPP – 16.2**

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#### **VERY SHORT ANSWER TYPE QUESTIONS**

- . Define pollution.
- . What is acid rain ?
- . Expand CFC and write about its effect on environment.
- . What is global warming ?
- . Define biogeochemical cycles ?

### SHORT ANSWER TYPE QUESTIONS

- . Write the causes and effects of water pollution.
- . Write a short note on importance of water in biosphere.
- . How is soil formed ? what is the role of human in fertility of soil ?

### LONG ANSWER TYPE QUESTION

- . Give diagrammatic representation of carbon and oxygen cycles.

## EXERCISE

### (Objective DPP # 15 .1 )

Q	1	2	3	4	5	6	7	8	
A.	B	A	C	A	A	D	B	D	

### (Objective DPP # 16 .1 )

Q	1	2	3	4	5	6	7	8	
A.	A	B	D	A	A	C	B	B	

# IMPROVEMENT IN FOOD RESOURCES

## INTRODUCTION

food is the combination of various organic and substances which is capable of providing

- (i) energy for the various metabolic activities.
- (ii) materials for repair / replacement of worn-out tissues in the body.
- (iii) materials for growth & reproduction.
- (iv) regulatory substances, body secretions and metabolic activities etc.

### **(a) Agriculture :**

(Ager means field ; cultural means cultivation). it is applied biological science which deals with the production of plants raising of animals

useful to man, involving soil cultivation, breeding and management of crops and livestock.

**(b) Horticulture ;**

(Hortus-garden ; cultura-cultivation). it is the branch of agriculture and the science of growing vegetables, fruits and ornamental plants.

**(c) Silviculture :**

(Sylvan-wood and trees) Cultivation of wood and trees **e.g. –pine, teakwood, sesamum etc..**

**(d) sources of Food :**

plants provide us foods like cereals, pulses, oil seeds, fruits and vegetables, on this basis plants are classified as follows :

**Table: Classification of crop plants**

Type of crop plant	Examples	Importance
1. cereals	Wheat, Rice, Maize, Minor Millets, Sorghum	Rich carbohydrates energy Requirements.
2. pulses	Gram(Chana), Pea (Matar) Black Gram (Moong), Pigeon Pea (Arhar), Lentil (Masoor) Etc.	Rice in proteins are body Builders.
3. oil seed crops	Soybean, Groundnut Sunflower, Niger, Sesame, Castor, Mustard, Linseed.	Rice in oils and acid
4. root crops	Turnip, Carrot, Turmeric, Sweet	It is utitized as vegetables &

	Potato & Ginger	medicines
5. sugar crops	Sugarcane And Beet	Important for industry.
Type of crop plant	Examples	Importance
6. fibre crops	Jute & Cotton	Important for jute and cotton industry.
7. plantation crops	Tea, Coffee, Coconut And Rubber	Increases case also called as Case crops.
8. fodder crops	Berseem, Maize, Sorghum And Elephant Grass.	Provide fodder animals
9. horticulture crops (Fruits and vegetables)	Apple, Banana, Guava, Pomegranate, Pears, Chilies, Coriander, Jeera, Carrot, Raddish, Cabbage, Cauliflower, Spinach, Cucurbit.	Provide vitamins and minerals along with small quantities of Carbohydrates, proteins and oils.

**(e) Crop Seasons :**

Different types of crops require different climatic conditions like :

- (i) Temperature
- (ii) Photoperiod (duration of light)
- (iii) Completion of life cycle

**(f) Depending Upon the Growing Season, there are two Groups of Crops :**

Kharif crop Rainy season crop	Rabi crop/ Winter season crop
-------------------------------	-------------------------------

(i) Are grown during monsoon/rainy season	(i) Are grown during winter season
(ii) They require warm and wet weather	(ii) They require cold and dry weather
(iii) They are sown in June/July and harvested in September/October	(iii) They are sown in October/November and harvested in March/April
(iv) E.g. – Rice, Jowar, Bajra, Cotton, Pea, Groundnut, Urad, Moong etc.	(iv) E.g. – Wheat, Barley, Gram, Mustard, Potato etc.

### **IMPROVEMENT IN CROP YIELD**

- (i) Varietal improvement of crop through genetic manipulation.
- (ii) Crop production management.
- (iii) crop protection management.

↑↑ **Improvement in Crop yield** : in India, there has been a four times increase in the production of food grains from 1960 to 2004. However, cultivable land area has increased by only 24 per cent. the yield of a crop can be increased by adopting number of improved agricultural practices, from sowing to harvesting. the various practices that are followed at various stages of production are as follows :

- ↑↑ preparation of soil ◇ Sowing
- ↑↑ Application of manures and fertilizers ◇ irrigation
- ↑↑ weed control ◇ Crop protection
- ↑↑ harvesting, threshing and winnowing ◇ Storage
- ↑↑ crop improvement ◇

Rotation of crops, mixed and multiple cropping.

#### **(a) Varietal improvement of Crops Through Genetic Manipulation :**

The principal aim Varietal improvement is to get many of the desirable &

economic characters as possible in one variety.

**(i) Aims of crop improvement are :**

- (A) Developing high yielding varieties (B)  
improved quality
- (C) Early and uniform maturity (D)  
insensitivity to light and temperature
- (E) Wider adaptability (F)  
Lodging- resistant varieties
- (G) Desirable agronomic characters

**(ii) Plant breeding :** the technique of producing improved varieties of crop plants by

the introduction of several desired characters into them is called as **plant breeding**. Scientists concerned with the improvement of crop varieties are called as **plant breeders**.

**(iii) Aims of plant breeding :** new varieties of crop plants have :

**(a)** higher yield.

**(b)** resistance to

heat, frost, drought

**( c )** pest resistance

**(d) early**

**maturing varieties**

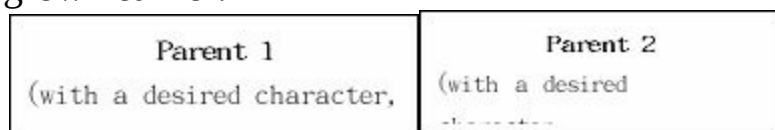
**(iv) Methods for the genetic improvement of crop plants :**

**(a)**introduction

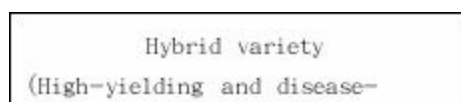
**(b)** selection

**(c)** hybridization

**(A) introduction :** it refers to the taking of superior varieties of crop plants from the place of their natural cultivation to the place where they were never grown earlier.



□  
□



↑↑ **Green revolution** was a process by which India's production of wheat, rice, maize and several other food grains was tremendously increased in the late 1960s and early 1970s. India, which was due to the new agricultural technologies whereby high-yielding varieties of wheat and rice were grown in India. Fertilizers and pesticides were used. Irrigation facilities were improved. Dr. M.S.Swaminathan played a key role in bringing about the 'green revolution'.



↑↑ Padam Vidhuahan Professor, DR.M.S> Swaminathan, FRS(Fellow of Royal Society), is the Father of green revolution in India. he stressed the need for the reorientation of the breeding programme and his work led to the era of dwarf varieties in India. In 1967, he developed a high-yield dwarf variety of wheat, Sharbati Sonara. Being a plant geneticist, he has contributed to the development of agriculture in indica. He has held various important positions in India and abroad.

**(B) Selection :** it is the process in which economic plants having best desired characters are picked up from the given population and seeds of such plants are used for future cultivation.e.g. Maize & Cabbage are represented by their cultivated varieties only.

### Selection can be

**(C) Hybridization :** it means the process of crossbreeding of two genetically dissimilar varieties of crop plants (each having a specific and better characteristics) to obtain a new crop plant having both the desired characteristics is called as **hybridization**. crop plants produced in this way are called as **hybrid varieties or high yielding varieties**.

Inter generic — Between plants belonging to

### **(b) Crop Production Management :**

in order to improve and manage our crop production system, we have to focus on cheaper and farmer friendly approaches. as there is direct co-

relationship between the higher yields and input applications.

↑↑ **Successful crop Productions upon :**

- (i) Understanding how crops develop and grow.
- (ii) How various factors affect the growth and development of crops and
- (iii) How each factor can be modified and managed.

↑↑ **Approaches for crop production :**

- (i) Nutrient management
- (ii) irrigation
- (iii) Mixed cropping
- (iv) Inter cropping
- (v) crop rotation

↑↑ **Nutrient management :** Plant nutrients are the mineral elements needed by the plants for their growth, development and maintenance. plants absorb a large number of elements from soil, besides water and air, only 16 elements are essential nutrients for plants, out of 40 elements in plant ash. they are :

- (i) Carbon
- (ii) iron
- (iii) hydrogen
- (iv) Manganese
- (v) Oxygen
- (vi) Phosphorus
- (vii) Nitrogen
- (viii) Zinc
- (ix) Phosphors
- (x) Copper
- (xi) Potassium
- (xii) molybdenum
- (xiii) Magnesium
- (xiv) Chlorine
- (xv) Sulphur
- (xvi) Calcium

↑↑ **Sources of plant nutrient :** the plants obtain their nutrients mainly from the soil. out of the total 16 nutrients, as many as 13 are absorbed from the soil.

SOURCES OF PLANT NUTRIENTS	
Soil	Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, Sulphur, Iron, Manganese, Boron, Zinc, Copper, Molybdenum, Chlorine
Air	Carbon, Oxygen
water	Hydrogen

↑↑ **Characteristics of an essential plant nutrient :**

- (i) In the absence of such element, the plant is not complete its life

cycle.

(ii) Such element much have a direct influence on the plant nutrition and metabolism.

(iii) The requirement of such element can be corrected or prevented only by supplying that Nutrient.

↑↑ **Classification of plant nutrients** : On the basis of quantities required 13 mineral nutrients are obtained from soil needed for plant growth have been grouped into two categories.

**(i) Macronutrients**

**(ii)**

**Micronutrients**

<b>Micronutrients</b>	Carbon, Hydrogen, Oxygen, Nitrogen, Phosphorus, Potassium, Calcium, Magnesium, Sulphur,
<b>Micronutrients</b>	Iron, Manganese, Boron, Zinc, Copper, Molybdenum, Chlorine.

out of the sixteen essential nutrients, some are required by plants in relatively large amounts than the others. the nutrients required in relatively large quantities are called macronutrients or major elements, while the ones required in very small quantities or traces are called micronutrients or minor elements. deficiency of the nutrients affects physiological process in plants as well as their reproduction, growth and susceptibility to diseases. to overcome the deficiency of nutrients, the soil can be enriched by adding manures and fertilisers.

↑↑ Besides these, carbon, oxygen and hydrogen are called **framework elements**.

## EXERCISE

### OBJECTIVE DPP – 17.1

- . Which one of the following includes only macronutrients?  
(A) C,N, Ca                      (B) H, Fe, P                      (C) O, K, Cl                      (D) K, S, Zn
- . Transfer of seedling from the nurseries to the main field is termed as  
(A) weeding                      (B) sowing                      (C) transplantation                      (D) ploughing
- . The unwanted wild plants growing along with the crop plants are called  
(A) weeds                      (B) seedling                      (C) minor crops                      (D) grasses
- . Damp grains in storage get heated due to  
(A) infestation by insects                      (B) decrease in humidity  
(C) decrease in atmospheric pressure                      (D) high moisture content and growth of moulds
- . Green manuring refers to  
(A) add green leaves to the soil  
(B) grow young and green crops of leguminous plants along with non leguminous  
(C) add decomposed organic matter to soil  
(D) none of these
- . Vermicomposting involves  
(A) earthworm                      (B) cockroach                      (C) leech                      (D) roundworm
- . Improved storage structures include  
(A) grain silos                      (B) pusa bin                      (C) pusa kothar  
(D) all of these
- . Weedicides among the following are  
(A) 2, 4-D, nitrofen, atrazine                      (B) atrazine, BHC, pyrethrum  
(C) Pyrethrum, EDB, methyl bromide                      (D) 2, 4-D, BHC, EDB
- . Which one of the following does not cause plant diseases?



# IMPROVEMENT IN FOOD RESOURCES

## MANURES & FERTILIZERS

### (a) Manure :

A manure is a mixture of various decomposed organic substances like dead leaves, city garbage, agricultural wastes, animal dung, crop residue etc. through the action of microbes. Manure increases the fertility and productivity of crops. As they contain plenty of organic compounds and almost all the essential elements required by the plants.

#### <sup>235</sup><sub>92</sub> Characters :

<sup>235</sup><sub>92</sub> Manures are organic substances obtained through the decomposition of plant wastes (like straw) and animal wastes (like cow dung). The decomposition is brought about by the action of microbes.

<sup>235</sup><sub>92</sub> Manures contain large quantities of organic matter.

<sup>235</sup><sub>92</sub> Manures contain nutrients in small quantities and therefore are needed to be supplied to crops in large quantities.

<sup>235</sup><sub>92</sub> Manures are not nutrient – specific. For this reason, manures are not of much help when a specific nutrient is required for a particular crop.

<sup>235</sup><sub>92</sub> Manures are bulky. So it is not convenient to store and transport manures.

<sup>235</sup><sub>92</sub> Manures are recycled and do not cause pollution.

<sup>235</sup><sub>92</sub> They enrich the soil with nutrients.

<sup>235</sup><sub>92</sub> Being rich in organic matter, manures improve soil texture and soil aeration. Water holding capacity in case of sandy soils and drainage in clay soil is increased.

<sup>235</sup><sub>92</sub> **Types of Manure :** Manures are of three types.

	<b>Farm Yard Manure</b>	<b>Compost Manure</b>	<b>Green Manure</b>
	Partially decomposed	It is prepared by a biological	It is prepared by growing
	mixture of cattle	decomposition of farm and	ploughing and mixing of
	excreta (dung & urine)	town refuse (vegetable and	young & green crops of
	along with litter	animal refuse, sewage waste)	leguminous & non-leguminous
	(bedding material)	weeds, garbage, crop stubble	plant such as Berseem, Egyptian
	and left over organic	Straw etc. It takes about 3-6	Clover ( <i>Trifolium alexandrium</i> )
	matter such as	months. During this period micro	Sunnhemp ( <i>Crotalaria juuncea</i> )
	roughage or fodder,	-organisms (aerobic as well as)	crops grown for 6-8 weeks
	dead leaves and twigs.	anaerobic) decompose organic	ploughed into field in tender
	All these materials	matter to yield compost	Stage, These remain buried
	are daily collected from	(2) Type  Farm Town refuse 0.5%N 1.4%N 0.5% K <sub>2</sub> O 1.4% K <sub>2</sub> O  1%P <sub>2</sub> O <sub>5</sub>	for 1-2 months. During this
	cattle sheds and		time these are completely
	stored in pit for decomposition		decomposed . Green
	by microbes		manuring reduces alkalinity .
	(bacteria & fungi) to form		Prevents leaching
	humus		And soil erosion .
	Farmyard manure		

contains		
5% Nitrogen 2% $P_2O_5$ 5% $K_2O$		

## (b) Fertilizers :

These are commercially manufactured inorganic salts or an organic compound containing one or more essential plant nutrients like Nitrogen, Phosphorus or Potassium which are used for increasing soil fertility. Fertilizers usually contain higher amount of nutrients than manures hence required in small quantities.

### Characters

$^{235}_{92}$  Fertilizers are inorganic or organic compounds containing the necessary plant nutrients.

$^{235}_{92}$  They contain much higher amount of nutrients in comparison to manures, and are therefore, required in very small quantities.

$^{235}_{92}$  They are manufactured commercially from chemicals, and are marketed in concentrated form.

$^{235}_{92}$  They are easy to use, store and transport.

$^{235}_{92}$  Being soluble in water, they are easily absorbed by the plants.

$^{235}_{92}$  Fertilizers are generally nutrient – specific i. e. these supply only one or more specific nutrients.

Types of Fertilizers			
<u>Nitrogenous</u>	<u>Phosphatic</u>	<u>Potassium</u>	<u>Mixed</u>
Contains nitrogen	Phosphorus	Potassium	More than one
as principal nutrient eg $NaNO_3$ $(NH_4)_2SO_4$	as principal nutrient $(NH_4)_3PO_4$	as principal nutrient $K_2SO_4$	nutrient (NPK) Potassium
$(NH_4)_2SO_4$	$(NH_4)H_2PO_4$	KCl	ammonium
$NH_2-CO-NH_2$	$Ca(H_2PO_4)_2$		



$\text{KNO}_3$  phosphate,  
 $\text{NH}_4\text{NO}_3$  urea,  
 $\text{Ca}(\text{NO}_3)_2\text{NH}_4\text{NO}_3$  ammonium  
 phosphate

<sup>235</sup><sub>92</sub> **Hazards of using fertilizers :** Thought use of fertilizers has brought about significant increase in crop yields, however, the continued use affects soil quality and brings about pollution of water bodies.

<sup>235</sup><sub>92</sub> **Effect on soil quality :** Continuous use of fertilizers leads to a loss of organic matter, a deterioration of soil structure and a decrease in porosity. As a result, the plant roots are deprived of oxygen and can not absorb the salt effectively. Further, the soil is more likely to become dry and powdery and can be blown away by the wind, when not protected by a plant cover.

<sup>235</sup><sub>92</sub> **Water pollution and eutrophication :** Excessive use of fertilizers, in particular nitrogenous ones, causes build up of nitrates in the soil. From the soil, the nitrates as well as phosphates are washed by rain and carried to lakes, ponds and rivers. Here, they stimulate excessive growth of microscopic plants like algae resulting in the formation of blooms. The algae grow quickly then die and decomposed. During decomposition, the algae deplete the oxygen content of the water body, which ultimately results in the death of fish and other aquatic animals. This excessive growth of algae and the subsequent depletion of oxygen content of water is called eutrophication. Fertilizers, therefore, must be used carefully and judiciously in limited quantity.

<sup>235</sup><sub>92</sub> **Application of fertilizers :** fertilizers are applied before sowing, during irrigation or sprayed on standing crops. But fertilizers are never applied directly to soil if the crop is standing. It would bring about wilting of crop due to exosmosis because of increase in the osmotic pressure around the roots of the plants.

<sup>235</sup><sub>92</sub> **Only urea is an organic compound.**

## VERMICOMPOSTING

Composting with the help of earthworms is called vermcomposting. Earthworms help in breakdown of wastes. This activity along with

**the excreta of the worms makes the compost rich in nutrients.**

<b>Table: Differences between manures and fertilizers</b>		
<b>S.No.</b>	<b>Manures</b>	<b>Fertilizers</b>
1.	Manures are organic natural substances derived from the decomposition of biological materials (plants and animal residues)	Fertilizers are inorganic or organic substances.
2.	Manures contain organic matter in large quantities.	Organic matter is not present.
3.	Manures contain nutrients in small quantities, and are needed in large quantities.	Fertilizers contain much higher amount of nutrients, and are required in very small quantities.
4.	They are not nutrient – specific.	These are nutrient - specific.
5.	They are prepared in field and villages.	These are manufactured in factories.
6.	Manures are bulky substances. So, these are inconvenient to store, use and transport.	These are available in concentrated form. So these are easy to store, use and transport.
7.	Manures do not cause pollution.	They cause water pollution.

### **BIOFERTILISERS**

Biofertilisers are micro-organisms(like bacteria, algae and fungi used and fungi used singly or in combination) or biologically active products which are used to enrich soil fertility.

Some of the Biofertilisers are given below :

- (i) Legume – Rhizobium symbiosis
- (ii) Azolla – Anabaena symbiosis
- (iii) Free – living bacteria (Azotobacter) living in soil symbiotically.
- (iv) Cyanobacteria (Anabaena, Nostoc)
- (v) Mycorrhiza (symbiotic association of fungi with roots of higher plants.)

### **ORGANIC FARMING**

Cultivation of land without conserving soil fertility and soil structure would lead ultimately to the development of deserts. Excessive and

indiscriminate use of pesticides, fungicides and herbicides as is done in present day agriculture could lead to

<sup>235</sup><sub>92</sub> changes in biological balance ; population of soil organisms will be affected.

<sup>235</sup><sub>92</sub> increase in the occurrence of cancer and other diseases.

<sup>235</sup><sub>92</sub> contamination of water (water pollution) and enrichment of water bodies with nutrients leading to excessive growth of phytoplankton). These are some of the problem due to the adoption of improved agricultural practice in order to increase food production for the ever increasing human population. Scientists are greatly concerned about these problems and attempts have been made to develop alternatives to chemical agriculture. The alternatives consist of adopting “green or ecofriendly technologies” or “ecologies farming” or organic farming is a farming system in which chemical fertilizers, herbicides or pesticides are minimally used or not used at all. Instead of , manures recycled farm wastes and biofertilisers are used in place of chemical fertilizers. Neem leaves or turmeric are used as biopesticide specifically in case of stored food grains.

<sup>235</sup><sub>92</sub> Advantages of Organic Farming :

(i) Natural ecosystem is not disturbed, as organic farming is in harmony with the natural ecosystem.

(ii) Soil fertility is preserved.

(iii) Harmful effects of chemicals on the living organisms are avoided.

(iv) Pollution of air, water and soil does not take place.

<sup>235</sup><sub>92</sub> The basic objective of cropping is to achieve insurance against total crop failure under poor rainfall conditions and there by minimizing risk and monetary loses.

## **IRRIGATION**

Process of supplying water to crop plants growing in the fields by means of canals, reservoir, wells, tube wells etc is know as irrigation. Water requirements of crop plants depends on two factors:-

(i) Crop-based irrigation : Water requirements of different crop plants varies at different stage of their growth & maturation e.g. paddy

crop is transplanted in standing water and also requires continuous water supply whereas this is not so for wheat, gram, cotton, maize crops etc.

(ii) Soil-based irrigation- irrigation also depends on the nature of soil in which crop is grown e.g. if two wheat crops are grow together one in sandy and another in clay soil, then in sandy more frequent irrigation is needed then clay soil.

### **(a) Irrigation systems :**

Most commonly used irrigation systems in our country are as follows :

(i) Canal systems : Canals usually receive water from rivers and usually an elaborate, extensive network of irrigation systems.

Canal ◇ Branch canal ◇ field channels ◇ then irrigate or a group of fields.

<sup>235</sup><sub>92</sub> Rotation systems called water bandhi or intermittent water delivery method is followed in canal irrigated areas.

(ii) Tanks : Tanks are usually small water storage reservoir, constructed at higher elevations in hilly areas. They intercept and store the run off water of small catchments areas.

(iii) Wells are dug and constructed wherever ground water is exploitable. Wells are of two types:

**(a)** Dug wells : in which water is collected from water bearing strata i.e. bottom below the ground water table. In these wells water from lower strata slowly accumulates. Water from these wells is usually lifted for irrigation purpose by mechanical means such as bullock operated devices.

**(b)** Tube wells : They are dug in the deeper strata much below the ground water table. Deep bore tube-well can supply water continuously. Water from tube-well is pumped up directly from fields through narrow lanes by using diesel or electrical pumps.

(iv) River valley systems: In southern part of India particularly in Western Ghats, Kerala & Karnataka, the rainfall is heavy but concentrated in 4-5 months of the year. Consequently many steep and narrow river valleys are found in these areas. This results in higher run off and discharge flows in the rivers. To prevent this, several perennial plants ( coffee, rubber, coconut, areca nut & tapioca) are cultivated on the

slopes of these valleys. Bottom lands of valley are used for growing single rice crop.

(v) River lift systems : it is used in the area where either canal flow is insufficient or irregular due to insufficient reservoir water release. In this system, water is directly drawn from the rivers (using pumps) in order to supplement irrigation in the areas adjoining rivers.

(vi) Sprinkler irrigation systems : it is water efficient systems and is being introduced in the canal irrigation areas of Haryana, Rajasthan and Madhya Pradesh. A device having perforated ring or small stand with a revolving nozzle to which a base is attached for watering crop plants. This systems spreads water uniformly over crop plants and fields, required quantity of water is supplied.

(vii) Drip- irrigation systems : modern systems being encouraged in Maharashtra, Karnataka, Andhra Pradesh, Orissa and Tamil Nadu for fruit crops. Fertigation is an innovative method for applying fertilizers through drip irrigation to maximize farm productivity with available water.

## **CROPPING PATTERNS**

### **(a) Mixed cropping :**

It is the practice of growing two or more types of crops simultaneously on the same piece of land. Different crops to be grown are selected in such a way that products & wastes from one crop can stimulate the growth of other crop.

#### **(i) Crop combinations used in mixed cropping :**

$\frac{235}{92}$ Growing wheat crop + gram	$\frac{235}{92}$ Growing cotton
crop + groundnut	

$\frac{235}{92}$ Growing groundnut +sunflower	$\frac{235}{92}$ Growing ragi +
gram	

$\frac{235}{92}$ Growing turmeric + groundnut
---

(ii) Selection of crops for mixed cropping : Following criteria are taken into account :

$\frac{2}{8}$ Duration of crops	$\frac{235}{92}$ Growth habit
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<sup>235</sup>/<sub>92</sub> Root pattern

<sup>235</sup>/<sub>92</sub> water

needs

<sup>235</sup>/<sub>92</sub> Nutrient demands

**(b) Intercropping :** improved version of traditional mixed cropping in which two or more crops are grown simultaneously in the same field but in a definite row pattern is called intercropping.

**(i) Criteria to accomplish intercropping :**

<sup>2</sup>/<sub>8</sub> spatial arrangement

<sup>235</sup>/<sub>92</sub> plant

density

<sup>235</sup>/<sub>92</sub> maturity dates of crops

<sup>235</sup>/<sub>92</sub> plant

architecture

**(ii) Types of intercropping :**

**(A) Row Intercropping :** in this intercropping all crop combination of mixed cropping are used in definite row pattern 1:1, 1 : 2 or 1: 3.

**(B) Strip Intercropping :** growing two or more crops simultaneously in strips, wide enough to permit separate crop production using machines.

**(iii) Advantages**

**(A)** Productivity is increased.

**(B)** It economises spaces and time of cultivating two or more crops.

**(C)** It helps to maintain soil fertility.

**TABLE COMPARISON BETWEEN MIXED CROPPING AND INTER CROPPING**

<b>Mixed cropping</b>	<b>Inter cropping</b>
1. Aim is to minimize risk of crop failure.	Aim is to increase productivity per unit area
2. Seed of component crops are mixed Before sowing.	Seed of component crops are not mixed.

3. Sowing is not done in rows.	Sowing is done in rows.
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### (C) Crop Rotation :

Practice of growing different crops on a piece of land in a preplanned succession. Depending upon the duration

(i) Crop rotation may be of three types :

(A) 1 years rotation : Rice-Wheat, Maize-Mustard

(B) 2 years rotation : Maize-potato-Sugarcane-Peas

(C) 3 years rotation : Maize- Mustard- Sugarcane-Methi-Rice-Wheat-Hing- Mustard.

Sugarcane-Berseem-Cotton-Oat- Sugarcane-Peas-Maize-Wheat.

(ii) Crop rotation confers following benefits :

(A) All crops do not require the plant nutrients in the same proportion. By growing crops in rotation, the fertility of the soil is utilized more evenly. The soil is not depleted in a particular nutrients.

(B) When different crops are grown, the operation concerned with the preparation of soil, manuring, sowing, harvesting and other operation are spread throughout the year, thereby reducing the work pressure at any particular time.

(C) When different crops are grown on the field one after another, the yields of product obtained are greater then the same crops are grown year after year.

(D) The incidence of weeds, pests and diseases is reduced.

### **CROPPROTECTION MANAGEMENT**

It includes eradication of pests, pathogens, weeds and other organisms that cause harm to the crop plants.

(i) **Pests** : These are the organisms like insects, rats, mites, weeds, fungi etc. which damage or destroy cultivated plants or plant products and can even make them unfit for human consumption.

(ii) **Pathogens** : These are disease causing organisms and include bacteria, fungi, virus etc.

(iii) **Weeds** : These are unwanted plants that grow and live at the

expense of main crop.

**(a) Effective methods to control pests :**

(i) Pesticides or biocides : Chemicals (poisons) used to kill pests of plants such as insects, fungi, weeds, mites, rats etc. are known as pesticides. They are of following types :

- (A) Fungicide : To kill fungi
- (B) Weedicide : To kill weeds
- (C) Rodenticide : To kill rodents like rats, moles
- (D) Nematicide : To kill nematodes

**(b) Preventive measures should be adopted instead of using pesticides as :**

- (i) Use of pest & disease resistant hybrid varieties of crop plants.
- (ii) Selection of optimum time of cropping
- (iii) Crop rotation and multiple cropping
- (iv) Clean cultivation
- (v) Summer ploughing
- (vi) Sowing of healthy seeds

**(c) Insect – pest Control :**

Some insects are serious pests of crop plants such as :

(i) Chewing insects : Locust, grasshopper, caterpillar larva destroy all sorts of crop plants.

**Control :** By mixing chlorophyriphos in the soil.

(ii) Sucking insects – Aphids (Aphis), leaf hoppers (Pyrilla) suck cell sap from various plant parts.

**Control :** By Malathion, lindane & Thiodan

(iii) Borer insects : sugarcane borer, grain weevil, cotton boll worm. Internal feeders, live inside the parts of crop plants

<sup>235</sup>/<sub>92</sub> Control : By metasystox.

**(d) Weed Control :**

It can be done by following ways :

(i) **Mechanical methods** – By weeding, removing weeds from crop fields by harrow, interculture ploughing, burning & flooding



- (ii) **Chemical methods** – Using chemicals called herbicides or weedicides e.g. 2, 4-D, Nitrofen, Atrazine
- (iii) **Biological methods** – Employ living organisms to destroy weeds e.g. :
- (A) Cassia plant prevents the growth of parthenium weed
  - (B) Herbivorous fish feed on aquatic weeds.
- <sup>235</sup>/<sub>92</sub> Advantages of biological method
- <sup>235</sup>/<sub>92</sub> It does not cause pollution.
- <sup>235</sup>/<sub>92</sub> Organisms are harmless to the main crop.
- (iv) Cultural methods : inclusion.
- (A) Proper seed & bed preparation
  - (B) Timely seed sowing
  - (C) Inter cropping
  - (D) Crop rotation
  - (D) Mixed cropping

## **STORAGE OF GRAINS**

9.3% food grain in our country are lost due to inadequate & improper storage. Factors responsible for such a great loss during storage are as follows :

- (i) **Biotic (living):** Insects, rodents, birds, mites etc.
- <sup>235</sup>/<sub>92</sub> Insect – pests
- <sup>235</sup>/<sub>92</sub> Common insect- pests include weevils, beetles, locusts, mites, aphids, grasshoppers, bugs and termites.
- <sup>235</sup>/<sub>92</sub> Insect – pests damage/ harm the plants in following ways :
- <sup>235</sup>/<sub>92</sub> They cut root, stem and leaves.
- <sup>235</sup>/<sub>92</sub> They suck the cell sap from various plant parts.
- <sup>235</sup>/<sub>92</sub> They bore into stems and fruits.
- <sup>235</sup>/<sub>92</sub> They form falls.
- <sup>235</sup>/<sub>92</sub> They eat stored grains.

- (ii) **Abiotic (non-living) :**

(A) Temperature

(B) Moisture

(C) Humidity

(D) Material of container in

which grains are stored

<sup>235</sup>  
<sub>92</sub>

The above mentioned factors bring about :

<sup>235</sup>  
<sub>92</sub>

Infestation of food grains by insects and microorganisms.

<sup>235</sup>  
<sub>92</sub>

Degradation in quality.

<sup>235</sup>  
<sub>92</sub>

Loss in weight.

<sup>235</sup>  
<sub>92</sub>

Poor germination potential of grains.

<sup>235</sup>  
<sub>92</sub>

Discoloration of product.

<sup>235</sup>  
<sub>92</sub>

Unpalatable or even toxic food materials.

<sup>235</sup>  
<sub>92</sub>

Finally poor marketability and lower profits. Thus, it is essential that loss of food grains during storage is avoided. The attack on food grains by insects and micro-organisms is called infestation. A general rise in the temperature of the grain and presence of patches of white powdery material on the bags or on the floor also indicates infestation of grain by insects. Presence of rodents can be detected by the excreta or tell – tale holes in the bags.

**(a) Preventive Measures :**

(i) Drying before storage

(ii) Maintenance of hygiene

(iii) Plant – product treatment

(iv) Prophylactic treatment

(v) Improved storage structures

<sup>235</sup>  
<sub>92</sub>

**Control Measures**

<sup>235</sup>  
<sub>92</sub>

Pests are controlled by the use of chemicals called pesticides.

<sup>235</sup>  
<sub>92</sub>

Fumigation is the most convenient and method of pest control in stored grains inside godowns.

<sup>235</sup>  
<sub>92</sub>

Fumigation are volatile (gaseous) chemicals that quickly vaporize and the resultant fumes kill the insects without affecting the grains. Utmost care has to be observed in handling of pesticides as these are equally harmful to humans and domestic animals.

## EXERCISE

### OBJECTIVE DPP – 18.1

- . The science of vegetable culture is called as  
(A) Agriculture (B) Horticulture (C)  
Olericulture (D) Floriculture
- . All animals are  
(A) Parasitic (B) saprophytic (C)  
autotrophic (D) heterotrophic
- . The principal cereal crop of India is  
(A) wheat (B) rice (C)  
maize (D) sorghum
- . which is the most important source of food and fodder ?  
(A) Algae (B) Fungi (C)  
Lichen (D) Cereal
- . The element which is required in largest quantity by plants is  
(A) sulphur (B) calcium (C)  
phosphorus (D) nitrogen
- . Nodules with nitrogen – fixing bacteria are present in  
(A) mustard (B) wheat  
(C) gram (D) cotton
- . Application of nitrogenous manure to a plant causes  
(A) vigorous vegetative growth  
(B) early flowering  
(C) early  
(D) growth retardation due to toxicity to  $\text{NH}_3$
- . Rotation of crops is essential for  
(A) getting different kinds of crops (B) increasing  
quality of minerals  
(C) increasing quality of proteins (D)  
increasing fertility of soil
- . The unwanted plants are known as  
(A) grasses (B) shrubs (C)

- weeds (D) fodder crops
- l. Plants can be made disease resistant by  
(A) breeding (B) hormones  
(C) colchicine (D) heat

## **SUBJECTIVE DPP – 18.2**

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### **VERY SHORT ANSWER TYPE QUESTIONS**

- . What are nutrients and how many nutrients are essential for plant growth ?
- . What are macro and micro - nutrients ? Name three of each kind .
- . What is green manuring ? Give examples of green manures.
- . What are fertilizers ? Mention three important features of fertilizers.
- . What are the hazards of using fertilisers ?

### **SHORT ANSWER TYPE QUESTIONS**

- . Define intercropping. Mention the advantages of intercropping.
- . How does intercropping differ from mixed cropping ?
- . Define organic farming. Why is organic farming important to us ?

### **LONG ANSWER TYPE QUESTION**

- . Explain the different types of nutrients for plants and differentiate between them with examples.

# **IMPROVEMENT IN FOOD RESOURCES**

## **ANIMAL HUSBANDRY**

Science which deals with the scientific management of farm

animals including their feeding, breeding, weeding and heeding (disease control) is called as Animal husbandry. Animal food mainly comes from:

- (i) **Milk** : from cattle such as cow, buffaloes, goat, camel.
- (ii) **Egg** : from birds (poultry).
- (iii) **Meat** : animals like pigs, fishes, poultry etc.
- (iv) **Honey** : from honey bees.

There are four main practices involved in keeping of animals or animal husbandry.

<sup>235</sup><sub>92</sub> Breeding : it is done to obtain animals with desired characters. Through breeding, we can develop high milk – yielding and high meat-yielding cattle.

<sup>235</sup><sub>92</sub> Feeding : it deals with the study of proper food (called feed), mode and time of feeding of different animals

<sup>235</sup><sub>92</sub> Weeding : This concerns with the elimination of uneconomical animals.

<sup>235</sup><sub>92</sub> Heeding : It means the proper care and management of animals.

<sup>235</sup><sub>92</sub> Most notable effort for dairy development & milk production in India is being carried out by NDDDB (National Dairy Development Board) and is called “operation flood” to increase milk production. It has resulted in white revolution in India.

TABLE NUTRITIONAL VALUES OF ANIMAL PRODUCTS				
Animal products	Nutrients (%)			
	Protein	Fat	Carbohydrate	Minerals
1. Cow	4.0	3.6	3.5	0.7
2. Egg	13.0	12.0	Traces	1.0
3. Meat	21.1	3.6	Traces	1.1
4. Fish	19.0	2.5	Traces	1.3

#### (a) **White Revolution :**

Just like the green revolution in case of crop plants, the increase in milk

production has been possible just like the green revolution in case of crop plants, the increase in milk production has been possible due to the launching of countrywide programme called 'operation flood' which resulted in the white revolution in India. This operation involved use of New improved high milk-yielding crossbreeds of milch animals and following the practices of animal husbandry providing them proper feed and health care. Dr.V. Kurien is credited with the designing and implementation of the largest dairy development programme – the operation flood, and sharing in of the white revolution in India. He is known as the father of white revolution and is the founder chairman of the National Dairy, Development Board (NDDB). Silver revolution refers to the tremendous increase in egg production, while blue revolution to the fish production.

**(b) Breeds of Cows :**

(i) High milk – yielding indigenous ( desi ) breeds.

(A) Gir (B) Sahiwal (C) Red  
Sindhi

(ii) Dual purpose indigenous breeds ( cows for milk and bullocks for draught work )

(A) Haryana (B) Tharwar (C)  
Deoni

(iii) The exotic ( foreign ) breeds of cows that have been used for crossbreeding are :

(A) jersey from USA (B) Brown Swiss from  
Switzerland

(C) Holstein – Friesian from Holland

Many high milk-yielding breeds of cows have been developed in India through crossbreeding of desi breeds with exotic breeds in recent years. These include Karan Swiss Friesian –Sahiwal or Frieswal Karan - Fries

(iv) High milk – yielding indigenous breeds of buffaloes :

(A) Murrah from Punjab and Haryana (B)

Mehsana from Gujrat

(C) Surti from Gujrat (D) Nili from Punjab

(E) Jaffarabadi from Gujrat

<sup>235</sup><sub>92</sub> Cattle like cows and buffaloes are normally housed in sheds, which possess following features

☐☐ The shed is properly roofed to protect the animals from rain, hat and cold.

☐☐ The floor of the shed is made sloping to facilitate cleaning, and kep their sitting space dry.

☐☐ The shed is airy, well – ventilated with adequate sunlight.

☐☐ The shed is spacious enough to provide sufficient space to each animal. a cow cow requires about six square meter space while a buffalo needs a little more space.

☐☐ The sheds are provided with feeding passage.

☐☐ Arrangement for clean drinking water is made.

☐☐ The sheds have proper arrangement for disposal of excreta.

**(c) various types of animal farming are :**

**(i) Cattle farming** – (Milk producing or milch animals)

**(ii) Poultry farming** – (Egg yielding animals)

**(iii) Fish farming** – (Meat providing fishes)

**(iv) Bee keeping-** (Honey providing bees)

**(i) cattle farming :** Farming of cattle for milk and labour is called cattle farming. it is done for two purposes :

**(A) Milk : Milk** providing animals are – cows, buffaloes, goats, camels.

**(B) Draught :** For labour. e.g. ox, camel etc.

cows & buffaloes are main providing animals in India. they are also used for bullock labour cow's milk is highly nutritious, contains large amount

↑ **Types of breeds of cattle :**

↑ | Draught breeds

↑ | Dual purpose

|

Strong & sturdy	Specialized in milk
Both for milk	
chiefly for labour	production production & labour

↑ Draught breeds      ☐☐ Dairy or milk breeds  
 ☐☐ Dual purpose

Strong & sturdy	Specialized in milk
Both for milk	
chiefly for labour	production production & labour







disinfectants.

↑ Poultry farming offers advantages like :

↑ Investment involved is small, ☐☐ Area required is small,

↑ Maintenance is easy, and ☐☐ Returns are quick.

↑ The egg – laying poultry birds is called hen (egg layer), while the one groomed for obtaining meat is called chicken or broiler.

**(iii) Fish farming = Pisciculture : Cheap source of animal protein for human food. Various ways to obtain fishes:-**

☐☐ Capture **farming – From natural resource :**

☐☐ Culture **farming** – Fish farming in land water fishes, ponds lakes, marine fishes. Our freshwater edible fish include cat fishes such as wall ago, mystus etc. Indian major carps such as catla, rohu, mrigal (Cirrhina) and exotic varieties such as silver carp and grass carp. Catla is the fastest growing carp of great economic significance.

**(iv) Bee farming = (Apiculture) :** Rearing of bees for honey is called as apiculture. Different varieties of bees are used for commercial production of honey. They are :

☐☐ A. indica is called Indian bee

☐☐ A. mellifera ( Italian bee) is domesticated in India to increase the yield of honey.

## EXERCISE

### OBJECTIVE DPP – 19.1

- . Murrah, Surti and Mehsana are the indigenous breeds of  
(A) cows                      (B) buffaloes                      (C) poultry                      (D) pigs
- . Inland fisheries is referred to  
(A) culturing fish in fresh water                      (B) deep sea fisheries  
(C) extraction of oil from fishes                      (D) capturing fishes from seas
- . chemical used to kill rats and moles is called as  
(A) fungicide                      (B) nematocide                      (C) rodenticide  
(D) insecticide
- . Cropping pattern involving a definite pattern of rows is called as  
(A) crop rotation                      (B) mixed cropping                      (C) inter cropping  
(D) monoculture
- . cattle food rich in one or more nutrients but lacks fibres is called as  
(A) roughage                      (B) concentrate                      (C) sap  
(D) none of these
- . IR36 and Pusa Basmati are high yielding varieties of  
(A) rice                      (B) wheat                      (C) maize  
(D) mustard
- . Honey bee culture is called as  
(A) pisciculture                      (B) apiculture                      (C) sericulture                      (D) horticulture
- . Hybridization can be  
(A) intervarietal                      (B) interspecific                      (C) intergeneric                      (D) all of these
- . The process of applying fertilizers through drip irrigation is called as  
(A) strip farming                      (B) fertigation                      (C) fumigation                      (D) none of

these

1. The specific term for poultry used for meat purpose is  
(A) layers (B) broilers (C) growers  
(D) none of these

## **SUBJECTIVE DPP – 19.2**

### **VERY SHORT ANSWER TYPE QUESTIONS**

- Define livestock.
- differentiate milch breeds and drought breeds of cattle.
- what are the two main components of cattle feed?
- Who is called as the Father of white revolution ?
- What is artificial breeding ?

### **SHORT ANSWER TYPE QUESTIONS**

- Describe about artificial insemination.
- Name two diseases of each of the following :  
(i) Cattle (ii) Poultry (iii) Fish
- Define animal husbandry. What is the need of it ?

### **LONG ANSWER TYPE QUESTION**

- What are biofertilizers? Why are they advantageous to be used?

## **ANSWER KEY**

### **(Objective DPP # 17.1)**

Q	1	2	3	4	5	6	7	8	
A.	A	C	A	D	B	A	D	A	

### **(Objective DPP # 18.1)**

Q	1	2	3	4	5	6	7	8	
A.	C	D	B	D	D	C	A	D	

**(Objective DPP # 19 .1 )**

<b>Q</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	
<b>A.</b>	<b>B</b>	<b>A</b>	<b>C</b>	<b>C</b>	<b>B</b>	<b>A</b>	<b>B</b>	<b>D</b>	