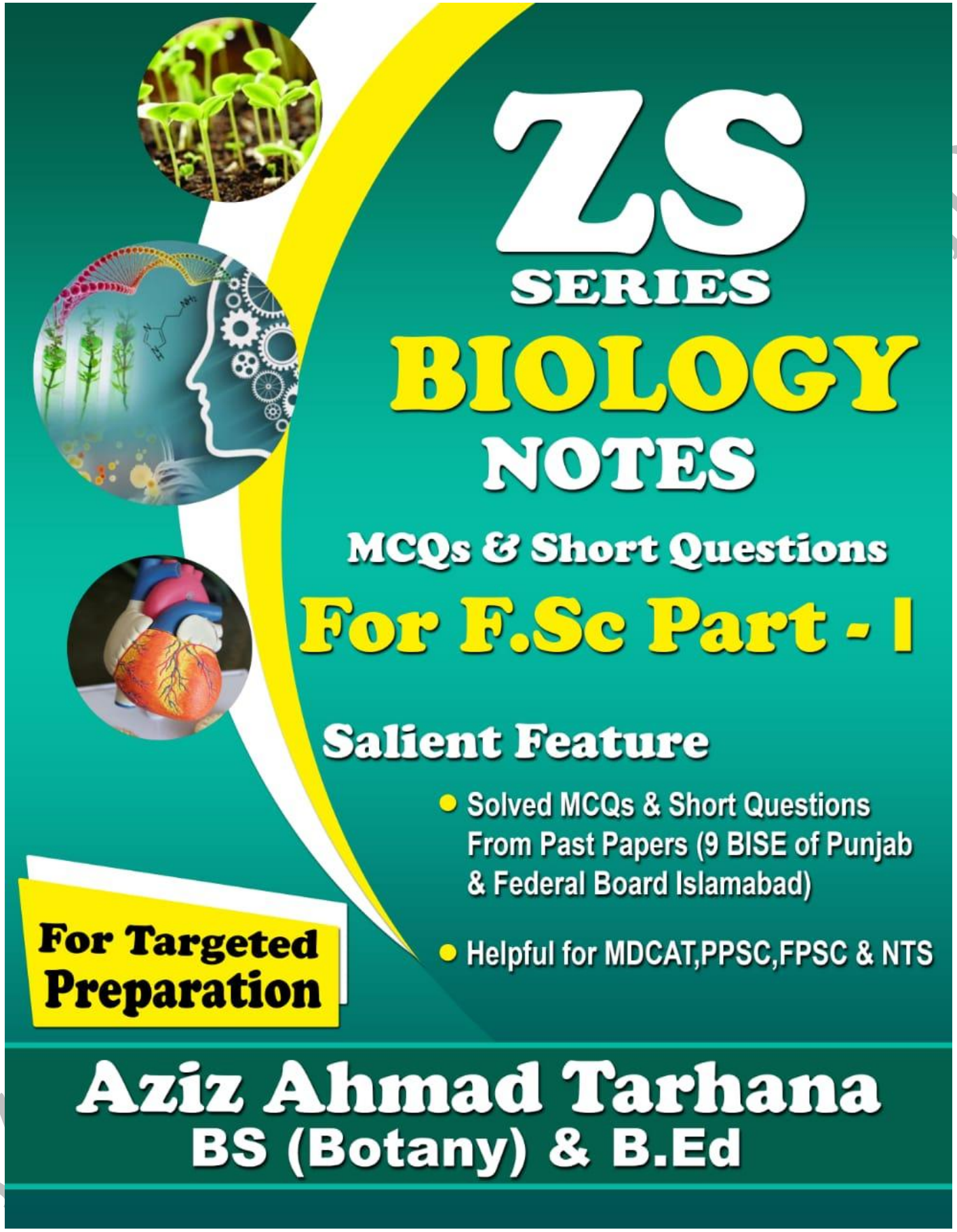
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Solved MCQs & Short Questions From Past Papers (9 BISE of Punjab & Federal Board Islamabad)
Helpful for MDCAT,PPSC,FPSC & NTS
For Targeted Preparation
Aziz Ahmad Tarhana
BS (Botany) & B.Ed

## SALIENT FEATURES OF Z-S SERIES:

- Questions in these notes are all selected from **PAST PAPERS** with number of times are repeated (highlighted with star sign).
- **Exercises** of all chapters are also covered.
- There are **1536 MCQs**, **603 SHORT QUESTIONS** and **121 LONG QUESTIONS**.
- These notes are composed according to **9 BISE of Punjab & AJK.**
- These notes are also preferred for competitive exams like **PPSC, FPSC, NTS** etc.
- **Simple, Easy and Concise** notes with heading.
- Some **Additional and Valuable points** only for brilliant students have also been added.
- **95% SUCCESS RATIO** in all BISE.
- Study plan for Students also included. Where students can select any plan according to their ability and can cover syllabus.
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**S-Z Notes Series for $9^{th}$,$10^{th}$,$11^{th}$,$12^{th}$ Classes**

# CONTENTS

# CH # 1: INTRODUCTION

## SHORT QUESTIONS (SELECTED FROM PAST PAPERS)

**Sentence which is under line in these notes means that they are also a part of MCQ.**

**For Example:**

**Branch of biology that deals with study of tissue called.**

**(a) Histology (b) botany (c) anatomy.**

**In notes it is written as**

**Histology** is branch of biology that deals with study of tissue**.**

1. **Give four characteristics of living organism.**

➢ **Characteristics:**

- They are composed of cells.
- They grow in size.
- They produce offspring.
- They use energy.

2. **Define anatomy and morphology.**

➢ **Anatomy:** Study of internal structure of organisms called **anatomy**.

➢ **Morphology:** Study of form and structure of living organism called **morphology**.

3. **Define molecular biology, microbiology, embryology and physiology.**

➢ **Molecular Biology**: Study of oraginsm, cell and organelles at molecular level called **molecular biology.**

- **Example:** Proteins, lipids and carbohydrates.

➢ **Microbiology:** Study of microorganism.

- **Example:** Bacteria, yeast and algae etc.

➢ **Embryology:** Study of **development** of organism from zygote called **embryology.**

- **Example**: Human embryo (ii) Plant embryo

➢ **Physiology:** Study of functioning of different parts of organism called **physiology**.

- **Example:** Stomach digests food. (ii) Heart pumps blood.

4. **Define ecology & histology.**

➢ **Ecology: Ecology** deals with study of environmental relationship with organism.

**Example:** (i) Population ecology (ii) Community ecology

➢ **Histology: Histology** is branch of biology that deals with study of microscopic tissue.

- **Example:** (i) Nervous tissue (ii) Muscle tissue

5. **Difference b/w fresh water & marine biology.** ★★

➢ **Fresh water biology: Fresh water biology** deals with study of life in fresh water & their physical & chemical parameters.

- **Example:** Life in rivers, lakes & ponds.

➢ **Marine biology:** This branch deals with study of life in marine & their physical & chemical parameters.

- **Example:** Life in seas & oceans.

**6. Define parasitology & biotechnology.** ★★★★★★

➢ **Parasitology:** **Parasitology** deals with study of parasite. This includes structure, mode of transmission & life history of parasite.
- **Example:** (i) Bacteria (ii) virus.

➢ **Biotechnology:** **Biotechnology** deals with use of living organism in manufacturing & service industry.
- **Example:** Manufacturing of insulin.

**7. What is bioelements? Write its types.** ★★

➢ **Bioelements:** Elements that form living organism called **bioelements.**
(ii) There are 16 bioelements.

❖ **Types:**
- **Major:** There are **6** major bioelement.
  Oxygen **(65%)**, Carbon **(18%)**, Hydrogen **(10%)**, Nitrogen **(3%)**, Calcium **(2%)** & Phosphorous **(1%)** are major bioelements.
- **Minor:** There are 6 minor bioelement.
  Potassium **(0.35%),** Sulphur (0.25%), Chlorine (0.15%), Sodium **(0.15%),** Magnesium (0.05%), iron **(0.04%)**.
- **Traces:** There are 4 trace bioelement.
  **Copper**, **manganese**, **zinc** & **iodine** are traces.

**8. Difference b/w micro molecules & macro molecules.** ★★★★★★

| Micro molecules: | Macro molecules: |
|---|---|
| They have low molecular weight. | They have high molecular weight. |
| Small in size. | Large in size. |
| Have simple structure. | Have complex structure. |
| **Example:** (i) $CO_2$ (ii) $H_2O$ (iii) **Glucose** | **Example:** (i) **Starch** (ii) Protein. |

**9. Define cell, organ & organelle.**

➢ **Cell:** **Cell** is structural and functional unit of life.
- **Example:** Neuron, nephron and muscle cell.

➢ **Organ:** Different tissue combine together in a structure to perform a specific function called **organ.**
- **Example:** (i) Liver (ii) Heart (iii) Kidney.

➢ **Organelle:** Subcellular structure that accomplished the cell's function called organelle
- **Example:** (i) Mitochondria (ii) Nucleus (iii) Ribosome.

**10. Define tissue.**

➢ **Tissue**: Group of similar cell performs similar function called **tissue.**
- **Example:** (i) Muscle tissue (movement) (ii) Xylem tissue (transport water).

**11. Difference b/w organ system formation in plants & animals.**

➢ **Organ system in plants:** Organ system organization is less definite & simple in plants.

❖ **Example:**
- Root involves in anchoring of plant & storage of food.
- Flower is reproductive part of plants.

➢ **Organ system in animals:** Organ system organization is well defined & complex in animal.
- **Example:** Stomach involves in digestions of protein, has secretary epithelium & has muscular tissue.

**12. Define population.** ★★★★★★★★

➢ **Population:** Group of same species living in same place at same time called **population**.

- **Example:** Number of student in class.

❖ **Attributes**:

- Gene frequency.
- Gene flow
- Population density
- Population pressure.

**13. Define community.** ★★★★★★★

➢ **Community:** Group of different population living in same place to form a **community**

- **Example:** (i) Forest (ii) Pond.

**14. Difference b/w simple & complex community.**

| Simple community: | Complex community: |
|---|---|
| It has low population. | It has more population. |
| Any change cause drastic effect. | Any change cause less drastic effect. |
| It is unstable community. | It is stable community. |
| **Example:** (i) Aquarium (ii) Fallen tree | **Example:** (i) Forest (ii) Pond |

**15. Define ecosystem & biosphere.** ★★★★★★

➢ **Ecosystem**: A community with nonliving surrounding called **ecosystem**.

- **Example**: (i) Aquatic ecosystem (ii) Terrestrial ecosystem.

➢ **Biosphere**: The part of earth inhabited by living organism.

- All ecosystem combine to form biosphere.
- It is 20km thick.

**16. Define biome.** ★★★★

➢ **Biome:** Large regional community primarily determined by **climate** called **biome**.

- **Example:** (i) Desert biome. (ii) Grassland Biome

**17. What is the significance of study of fossils.** ★★★

➢ **Significance of fossils:**

- Fossils give information about ancestral history of organism.
- Fossils also give information about environmental conditions of past.

➢ **Age calculation**:

- By comparing radioactive isotopes.
- By comparing layers (deeper layers are older).

**18. Write name of four eras of geological time chart.** ★★

➢ **Geological eras:** (i) Proterozoic era (ii) Palaeozoic era
(iii)Mesozoic era (iv) Cenozoic era.

**19. Define phyletic lineage & biodiversity.** ★★★★★

➢ **Phyletic lineage**: A series of species arranged in ancestor to descendants sequence called phyletic lineage.

- Today life came from remote past.
- Evolutionary changes produce new species.

➢ **Biodiversity:** Total number & variety of species in a place called **biodiversity.**

- **Example:** Flora & fauna.

**20. Define hypothesis.** ★★★

➢ **Hypothesis:** Tentative explanation of observation called **hypothesis.**
There are two ways of formulating hypothesis.
(i) Deductive reasoning. (ii) Inductive reasoning.

**21. Difference b/w deductive & inductive reasoning.** ★★★★★★★★

| Deductive reasoning: | Inductive reasoning: |
|---|---|
| **Deductive reasoning** moves from **general to specific.** | **Inductive** reasoning moves from specific to general. |
| A top down approach. | A bottom up approach. |
| **Example**: If all birds have wings then sparrow is bird. | **Example**: If sparrow has wings than sparrow is bird. |

**22. Define law & theory. / How & when a hypothesis is become a theory. Write its features.** ★★★★★

➢ **Theory**: Hypothesis supported by many tests called theory OR
Hypothesis that are often tested & never rejected called theory**.**
**Features:**
- **Example**: (i) Cell theory. (ii) Theory of natural selection.

A theory which suggest new & different hypothesis called **productive** theory.

➢ **Law**: If a theory survives and supported by experimental evidence, it becomes a law.
- Law is uniform in nature.
- Biology is short in laws because of **exclusive nature of life.**
  - **Example**: (i) Mendel's law (ii) Hardy-Weinberg law.

**23. Define cloning.**

➢ **Cloning**: Production of genetically identical organism by asexual reproduction through tissue culture technique called **cloning**.
- **Cloning** is used for achieving eugenic aims.
- **Clone:** A **clone** is a cell/individual produce by asexually.

**24. What is tissue culture technique.**

➢ **Tissue culturing:** Culturing of tissue for production of identical organism called tissue culture. In this technique, tissue of cambium excised and cultured. That tissue develops into new plant in culture medium.

❖ **Use:**
- It used for production of identical organism.
- It is used for rapid propagation.

**25. What is biological control.** ★★★★

➢ **Biological control:** In this, we use living organism to control the problems by eliminating hazards of pollution & toxicity. Pests are destroyed by living organism in **biological control**.
- **Example:** Aphid that attacks walnut tree is controlled by **wasps.** Wasp eats this aphid.

**26. Define bio-pesticides.**

**Bio-pesticide:** Chemicals derived from living organism to kill pest**. Bacteria**(Bt) used in bio-pesticide
**Example:** Canola oil and baking soda have pesticidal application**.**

**27. Define integrated disease management.** ★★★★★★★★★★

➢ **Integrated disease management**: Control of disease using all relevant methods called IDM. This includes awareness of community about severity, cause & remedies of disease. Dangerous diseases are controlled by IDM.
- **Example**: Control of dengue fever.

**28. Define hydroponic culture technique.** ★★★★★★★★★★

➢ **Hydroponic culture technique**: **Hydroponic culture technique** is used to test whether a nutrient is essential for plant or not.

In this technique plants are grown in aerated water to which nutrient, salt & minerals are added.

- **Use**: Astronauts use it for growing vegetables. It is also used in labs for experiments on plants.

**29. What is pasteurization. Write its significance.** ★★★

➢ **Pasteurization:** It is developed by Louis Pasteur that's why called pasteurization.

- **Significance: Pasteurization** is used to preserve **milk & milk products**.
  Milk is heated at $71^0$C for 15 minutes. Bacteria & other micro-organism killed by heating milk.

**30. How does AIDS spread.**

**AIDS:** AIDS (acquired immune deficiency syndrome) is caused by **HIV virus**.

- Free sexual contact.
- Blood transfusion.
- Infected syringes and surgical instruments.

**31. Write a short note on vaccination.**

➢ **Vaccination:** The word vaccination is derived from a Latin word vacca means cow.

- Vaccine was first developed by **Edward Jenner** in 1796.
- **Function:** Many diseases are controlled by vaccine like polio, measles & mumps etc.
  Vaccine makes the people immune against diseases.
- **Example:** (i) Vaccine of small pox (ii) Vaccine of polio.

**32. Difference b/w radiotherapy & chemotherapy.** ★★★★★

| Radiotherapy: | Chemotherapy: |
|---|---|
| In radiotherapy, cancerous part is exposed to short wave radiation from radioactive material at regular interval. | In chemotherapy, anticancer chemical given to patient at regular interval. They kill cancer & normal cell. |
| **Use**: **Radiotherapy** is used to control cancer and break kidney stones etc. | **Use:** It is used against cancer and many diseases. |
| **Disadvantage:** Memory problems & skin problems. It destroy healthy cells. | **Disadvantage:** It destroyes both cancers and healthy cells. |
| In radiotherapy, X-rays are used. | In chemotherapy, drugs are used. |
| A local treatment. | A systematic treatment. |

**33. Define gene therapy.** ★★★★★★★

➢ **Gene therapy**: **Gene therapy** is used to repair defected gene. First isolate normal gene and insert it into host through **bone marrow cells**. (ii) This is new technique.

- **Example**: (i) Treatment of cancer (ii) Treatment of haemophilia.

**34. Define bioremediation.** ★★★★

➢ **Bioremediation:** Removal of environmental pollutants by living organism called **bioremediation**.

- **Example**: **Algae/fungi** used in bioremediation. Algae absorb heavy metals and reduce pollution.

**35. Define endanger species.** ★★★

➢ **Endanger species**: Those species which extinct in near future. If these species are not protected would soon extinct.

- **Example:** Indus dolphin in Pakistan is an endanger species.

**36. How environmental pollution controlled.**

➢ **Control of pollution:**

- Bioremediation and bioabsorption for water pollution.
- Treatment of industrial waste for solid waste.
- Plantation of forest for air pollution.

## Exercise Short Questions

1. **What do you mean by hypothesis.**
   See question number: 20
2. **How does Lord differ from theory.**
   See question number: 22
3. **What is deductive reasoning.**
   See question number: 21
4. **Define vaccination.**
   See question number: 31
5. **Write a short note on cloning.**
   See question number: 23

## MULTIPLE CHOICE QUESTIONS
## (SELECTED FROM PAST PAPERS)

1. Study of fossils called = **Paleontology**
2. Study of distribution of **animal** in nature = **Zoogeography**
3. Study of ancestral history called = **Evolution**
4. Study of social behavior & communal life of human beings called = **Social biology**
5. Most recent era is = **Cenozoic era**
6. Mammals become dominant in = **Cenozoic era**
7. What is percentage of insects of living organism = **53.1%**
8. How many species identified so far = **2.5 million**
9. Plants having foreign DNA called = **Transgenic**
10. Treatment of cancer = **Chemotherapy & Radiotherpy**
11. In 1977, scientist of **Scotland** succeeded in cloning a = **Sheep**
12. Automobiles release pollutant = **Lead**
13. Unit of life = **Cell**
14. Lowest level of biological organization = **Population**
15. Genetically engineer vaccine is not available for = **HCV**
16. Muscle of stomach is ___ type = **Smooth**
17. ___% of plant species = **17.6**
18. ___ is irrefutable theory = **Law**
19. Geological period started 225 million years ago = **Triassic**
20. Devonian period started ___ million ago = **400**
21. Single species is in **= Population**
22. Ecosystem include = **$O_2$, plants and animals**

23. Cretaceous, Jurassic and triassic period = **Mesozoic**
24. Which of the following is not a macromolecule = **Amino acid**
25. A structure with an cell performs specific function is = **Organelle**
26. Vaccine is not used against cancer HIV infection multiplies in = **Monkey**
27. What is the number of Naturally occurring chemical elements = **92**
28. Lowest percentage of bio elements in men among the following is of = **Manganese**
29. Which of the following is not attribute of population = **Gene structure**
30. Fungi, protozoan and various prokaryotes are **= 9.4%**
31. Statement made by scientist that may or may not be true is = **Hypothesis**
32. Chemicals produced by microorganism which are capable of destroying growth of microbes is called = **Antibiotics**
33. The heavy metal is chromium National environment problem in Pakistan is = **Pollution**

## EXERCISE MCQs

1. Which one of the following is a correct sequence in biological method = **Observations hypothesis deduction testing of deduction**
2. Which one of the following is implied in treatment of cancer = **Radiotherapy and chemotherapy**
3. Which is not a viral disease = **Tetanus**
4. Which one of the following is not related to Cloning = **Removal of peace of DNA or gene from cell and incorporating another Jenner piece of DNA/gene in its place**

## LONG QUESTIONS
## (SELECTED FROM PAST PAPERS)

1. Discuss organelle, cell & individual level of organization. ★★★★
2. Discuss biological organization upto organism level. ★★
3. Discuss phyletic lineage. ★★★★
4. Write a detail note on biological method. ★★★★★★★
5. Explain biology & service of mankind. / Role of biology in food production. ★★★★★★★★★
6. How biology help mankind in area of health & disease. ★★★★★★★
7. Write a note on drug treatment/gene therapy & vaccination. ★★★★★
8. Write a note on cloning. ★★★★★★★★★★★
9. Discuss protection & conservation of environment. ★★★★★★★★

# CH# 2: BIOLOGICAL MOLECULE

## SHORT QUESTIONS (SELECTED FROM PAST PAPERS)

1. **Define biochemistry. Write its importance.** ★★★★★

➢ **Biochemistry**: Study of chemical components & chemical process in living organism called **biochemistry.**

- **Importance:** It is essential for understanding anatomy & physiology because all organisms have biochemical organization.
- **Example:** (i) Photosynthesis (ii) Respiration.

2. **Define metabolism.**

➢ **Metabolism**: All the chemical reaction occurring within cell called **metabolism**.

- **Example:** (i) Photosynthesis (ii) Respiration.

3. **Define anabolism & catabolism.** ★★★★★

| Anabolism | Catabolism |
|---|---|
| Simple molecule combine to form complex molecule | Complex molecule break into simple molecule |
| It needs energy. | It release energy |
| Endergonic reaction. | Exergonic reaction. |
| **Example:** Photosynthesis | **Example:** Respiration |

4. **Define heat capacity of water.** ★★★★★

➢ **Heat capacity of water**: The number of calories required to raise the temperature of 1g of water from 15-16$^{o}$ C is 1 called **heat capacity of water.**

- **Advantage:** Water has great ability to absorb heat and act as temperature stabilizer & protects living organism against sudden thermal changes.

5. **Why heat capacity of water is very high.**

➢ **Heat capacity of water**: The heat capacity of water is very high because water has great ability of absorbing heat with minimum change. Much of energy is used to break hydrogen bond in water.

6. **Define heat of vaporization.** ★★★★

➢ **Heat of vaporization:** Amount of energy required to convert 1 g of water into vapor called heat of **vaporization.**

- **Example:** Specific heat of vaporization of water is **574 Kcal/kg.**

7. **What is ionization of water.**

➢ **Ionization of water:** Water ionized to form H+ and OH ions. This reaction is reversible. At 25$^{0}$C, concentration of $H^{+}/OH^{-}$ is about $10^{-7}$ moles/liter.

8. **Write two protective role of water.**

➢ **Protective role of water:** Water act as lubricant that protects damages from friction.

❖ **Example:**

- Tears protects eye during rubbing of eyelids.
- Water forms fluid around internal organs for protection.

9. **What is carbohydrate.**

➢ **Carbohydrates:** Carbohydrates are polyhydroxy aldehyde (CHO) or ketone (C=O).

- **Formula:** General formula of carbohydrate is $C_X (H_2O)_Y$. Here X & Y is whole number (3-1000).
- **Composistion:** Carbohydartes are made of carbon, oxygen & hydrogen.

❖ **Types of monosachride:**

- **Aldo sugar**: Sugar with the aldehyde group (CHO) is called aldo sugar.
- **Example**: Glucose.
- **Ketosugar**: Sugar with the keto group (C=O) is called keto sugar.
- **Example**: Fructose.

**10. Define monosacchride and oligosacchrdie.**

| Monosacchride | Oligosacchrdie |
|---|---|
| They are composed of single sugar. | They are composed of 2-9 sugar. |
| They are soluble in water. | They are less soluble in water. |
| They are sweet in taste. | They are less sweet in taste. |
| They cannot be hydrolyzed. | They can be hydrolyzed. |
| **Example:** Glucose & fructose. | **Example**: Sucrose & maltose. |

**11. What is %age of glucose in blood?**

➢ **Glucose:** It is monosaccharide. (ii) Our blood contains **0.08%** glucose.
(iii) Glucose is six carbon sugars. (iv) It is produced by photosynthesis.

**12. Define glycosidic bond with example.** ★★★

➢ **Glycosidic bond**: The covalent bond formed between two **monosaccharides** called **glycosidic bond (C-O).**

- **Example**: Bond b/w glucose and fructose to form sucrose.

**13. Name reducing sugar. Name common disacchride.**

➢ **Reducing sugar:** (i) Glucose (ii) fructose.

➢ **Common disaccharide:** Sucrose is most common disaccharide (glucose + fructose).

**14. Difference b/w amylose & amylopectin.** ★★★★★★★★

| Amylose | Amylopectin |
|---|---|
| They have unbranched chain of glucose. | They have branched chain of glucose. |
| Soluble in hot water. | **Insoluble in water.** |
| Has α 1-4 glycosidic linkage. | Has α 1-4 & α 1-6 glycosidic linkage. |
| Amylose content in starch is 20%. | Amylopectin content in starch is 80%. |

**15. Difference b/w starch & glycogen.**

| Starch | Glycogen |
|---|---|
| Found in grains, fruit & root | Found in liver & muscle |
| Amylose starch is soluble in water | Insoluble in water |
| Found in plants. | Found in animals & fungi. |
| Amylose starch has α 1-4 glycosidic linkage. | Glycogen has α 1-4 & α 1-6 glycosidic linkage. |
| **Test:** Give **blue** color with iodine. | **Test:** Starch give **red** color with iodine. |

**16. What is cellulose?**

➢ **Cellulose**: (i) **Cellulose** is most abundant carbohydrate **(polysaccharide)** in nature.
(ii) **Cotton** is pure form of cellulose. (iii) It is insoluble in water.

- Cellulose is not digested by human because human lack cellulose enzyme. It is digested by herbivore, because it is digested by bacteria, yeast & micro-organism found in digestive tract.
- **Test:** Cellulose gives no color with iodine.

**17. Define lipid. Write its functions.** ★★★★

➢ **Lipid: Lipids** are heterogenous group of compound related to fatty acids.
Lipids are insoluble in **water** but soluble in organic solvent.

- **Example:** (i) Phospholipid (ii) Wax (iii) Terpenoids. (iv) Acylglycerol.

❖ **Functions:**

- Lipids are important part of cellular membranes.

- Lipids are used to store energy.
- Lipids provide insulation against atmospheric hazards.

**18. Why fats consider high energy compound.**

➢ **Lipids**: Lipids store double amount of energy as compared to carbohydrate and protein.
- **Reason:** Fat contains more portion of **C-H** bond and low portion of oxygen.

**19. Define ester and give equation.**

➢ **Ester**: An ester is formed by reaction of alcohol and acid with release of water.
- **Equation:** $C_2H_5OH + HOOCCH_3$ ---→ $C_2H_5OCOCH_3 + H_2O$

**20. Difference b/w fat and oil.**

➢ **Oils**: (i) They have unsaturated fatty acid. (ii) They are liquid at room temperature.
- **Example**: (i) Almond oil (ii) Vegetable oil

➢ **Fat:** (i) They have saturated fatty acid. (ii) Animal fat are solid at room temperature.
- **Example:** (i) Beef fat (ii) Butter

**21. Difference b/w saturated & unsaturated fatty acid.**

| Saturated F.A: | Unsaturated F.A: |
|---|---|
| Fatty acid that contains no double bond called saturated fatty acid. | Fatty acid that contains upto six double bonds called unsaturated fatty acid. |
| High melting points. | Low melting points. |
| Make up fat. | Make up oil. |
| **Example:** Acetic acid. | **Example:** Oleic acid. |

**22. What do you know about wax.** ★★★★

➢ **Wax:** They are protective coating on animals & insects.
- **Composition:** Wax is composed of long chain of alkanes, alcohol, ketones and ester of fatty acid.

❖ **Function:**
- Waxes protect plants from abrasive damage & water loss.
- They provide water barrier for insects, birds & animals.

**23. Define terpenoids with example.** ★★★

➢ **Terpenoid:** They are made of many isoprenoid units.
- They condense to form many compound.
- **Example:** (i) Rubber (ii) Carotenoid (iii) Terpenes.

**24. Give important function of protein.** ★★★

➢ **Function of protein**: All enzymes (biocatalyst) are protein.
- **Transport of material:** Some proteins transport substance i.e heamoglobin transport Oxygen.
- **Defense:** Some proteins defend against pathogen i.e antibodies (kills pathogens).

**25. How amino acid differ from each other.**

➢ **Amino acid:** All amino acid has same amino group ($NH_2$) & carboxylic group (COOH) attach to alpha carbon. But different R group. Due to R group amino acids are different from each other.
- **Example:** **(i)** Glycine (H) (ii) Alanine ($CH_3$)

**26. Draw general formula of amino acid.** ★★★★

➢ **Structural formula**: All amino acid have amino group ($-NH_2$). Carboxyl group (-COOH), hydrogen (-H), variable Group (R) & attach with **alpha carbon** (central carbon).

**27. How peptide bond is formed.** ★★★

➢ **Peptide bond**: The bond between carboxyl group (COOH) of one amino acid and amino group ($NH_2$) of another amino acid with release of water. This **C-N** bond called **peptide bond.**
**Example:** **B**ond b\w glycine & alanine.

**28. Write contribution of F. Sanger.**

- **F. Sanger:** **F. Sanger** was first scientist who determined the sequence of amino acid in proteins.
  - **Contribution:** He concluded that, insulin consist of 51 amino acids in two chains. One chain consists of 21 amino acid & other chain consists of 30 amino acid that held together by disulphide bridge.

**29. How many chains & amino acids present in haemoglobin.**

- **Haemoglobin:** Haemoglobin is protein that transports oxygen. It consists of 574 amino acids in four chains. Two alpha & two beta chains.
  - **Alpha chain:** Haemoglobin has two alpha chains.
    (ii) Each Alpha chain contains **141** amino acids.
  - **Beta chain:** Haemoglobin has two beta chains.
    (ii) Each beta chain contains **146** amino acids.

**30. Compare alpha helix and beta pleated sheet.**

- **Alpha helix**: Protein molecules coil to form alpha helix. It is uniform structure with **3.6** amino acids in each turn. This helical structure is kept due to hydrogen bond.
  - **Example**: (i) Keratin (ii) Wool
- **Beta pleated sheet**: It is formed by folding back of polypeptide chain.
  - **Example:** Silk fiber.

**31. Difference b/w fibrous & globular protein.** ★★★★

| Fibrous | Globular |
|---|---|
| They are in form of fibril | They are spherical or ellipsoidal |
| Secondary structure is important | Tertiary structure is important |
| They are non crystallize | They can be crystallize |
| They are insoluble in water. | They are soluble in water. |
| **Example:** Silk fiber, myosin and fibrin | **Example: Enzyme, antibody** & **heamoglobin** |

**32. Difference b/w purines & pyrimidines.** ★★

| Purines: | Pyrimidines: |
|---|---|
| Purines are double ring structure. | Pyrimidines are single ring structure. |
| Has high melting and boiling points. | Has low melting and boiling points. |
| Catabolism of purines produces uric acid. | Catabolism of pyrimidines produces ammonia & $CO_2$ |
| **Example:** (i) Adenine (ii) Guanine. | **Example:** (i) Cytosine (ii) Thymine (iii) Uracil |

**33. What is ATP. Draw structure.**

- **ATP:** It is a nucleotide which is used as energy currency in cell.
  - **Composition:** It consists of ribose sugar, nitrogenous base & three phosphates.

**34. Difference b/w nucleotide & nucleoside.** ★★★

| Nucleotide | Nucleoside |
|---|---|
| It is formed by nucleoside and phosphoric acid | **Nucleoside** is formed by nitrogenous base and pentose sugar |
| Precursor of DNA & RNA. | Precursor of nucleotide. |
| Used as source of energy & in sequencing. | Important for optimal growth. |
| **Example:** AMP, ADP & **ATP** | **Example:** Guanosine, adenosine |

**35. Nucleic acid are polymer of which compound.**

- **Nucleic acids** Nucleic acids (DNA & RNA) are polymer of **nucleotide**.

❖ **Types:** There are two types of nucleic acid.

- **DNA**: It is made of deoxyribonucleotide. (ii)DNA is made of **two** stranded which is **antiparallel**.

- **RNA**: It is made of ribonucleotide. (ii) RNA is made of single stranded.

**36. What is phosphodiester linkage. Also draw its structure.**

➢ **Phosphodiester linkage:** Nucleotides of DNA are united with each other through phosphodiester linkage **(C-O-P-O-C)** in a specific sequence to form polynucleotide chain.

**37. What is NAD.**

➢ **NAD:** Nicotinamide adenine dinucleotide (NAD) is an example of **dinucleotide.**

- **Function:** It is important coenzyme in many redox reactions in cell.

**38. What do you about different type of RNA.**

| mRNA | tRNA | rRNA |
|---|---|---|
| It take genetic message from nucleus to ribosome | It transfer amino acid to ribosome | It is machinery of protein synthesis. |
| It has variable length. mRNA of 3000 nucleotide form protein of 1000 amino acid | It has 75-90 nucleotides in length. At least, 20 kinds of tRNA present in cell. | On ribosome mRNA translated into protein. |
| **Percentage: 3-4%** in cell. | **Percentage: 10-20%** in cell. | **Percentage: 80%** in cell. |

**39. What are conjugate molecules.** ★★★★

➢ **Conjugate molecule**: Two different type of molecule combine to form conjugated molecules.

- **Example**: (i) Lipoprotein = lipids + protein.
  (ii) **Glycoprotein** (cell secretions) = carbohydrate + protein.
  (iii) Nucleohistone (part of **chromosome**) = Histone + DNA.

**40. Draw ring structure of glucose, glucopyranose, ribofuranose, lecithin & glycylalanine and fructose.** ★★★

## Exercise Short Questions

1. **Name the carbohydrates suitable as food for men.**
   **Carbohydrates:** Starch, glycogen, glucose, fructose & maltose etc.
2. **Why are fats considered as high energy compounds.**
   See question number: **18**
3. **What is function of messenger RNA.**
   See question number: 38
4. **What is general formula for amino acids.**
   See question number: 26
5. **What is the percentage of water in brain cells of human.**
   **Percentage of water in brain cell:** 85% water in brain cells of human.

## MULTIPLE CHOICE QUESTIONS
## (SELECTED FROM PAST PAPERS)

1) %age of water in bacterial cell = **70%**
2) Most abundant organic compound in mammal = **Protein**
3) Carbon is a = **Tetravalent**
4) **Brain** cell contain water = **85%**
5) ___ tissue contain 20% of water **= Bone**
6) Which is rare in nature & occur in some **bacteria** = **Tetroses**

**7)** Most of monosacchride form ring structure = **Solution**
**8)** in free state glucose present in = **Dates**
**9)** Synthesis of 10 g of glucose need solar energy = **717.6 kcal**
**10)** Glycosidic linkage is = **C-O**
**11)** Starch, glycogen, cellulose & agar are example of **= Polysaccharide**
**12)** Which is not a polysaccharide = **Cutin**
**13)** Main source of carbohydrate for animals is = **Starch**
**14)** Chief form of carbohydrate stored in animal body = **Glycogen**
**15)** How many carbon is present in palmitic acid = **16**
**16)** Fats & oils have specific gravity of about = **0.8**
**17)** Which is frequently associated with membranes = **Phospholipid**
**18)** Phosphatidylcholine is common = **Phospholipid**
**19)** Which protein present in nail & hairs = **Keratin**
**20)** Amino acid arranged to form protein according to information on = **mRNA**
**21)** Which is not a conjugate molecule = **Polysaccharide**
**22)** ___ not a Lipid = **Chitin**
**23)** ___ not a polysacchride = **Cutin**
**24)** Melting point of palmitic acid = **$63^0$C**
**25)** ___ not found in tertiary structure of protein = **hydrophobic Interactions**
**26)** Amino acid linked to each other by__ bond = **Peptide**
**27)** %age of RNA in a bacterial cell = **6**
**28)** ___ not a terpenoid = **Wax**
**29)** ___bond is potential source of energy for activities = **C-H**
**30)** %age of Carbohydrate in mammals = **4**
**31)** __ human tissue contain 20% water = **Bone**
**32)** Hemoglobin has ___ structural organization = **Quaternary**
**33)** ___ types of amino acid found in cell = **170**
**34)** ___%age of DNA in mammalian cell = **0.25**
**35)** ___ not a Carbohydrate = **Wax**
**36)** ___ unsaturated fatty acid = **Butyric acid**
**37)** ___ yields polyhydroxy aldehyde or ketone = **Carbohydrate**
**38)** Most common hexose = **Glucose**
**39)** Fats are insoluble in = **Water**
**40)** ___Kcal energy is released during breaking phosphate bond of ATP = **7.3**
**41)** Glucose form six corner ring in solution called = **Glucopyranose**
**42)** Percentage by weight of RNA in bacterial cell = **6%**
**43)** Dextrin, Agar & patient are = **Carbohydrates**
**44)** Which of the following atom down don't occur Carbohydrates = **Nitrogen**
**45)** During Ester formation oh is released from = **Alcohol**
**46)** Basic element of all organic compound is = **Carbon**

**47)** Which one are intermediate in respiration in photosynthesis is = **Glyceraldehyde and dihydroxy acetone**

**48)** Simplest monosaccharide containing keto group is = **Dihydroxyacetone**

**49)** Which is example of disaccharide = **Lactose**

**50)** Glycogen is also called = **Animal starch**

**51)** Chief of Carbohydrates stored in animal bodies = **Glycogen**

**52)** Fatty acids are organic compounds containing H, O and ___ = **Carboxylic group**

**53)** Acyl- Glycerol like fats and oils are Ester formed by condensation reaction between = **Fatty acid and alcohol**

**54)** Amino acids are link to each other by = **Peptide Bond**

**55)** Which term we will use when the two amino acid join each other = **Di-peptide**

**56)** Helical shape of a polypeptide is due to presence of = **Hydrogen bond**

**57)** Secondary structure of protein is found in = **Keratin**

**58)** Globular proteins diaphragm from fibrous proteins in = **Being soluble in aqueous medium**

**59)** Who used the technique of X-Ray refraction to determine the structure of DNA = **Wilkins and Franklin**

**60)** Which of the following combination of base pair is absent in DNA = **A-U**

**61)** Adenine is always opposite to = **Thymine**

**62)** Cytosine is opposite to = **Guanine**

**63)** Number of base pairs in one turn of DNA is = **10**

**64)** Conjugated histone proteins are = **Structural and regulatory**

**65)** Most cellular secretions/blood group antigens are = **Glycoproteins.**

## EXERCISE MCQs

1. Animals obtain carbohydrate S mainly from = **Starch**
2. Peptide bond is = **C-N link**
3. Globalar protein differ from fibrous protein in being = **Soluble in aqueous medium**
4. Which of the following kinds of atom do not occur in carbohydrates = **Nitrogen**
5. Amino acids are arranged in proper sequence during proteins synthesis according to the instruction transcribed on = **mRNA**

## LONG QUESTIONS

1. Explain importance of carbon. ★★
2. Explain importance of water. ★★★★★★★
3. Discuss monosaccharide & oligosaccharide.
4. Discuss polysaccharide. ★★★★★★★★
5. Explain lipid in detail. ★★★★★★★
6. Write a note on acylglycerol & phospholipid.
7. Write a note on function & classification of protein. ★★★★
8. Discuss primary & secondary structure of protein. ★★★★★★★★
9. Compare DNA with RNA. ★★★
10. Write a note on Watson & crick model of DNA. Also draw. ★★★
11. Discuss different types of RNA. ★★★

# CH # 3: ENZYME

## SHORT QUESTIONS (SELECTED FROM PAST PAPERS)

1. **What is enzyme? Write its importance.**

➢ **Enzyme:** **Enzymes** are biological **globular** proteins which speed up a chemical reaction.

- Enzymes are made of **amino acids**.
- **Example:** Amylase (ii) Pepsin.
- **Importance:** (i) They speed up reactions. (ii) They lower the activation energy.

2. **Define cofactor. Write its function.** ★★★★★★★★★★

➢ **Cofactor:** Enzyme requires non protein part for proper functioning called **cofactor**.

- **Function**: It acts as bridge b/w enzyme & substrate.
  (ii) It is source of energy.
- **Example:** (i) $Mg^{2+}$ (ii) NAD.

3. **Define activator.** ★★★★★★★★★★

➢ **Activator:** The detachable inorganic cofactor called **activator.**

- **Example:** (i) $Mg^{2+}$ (ii) $Fe^{2+}$.

4. **Define coenzyme & prosthetic group.** ★★★★★★★★★★

➢ **Prosthetic group**: If cofactor covalently bounded to enzyme called **prosthetic group.**

- **Example:** Heme, copper, ubiquinone & flavin.

➢ **Coenzyme**: If cofactor loosely attach with enzyme called **coenzyme.**

- **Example:** NAD, FAD & Co enzyme A.

5. **Define apoenzyme & holoenzyme.** ★★★★★★★

➢ **Apoenzyme**: Enzyme with removed cofactor (coenzyme/prosthetic group) called **apoenzyme.**

- **Holoenzyme** is active enzyme.
- **Example**: (i) Apoglucose oxidase (ii) Catalytic region of DNA polymerase.

➢ **Holoenzyme**: Enzyme with cofactor (coenzyme/prosthetic group) called **holoenzyme.**

- **Example:** (i) DNA polymerase complex. (ii) RNA polymerase complex

6. **Give character of enzyme.** ★★★★★

➢ **Characteristics**:

- Enzymes are globular **protein.**
- They speed up chemical reaction.
- Enzymes are reaction **specific**.
- Enzyme lowers the **activation** energy.

7. **Difference b/w pepsin & pepsinogen./why pepsin produced in inactive form.**

➢ **Pepsin:** Pepsin is powerful protein digesting enzyme that can destroy cell's internal structure. That's why Pepsin is produced in inactive form of **pepsinogen**.

➢ **Pepsinogen:** Pepsinogen is inactive form of pepsin. It is converted into pepsin when required.

8. **How enzyme speed up chemical reaction.**

➢ **Speed up reaction:**

- Enzyme speed up chemical reaction by lowering activation energy.
- Sometime, enzyme use cofactor for speed up chemical reaction.

**9. What is enzyme to enzyme chain. / How enzyme catalyze series of reaction?**

- **Enzyme chain:** Many enzymes work together in specific order, creating enzyme chain. So enzyme use product of another enzyme as substrate. After that reaction, product is passed to next enzyme.
  - **Example:** Enzymes of photosynthesis & Respiration.

**10. Define active site. Give two parts.** ★★★★★★★★

- **Active site**: Substrate reacts with enzyme on charge bearing site called **active site.**
- **Parts**: There are **two** regions of active site.
  - **Binding site**: Binding site where substrate bind to enzyme to form ES complex.
  - **Catalytic site**: Catalytic site catalyze transformation of substrate into products.

**11. What is lock & key model.** ★★★★★★★★★★★★

- **Lock & key model**: According to this model, one specific key can open only specific lock. Similarly specific enzyme transforms specific substrate into product. Active site is **rigid** structure. There is no modification in active site.
  - **Proposed: Email Fischer** (1890) proposed lock & key model.

**12. What is induce fit model.** ★★★★★★★★★★★★★

- **Induced fit model**: According to this model, when substrate combine with enzyme it change enzyme structure. This change increase catalytic activity of enzyme.
  - **Proposed: Koshland** (1959) proposed induce fit model.

**13. What is the effect of enzyme concentration on its activity.** ★★★★★

- **Effect of enzyme concentration**: If amount of enzyme increase the rate of reaction also increase. In this way number of active site increase & more substrate change into products.

**14. Write effect of temperature on enzyme activity.** ★★★★★★★★

- **Optimum temperature**: All enzyme work maximum at specific temperature called optimum temperature.
  - **Example**: Optimum temperature of human enzyme is **$37^0$C .**
- **High temperature:** Heat provides activation energy to speed up reaction. Heat also gives kinetic energy to reactants to move fast.
- **Very high temperature:** Very high temperatures increase the vibrations of atoms & destroy the enzyme structure. Hence reactions decrease.

**15. Write effect of PH on enzyme activity.** ★★★★★★★★

- **Optimum PH**: All enzyme work maximum at specific PH called optimum PH.
  - **Example**: Optimum PH of pepsin is **2** (ii) Optimum PH of arginase is **9.7**
- **Slight change**: Slight change in PH cause ionization of active site & substrate. That's why enzyme activity retards.
- **Extreme change**: Extreme change in PH breaks enzyme's bond, cause **denaturation** of enzyme.

**16. Define inhibitors.** ★★★★★★★★★★

- **Inhibitors**: A chemical substance react with enzyme & cannot change into product & block the active site called inhibitor.
  - **Example**: **Cyanide** (ii) **Antibiotics** (iii) **Drugs**.

**17. Define reversible & irreversible inhibitors.** ★★★★★★★★★★★★★★★

| **Irreversible**: | **Reversible inhibitors**: |
|---|---|
| **Irreversible** inhibitors form covalent bond with active site & block the reaction. | **Reversible** inhibitors form weak linkage with **enzyme.** |
| They also destroy the structure of enzyme. | Their effect can be neutralized by adding more substrate. |

| | |
|---|---|
| Enzyme-inhibitor complex dissociates very slowly. | Enzyme-inhibitor complex dissociates quickly. |
| **Example**: Cyanide & pencillin. | **Example**: Malonic acid |

**18. Define competitive & non competitive inhibitors.** ★★★★★★★★★★★★

| Competitive inhibitors: | Non competitive inhibitors: |
|---|---|
| They have similar structure with substrate so attach to binding site but cannot activate catalytic site. Products are not formed. | They attach to enzyme other than active site & change the structure of enzyme. If genuine substrate attaches, catalysis fail to form products. |
| Block the active site. | Distort the active site. |
| Their effect can be neutralizes by adding more substrate. | Their effect cannot be neutralizes by adding more substrate. |
| **Example**: Malonic acid. | **Example**: Metals (Hg). |

## Exercise Short Questions

1. **List of conditions that destroyed enzymatic activity by disrupting bonds between atoms in an enzyme.**
   **Conditions:** pH & temperature.
2. **How do low and high temperature effect enzyme activity.**
   See question number: 14
3. **What is prosthetic group.**
   See question number: 4
4. **Define inhibitors of enzyme.**
   See question number: 16
5. **How does an enzyme accelerate a metabolic reaction.**
   See question number: 8

## MULTIPLE CHOICE QUESTIONS
## (SELECTED FROM PAST PAPERS)

**1)** Catalytic activity restricted to small portion of enzyme called = **Active site**
**2)** Raw material for synthesis of coenzyme/ coenzyme closely related with = **Vitamins**
**3)** Enzymes involved in cellular respiration are present in = **Mitochondria**
**4)** Enzymes involved in protein synthesis are present on = **Ribosomes**
**5)** Which is three dimensional globular protein = **Enzymes**
**6)** Functional specificity of every enzyme is consequence of its specific = **Chemistry & configuration**
**7)** Optimum PH of enterokinase **(5.50),** salivary amylase **(6.80)** & pancreatic lipase (**9**), sucrase **(4.50),** catalases **(7.60),**
**8)** Catalytic activity is restricted to small portion of enzyme called = **Active site**
**9)** Competitive inhibitor of succinic acid = **Malonic acid**
**10)** Activitaed enzyme consist of polypeptide and cofactor called = **Holoenzyme**
**11)** Enzyme involved in photosynthesis found in = **Chloroplast**
**12)** Rate of enzyme action doubles after every __ rise in temperature = **$10^0$C**
**13)** Specificity of enzyme is due to its = **Configuration**
**14)** Enzyme succinate dehydrogenase converts succinate into = **Fumarate**

**15)** The inhibitors which may destroy the globular structure of enzyme is = **Non competative**

## EXERCISE MCQs

1. If more substrate to an already occurring enzymatic reaction is added, more enzyme activity is seen because = **There is probably more enzyme available then substate**
2. If you add more substrate to already occurring enzymatic reaction and it has no effect on the rate of reaction What is the form given for this situation = **Saturation**
3. The rate of an enzyme catalyzed reaction **= Can be reduced by inhibitors**
4. The active site of an enzyme = **Determine by its structure specificity of enzyme**
5. Which statement about enzymes is not true = **They are non specific in their action**

## LONG QUESTIONS
## (SELECTED FROM PAST PAPERS)

1. Write characteristics of enzymes.
2. Write different factors affect rate of enzyme action.
3. Explain inhibitors.

# CH # 4: THE CELL

## SHORT QUESTIONS (SELECTED FROM PAST PAPERS)

1. **What is mean by omnis cellula e cellula? Who propose it?**

➢ **Proposed:** Omnis cellula e cellula was proposed by Germen Physician **Rudolph Virchow.**

- **Meaning:** Omnis cellula e cellula means that new cells are only produced by division of **pre existing cells**.

2. **What is cell theory? Who formulate it finally?** ★★★★★★★★★★

➢ **Cell theory:**

- All organisms composed of one or more cells.
- New cells arise from previously existing cells.
- Cell is the basic structural & functional unit of life.

❖ **Formulation:** Cell theory was finally formulated by **Schleiden** (German botanist) & **Shwann** (German zoologist).

3. **Define resolution and magnification power of microscope.**

| Resolving power: | Magnification power: |
|---|---|
| It increases the clarity of object. | It increases the size of object. |
| **Example:** Resolving power of human eye is **0.1mm** & light microscope is **0.2um.** | **Example:** Magnification power of light microscope is **1500X.** |

4. **Write function of parenchyma, sclerenchyma & xylem cell.**

➢ **Function of parenchyma: Parenchyma cells** store **extra food**.

➢ **Sclerenchyma:** Give support to plant.

➢ **Function of xylem:** Xylem conduct water & salt from root to aerial part of plants.

5. **Define cell fractionation.** ★★★★

➢ **Cell fractionation:** Isolation of different components & organelles of cell on the basis of size, density & weight.

- This technique used in cell biology to study cellular process & cell organelle.

6. **Write chemical composition of plasma membrane.**

➢ **Composition of plasma membrane:** Plasma membrane composed of 60-80% **proteins** & **20-40%** lipids. Small amounts of carbohydrates also present.

7. **What is unit membrane model of plasma membrane.**

➢ **Unit membrane model:** Cell membrane is made of lipid bi layer, sandwiched between two protein layers. This structure is found in all membranes that's why called unit membrane model.

8. **Define fluid mosaic model.** ★★★★★★

➢ **Fluid mosaic model:** According to this model, cell membrane is made of lipid bilayer in which protein molecule are embedded in mosaic manner. It also contain pore for transport of material.

- **Proposed:** This model was proposed by Sanger and Nicolson.

9. **Define semi permeable membrane.** ★★★

➢ **Semi permeable membrane:** Plasma membrane allowes some molecule to pass (gas, water, glucose and lipid soluble) but prevent to enter most molecules (ions and large molecules). That's why it is called semi or differentially permeable membrane.

10. **What is endocytosis & exocytosis. Give types.** ★★★★★★★★★★

➢ **Endocytosis:** Intake of material by infolding of cell membrane called **endocytosis.**

❖ **Types:** There are two types of endocytosis.

- **Pinocytosis**: Take in liquid material (water) in cell called **pinocytosis.**
  (ii) Also called cell drinking.
- **Phagocytosis**: Take in solid material (food) in cell called **phagocytosis**.
  (ii) Also called cell eating

➢ **Exocytosis**: Removal of material by invagination of cell membrane called exocytosis.

**11. Difference b/w primary & secondary wall.** ★★★★★

| Primary wall: | Secondary wall: |
|---|---|
| It is present outside to secondary wall. | **Secondary wall** is present inside to primary wall. It is rigid and thick. |
| It is true wall. | It is not true wall. |
| It is single layered. | It is many layered. |
| **Composition:** Primary wall is made of **pectin,** hemicelluloses & **cellulose**. | **Composition:** It is made of lignin, silica, waxes & cutin. |

**12. Write the function of cell wall.**

➢ **Cell wall:**

- It gives definite shape to cell & keep it rigid.
- It does not act as barrier.
- Cell wall is secreted by **protoplasm** of cell.

**13. Write the function of cytoplasm.** ★★★★★

➢ **Function of cytoplasm:**

- It contains several cell organelles.
- It provides movement to some organism by cytoplasmic streaming.
- Many metabolic processes like glycolysis occur in **cytoplasm**.

**14. Define cytosol.**

➢ **Cytosol:** Soluble part of cytoplasm called **cytosol**. (ii) It consists of 90% of water.

**15. Define ER. Difference b/w rough & smooth endoplasmic reticulum.** ★★★★★★

➢ **Endoplasmic reticulum:** Channels extending throughout cytoplasm (from nuclear membrane to plasma membrane).

➢ **Rough ER:** Endoplasmic reticulum with attach ribosome called **rough ER**.

❖ **Function:**

- Due to ribosome it synthesized protein.
- It stores & export protein.

➢ **Smooth ER:** Endoplasmic reticulum without ribosome called smooth ER.

❖ **Function:**

- **SER** Involve in metabolism of lipid.
- **SER** helps in Detoxification of drugs & transmission of impulse.
- Help in Transport of materials.
- Give mechanical support to cell.

**16. Compare cisternae with cristae.** ★★

➢ **Cisternae:** The tubular or spherical membrane of endoplasmic reticulum called cisternae

- **Function:** Cisternae separate **endoplasmic reticulum** fluid from cytoplasm.

➢ **Cristae:** Inner membrane of **mitochondria** has many infolds called **cristae.**

- **Function:** (i) Cristae increase the surface area of mitochondria.
  (ii) It also contains enzymes.

**17. Define polysome.** ★★

➢ **Polysome:** Group of ribosome attach to mRNA called **polysome**.
- **Function**: They involve in protein synthesis.
- Polysome found in both prokaryotic & eukaryotic cell.

**18. What is ribosome. How attachment of two ribosomal subunits are controlled.**

➢ **Ribosome:** Ribosome is made of equal amount of **RNA & protein (Ribonucleo protein particle).** Palade was 1st person to study **Ribosome.**

❖ **Forms:** Ribosome exists in two forms.
- Ribosome Floatings freely in **cytoplasm**.
- Ribosome Attach with rough ER.

❖ **Subunit:** Ribosome consists of two subunits. Large subunit is 60S & small unit is 40S.
- **Attachment of ribosomal subunit:** The attachment of larger subunit (60S) to smaller subunit (40S) is controlled by **$Mg^{2+}$.** They combine to form **80S** (S=Svedberg unit).
- **Function:** Function of ribosome is to synthesize **protein.**

**19. Write two function of Golgi complex.** ★★★★

➢ **Golgi complex:** Golgi body also called **dictyosome** (plants). Golgi body was discovered by Camilo Golgi in 1898. It is membrane bound sac found in all eukaryotes.

❖ **Functions:**
- **Golgi complex** concerned with **cell secretions**.
- It transports different substance like enzymes.
- **Golgi body** modifies proteins & lipids into glycoprotein & glycolipid by adding carbohydrates.

**20. Define autophagy & autophagosome.**

➢ **Autophagy:** Self eating of cell called autophagy.
- **Function:** Old & worn out parts like old mitochondria are digested. It results in recycling of cell parts.

➢ **Autophagosome:** Lysosomes eat their own cell parts under abnormal conditions (starvation) called autophagosome.
(ii) Food vacuole fuses with lysosome to form secondary lysosome.

**21. What is lysosome. Write its function.**

➢ **Lysosome: Lysosome** was first time isolated by **De Duve**. It is single membrane bound organelle contain many enzyme like hydrolytic enzyme & phosphatase.

❖ **Function:**
- Help in digestion of phagocytosed food.
- Involve in autophagy.
- Export enzyme.

**22. What is congenital disease.** ★★★★★★★★★

➢ **Congenital disease:** Disease existing from birth in patient**.** Mostly, congenital disease caused due to accumulation of different substance (glycogen & glycolipid) in cell. They are also called storage disease. In these diseases lysosomal enzymes are missing.
- **Example:** Tay sach disease cause by accumulation of **lipid** in brain cell.

**23. What is glycogenesis type II & Tay Sach disease.** ★★★

➢ **Glycogenesis type II:** It is storage disease. In this, glycogen accumulates in liver & muscle.
- **Cause**: Enzyme (alpha glucosidase) that degrades glycogen to glucose is missing.

- **Tay-Sach disease:** It is storage disease. In this, lipids accumulate in brain cell leads to mental retardation & even death.
  - **Cause:** Enzyme (lipase) that degrade lipid is missing.

**24. Difference b/w peroxisome & glyoxysome.** ★★★★

- **Peroxisome:** It is single membrane bound sac contain many enzymes like catalase & peroxidase.
  - It is present in plant & animal cell.
  - Diameter of peroxisome is about **0.5 um.**
- **Function:** Peroxisome **(microbodies)** helps in formation & decomposition of hydrogen peroxide.
- **Glyoxysome:** It is single membrane bound sac containing enzyme like catalase & glycolic acid oxidase.
  - It is present only in plant (having lipid rich seed).
  - **Function:** They are involves in glyoxylate cycle (convert fats into carbohydrate).

**25. Difference b/w lipid rich & lipid poor seed.**

| Lipid rich seed: | Lipid poor seed: |
|---|---|
| Seeds that rich in lipids are called lipid rich seeds. | Seeds that poor in lipid called lipid poor seeds. |
| Glyoxisome present. | Glyoxisome absent. |
| **Example:** (i) Castor bean (ii) Soya beans. | **Example:** Bean. |

**26. Write importance of vacuole in plant cell.**

- **Importance of vacuole:**
  - Vacuole expand plant cell without diluting its cytoplasm.
  - They act as storage house of many substances like water & other metabolites.
  - **Vacoule** provides turgidity to leaves & young parts of plants.

**27. Write a note on cytoskeleton.** ★★★★★★★★★★★

- **Cytoskeleton:** It gives structure to cell. It consists of microtubule, microfilament & intermediate filament.

| Microtubule | Intermediate filament | Microfilament |
|---|---|---|
| Microtubule is made of **tubulin** protein. | It is made of Keratin protein. | It is made of actin & myosin protein. |
| Its diameter is 25nm. | Its diameter is 8-12nm. | Its diameter is 7nm. |
| They form spindle during mitosis. | It maintains cell shape. | Involve in internal cell motion. |

**28. Write role of centrioles.** ★★★★

- **Role of centriole:**
  - Centrioles form **spindle fibers**.
  - They help in cilia formation.
  - They play important role in location of furrowing during cell division.

**29. Why mitochondria called power house of cell.**

- **Power house of cell:** Mitochondria extract energy from food & convert into ATP. This ATP is used by cell. Energy is spends in form of ADP. **Mitochondria** regenerate ATP from ADP & Pi. That's why mitochondria called power house of cell.

**30. Why mitochondria called self replicating organelle.** ★★

- **Self replicating organelle:** Mitochondria have ribosome & DNA. Due to presence of ribosome (form protein) & DNA (contain information), they have ability to replicate itself without any aid. That's why it is called self replicating organelle.

**31. Write function of mitochondria.** ★★★★★

➢ **Function of mitochondria:** Mitochondria contain many enzyme & coenzymes that take part in many processes like Krebs cycle & fatty acid metabolism. **Mitochondria** involves in cellular respiration (supply energy). They also provide space for these reactions. They generate ATP from ADP. That's why called power house of cell.

**32. What is F1 particle.**

➢ **F1 particle:** F1 particle found on inner mitochondrial membrane.

- **Function:** They involve in ATP formation. It is also called ATPase.

**33. What is Plastid. Write about chloroplast.** ★★★★★★★

➢ **Plastid: Plastid** is membrane bound organelle present only in algae/**plant cell**. It contains pigment.

❖ **Types**:

- Chloroplast
- Chromoplast
- Leucoplast

➢ **Chloroplast: Chloroplast** is double membrane bound organelle contain green pigment/**chlorophyll**. They absorb light energy & manufacture food. They have resemblance with haem group of haemoglobin. Chlorophyll contains **$Mg^{2+}$** while haemoglobin has **$Fe^{2+}$** in centre.
Many thylakoid arrange to form granum. Thylakoid is surrounded by fluid called stroma.

**34. What is intergranum, stroma & thylakoid.** ★★

➢ **Intergranum:** Each granum is connected with each other through non-green part called intergranum.

➢ **Stroma:** Fluid that surrounds thylakoid called **stroma.** It contain proteins, ribosome & DNA

➢ **Thylakoid:** Flattened vesicles that arrange themselve to form grana & intergrana.

**35. Difference b/w chromoplast & leucoplast.** ★★★★★★

| **Chromoplast:** | **Leucoplast:** |
|---|---|
| **Chromoplast** gives color to plant other than green. | **Leucoplasts** are colorless. |
| They are present in petals & ripened fruit. | **Leucoplasts** are found in underground part of plant. |
| Found in photosynthetic parts of plants. | Found in non-photosynthetic parts of plants. |
| Pigmented plastid. | Non-pigmented plastid. |
| **Function**: (i) It helps in pollination.<br>(ii) Dispersal of seed. | **Function**: It store food. |

**36. What is nucleolus & nucleoplasm? / Write two region of nucleolus.** ★★★★

➢ **Nucleolus:** It is darkly stained body without membrane.
(ii) It may be one or more in nucleus.

❖ **Regions of nucleolus:** There are two regions of nucleolus.

- **Peripheral granular area:** This area composed of precursor of ribosomal subunit.
- **Central fibril area:** This area consists of RNA & rDNA.

❖ **Function**:

- **Nucleolus** synthesize & store rRNA.
- **Nucleolus** synthesizes & export ribosome.

➢ **Nucleoplasm:** Soluble part of nucleus called nucleoplasm.

**37. What is chromosome? Write its importance.** ★★★

- **Chromosome:** During cell division, chromatin material is converted into darkly stained chromosome. It consists of arm & centromere.
  - **Centromere:** Part of chromosome where spindle fibers attach during cell division.
  - **Function:** Involve in separation of chromosome during anaphase.Chemically it is composed of **DNA** (40%) & protein (60%). Each species has specific number of chromosome.

❖ **Example**:

- Human has 46 chromosomes in one cell.
- Fruit fly *Drosophila melanogaster* have **8** chromosomes.

**38. Difference b/w nucleus & nucleoid.** ★★

| Nucleus: | Nucleoid: |
|---|---|
| Double membrane bound organelle that contains chromatin material (**DNA**). | They are without membrane & contain chromatin material. |
| It is found in eukaryotes. | It is found in prokaryotes. |
| Nucleus has definite shape. | Nucleoid has irregular shape. |
| Nucleus is well organized. | Nucleoid is not well organized. |
| Contain one or more chromosome. | Contain only one chromosome. |

**39. Difference b/w prokaryotic & eukaryotic cell.** ★★★★

| Prokaryote | Eukaryote |
|---|---|
| It lack distinct nucleus. | It has distinct nucleus. |
| Nuclear membrane is absent. | Nuclear membrane is present. |
| DNA submerged into cytoplasm. | DNA enclosed in nuclear membrane. |
| It lack membrane bound organelle. | Membrane bound organelle is present i.e ER & mitochondria. |
| Prokaryotic ribosome is **70** S. | Eukaryotic ribosome is **80 S**. |
| Bacterial/prokaryotic cell wall made of **peptidoglycan/murein**. | Cell wall of fungi made of **chitin**.<br>Cell wall of plant made of **cellulose**. |
| **Example**: Bacteria & cyanobacteria. | **Example:** Plant & fungi. |

## Exercise Short Questions

1. **Describe various movements involved in the transport of materials across the cell.**
   **Movements:** Diffusion, facilitated diffusion, osmosis, active transport, endocytosis & exo cytosis.
2. **State various structural modification in the cell involved in secretions.**
   **Cell secretions:** Cell secretions are mostly glycoprotein in nature. Protein are formed by ribosome & then transported to endoplasmic reticulum. And at the end transported to Golgi body where carbohydrate are added to protein and converted into glycoprotein.
3. **List the process block by mitochondrial failure in a Cell.**
   **Blocked process:** Aerobic respiration (Krebs cycle & ETC). (ii) Fatty acid metabolism
4. **What will happen if a chromosome loses its centromere.**
   Chromosome becomes useless because spindle fiber not attached to kinetochore (part of centeromere) during cell division.
5. **How does autophagy help in converting a tadpole larva into an adult amphibian.**
   **Autophagy:** Tad pole larva has tail while adult amphibians lack tail. Tail is destroys by **lysosome** by phenomenon of autophagy.

6. **Is there any similarity between bacterial and plant cell wall.**
   Yes, bacterial cell wall made of peptidoglycan (amino acid + polysachride) & plant cell wall made of cellulose (polysaccharide).

## MULTIPLE CHOICE QUESTIONS
## (SELECTED FROM PAST PAPERS)

**1)** Structural & functional unit of life is = **Cell**
**2)** Micrographia is publication of = **Robert hooke**
**3)** Discovery of nucleus = **Robert brown**
**4)** Resolution of human naked eye is = **1 mm**
**5)** Resolution of electron microscope = **2-4 angstrom**
**6)** Muscle cells have ability to = **Contract & relax**
**7)** Which cell transmit nerve impulse = **Nerve cell**
**8)** Secondary wall is not made of = **Cellulose**
**9)** Nature of Most of cellular secretion is = **Protein**
**10)** Cause of cyclosis & amoeboid movement = **Microfilament**
**11)** Each centriole consist of microtubule = **9**
**12)** Cristae are found in = **Mitochondria**
**13)** Cell with two nuclei called = **Binucleate**
**14)** Erythrocytes have nuclear pore **= 3-4 pore/nucleus**
**15)** Plasma membrane and Everything present in plasma membrane called = **Protoplasm**
**16)** ___ found in primary cell wall = **Pectin**
**17)** ___ not found in secondary wall = **Pectin**
**18)** Any Foreign object enter into cell engulfed by = **Lysosome**
**19)** Organelles of symbiotic origin = **Mitochondria**
**20)** Glyoxisome are most abundant in = **Plant seed**
**21)** Sacculus related to ___ of cell = **Cell wall**
**22)** One micrometer is equal to = **$10^{-6}$**
**23)** Nuclear membrane is continuous with = **Endoplasmic reticulum**
**24)** Myosin is present in = **Muscle**
**25)** ___ not present in plant **= Flagella**
**26)** Outer surface of Golgi called = **Convex**
**27)** Haploid chromosome in *Drosophila melanogaster* = **4**
**28)** The number of chromosomes in diploid cell of potato is = **48**
**29)** 50 are more thyllakoids forms = **Granam**
**30)** Enzymes of glyoxylate cycles are located in = **Glyoxysome**
**31)** Cells which secret there hormones = **Gland cells**
**32)** Which of the following process is cause substance to move across membrane without expenditure of cellular energy = **Diffusion**

33) **Robert hook** was the first person to see cells in = **Cork**
34) Cell consist of basic components = **All (plasma membrane, cytoplasm & nucleus)**
35) Micrometer is a unit of **= Length**
36) Plasma membrane is found in = **All (animals, plants & bacteria)**
37) Living substance of living organisms is called = **Protoplasm**
38) Semi circular channels and Systems of tubes found in cytoplasm is known as = **ER**
39) Harmful substance are detoxified in liver cells by = **ER**
40) Leucoplast are kind of = **Plastid**
41) In generalized plant cell the nucleus is present = **Place to the side of cell**
42) Organelle found in both prokaryotic and Eukaryotic cell is = **Ribosome**
43) The uphill movement of material is = **Active transport**.

## EXERCISE MCQs

1. Which statement about the nuclear envelope is not true = **It's inner membrane beers ribosome**
2. Which statement about plastid is true = **They contain DNA and ribosome**
3. Which type of cell would probably the most appropriate to study lysosome = **Phagocytic water blood cell**
4. Which of the following pairs of structure function is mismatched = **Golgi-muscle contraction**
5. Which of the following statement about ribosome is correct = **They are attached to cisternial surface**

## LONG QUESTIONS
## (SELECTED FROM PAST PAPERS)

1. Write a detail note on plasma membrane & lysosomes. ★★★★★★★★
2. Explain cell wall.
3. Write a note on endoplasmic reticulum. ★★★
4. Write a note on ribosome & Golgi complex. ★★★
5. Write a note on glyoxysome, peroxisome & cytoskeleton. ★★★
6. Write a detail note on mitochondria. ★★★★★★★★
7. Write a note on plastid. ★★★★★★★★
8. Explain nucleus & chromosome.
9. Compare prokaryotic & eukaryotic cell. ★★★★★

# CH # 5: VARIETY OF LIFE

## SHORT QUESTIONS (SELECTED FROM PAST PAPERS)

1. **Define species.** ★★★★★★★★
- **Species:** **Species** is a group of natural population which can interbreed freely among themselves & produce fertile offspring but reproductively isolated from other organism.
  - **Species** is basic unit of classification.
  - **Example:** *Zea mays* (ii) *Homo sapiens*
2. **Write classification of corn.** ★★★
- **Classification of corn:** Kingdom (plantae), division (anthophyta), class (angiospermae), **order (poales)**, family (poaceae), genus **(zea)**, species (mays).
3. **Write contribution of carlous Linnaeus.**
- **Carolus Linnaeus:**
  - **Linnaeus** introduced binomial nomenclature system.
  - He took scientific names from **Latin** words.
  - He published the list of plant name in **1753** & list of animal name in 1758.
  - He also classify living organism.
4. **What is binomial nomenclature.** ★★★★★★★★
- **Binomial nomenclature:** In this system, each species has a scientific name which consists of two words.
  - **Introduced:** This is introduced by Carlous linneaus in 18$^{th}$ century.
  - In binomial nomenclature, First name called generic name (Allium) which show **genus** & start with capital letter.
  - Second name called specific name (cepa) which show species & begin with small letter.
  - **Example:** **Brinjal (***Solanum melangena*) (ii) **Onion (*Allium cepa*)**.
5. **Write the botanical name of brinjal, amaltas & potato.** ★★
- **Brinjal (***Solanum melangena*)
- Amaltas (***Cassia fistula***)
- Potato (***Solanum tuberosum*).**
6. **Write two reasons for creating kingdom protista.**
- **Reason:**
  - Some organism show both plant & animal character like euglena. Euglena show plant like character (have chlorophyll) & animal like (cell wall is absent).
  - Two kingdom systems ignore the difference between prokaryotes & eukaryotes.
  - **Proposed:** **Ernst hackle** proposed third kingdom protista for such organism.
7. **What terminology was given by E. Chatton.**

**E. Chatton:** E. Chatton introduced Procariotique and eucariotique.

| Procariotique: | Eucariotique: |
|---|---|
| Pro (before) cariotique (nucleus) lack proper nucleus. | Eu (true) cariotique (nucleus) have proper nucleus. |
| They lack nuclear membrane. | They have nuclear membrane. |
| They lack membrane bound organelles. | They have membrane bound organelles. |
| **Example:** Bacteria | **Example:** Plant & animal cell |

8. **Write the name of five kingdom system.**

➢ **Name of five kingdom system:** Five kingdom system introduced by **R. Whitaker.**

**Kingdoms:** Monera (ii) Protista (iii) Plantae (iv) Fungi (v) Animalia.

9. **Difference b/w kingdom Monera & Protista.**

| Monera | Protista |
|---|---|
| They are prokaryotes. | They are eukaryotes. |
| They lack proper nucleus. | They have proper nucleus. |
| They are unicellular. | They are unicellular & simple multicellular. |
| Some are autotrophs & few are heterotrophs. | Some are autotrophs & few are heterotrophs. |
| **Example**: Bacteria & cyanobacteria. | **Example: Amoeba** & algae. |

10. **How fungi resemble with animals.**

➢ **Resemblance with animals:**

- Both are heterotrophic.
- Both are eukaryote.
- Both are multicellular.

11. **Define virology.**

➢ **Virology:** Branch of biology that deals with the study of virus called **virology**.

- **Example**: (i) HIV (ii) Polio virus.

12. **Define obligate parasite.** ★★

➢ **Obligate parasite:** Parasite that can live in host & can't grow in artificial medium called obligate parasite.

- **Example**: Virus & mildew.

13. **Define capsid of virus.** ★★★★★

➢ **Capsid:** The coat of virus called capsid. It is made of protein.

- **Function: Capsid** surrounds the nucleic acid of virus.

14. **What is genome.**

➢ **Genome:** Genetic material of virus called genome.

- It may be DNA/RNA.
- It is surrounded by capsid.

15. **What is capsomere. Give number of capsomere in adenovirus.** ★★★★★

➢ **Capsomere:** The capsid of virus is made of **protein** subunit called **capsomere.**

- Each virus has specific number of capsomere.
- **Example:** The capsid of adenovirus is made of **252** capsomer.
  Capsid of herpes virus is made of **162 capsomeres**.

16. **Difference b/w virions & prions.** ★★★★

➢ **Virions:** The complete, mature & infectious particle called virion.

- It is composed of central core (nucleic acid) & protein coat (capsid).
- It causes disease in human.
- **Disease:** They cause small pox & polio etc.

➢ **Prions: Prions** are infectious particles made of **protein** only.

- It was discovered in 1983.
- **Disease: Prions** cause disease like **mad cow** & **mysterious brain** in human.

17. **Define naked virus.**

➢ **Naked virus:** Non-enveloped virus called naked virus. Their nucleocapsid does not cover with envelop.

- **Example:** Adenovirus.

**18. What is lytic & lysogenic phage.** ★★★★★★

- **Lytic cycle:** Viral nucleic acid control host machinery & starts multiplying. About **25** min, **200** new bacteriophages are formed & bacterial cell bursts. It is called lytic cycle.
- **Lysogenic cycle:** In some cases, viral DNA instead of taking control over host's machinery becomes incorporated into bacterial chromosome. Phage in this state called **prophage** & it is called **lysogenic cycle.**

**19. What is prophage & provirus.** ★★★★

- **Prophage:** The phage DNA that inserted into bacterial chromosome during lysogeny called prophage.
  - Prophage is found in bacteriophage.
- **Provirus:** Retrovirus inserted DNA in host called provirus. That DNA incorporated to host DNA & passed to next cells.
  - Provirus is found in retroviruses.

**20. Define induction.** ★★★

- **Induction:** Viral DNA attach to bacterial chromosome during lysogeny and passes to next successive generations. Sometime viral DNA detaches from bacterial chromosome & lytic cycle starts called induction.

**21. Write classification of viruses on basis of morphology.**

- **Classification of virus:**
  - **Rod shape virus:** Tobacco mosaic virus is example of rod shape virus.
  - **Spherical virus:** Polio virus is example of spherical virus.
  - **Tad pole virus:** Bacteriophage is example of tad pole virus.

**22. Name some viral disease.**

- **Viral disease:** (i) Small pox (ii) Herpes simplex (iii) Influenza (iv) Mumps & measles (v) Polio.

**23. What is small pox & herpes simplex.** ★★★

- **Small pox:** Small pox is caused by **pox virus** (**DNA** virus). Raised fluid filled vesicles are formed on body. Later it becomes pustules. Pustules leave pitted scar on body called **pocks.**
- **Herpes simplex:** Herpes virus is responsible for **herpes simplex (DNA).** It is naturally occurring disease. Vascular lesion formed on epidermis.
  - **Symptoms:** Vascular lesions on mouth, lips & other skin site.

**24. What is oncovirus & paramyxo virus.** ★★

- **Oncoviruses:** They are cancer causing virus.
  - They are RNA virus.
  - They convert RNA into DNA.
  - They cause disease in animals.
  - **Example:** Herpes virus.
- **Paramyxo virus:** They are RNA virus. They are large, enveloped & RNA virus.
  - **Example:** Measles & mumps belong to **paramyxovirus.**
  - **Cure:** They are cured by adopting hygienic condition.

**25. What do you know about measles and mumps and Polio Disease.**

- **Mumps: Mumps** is highly contagious disease.
  - About 60% adult are of **mumps**.

- **Measles:** Measles is common disease among children and adults.
  - Measles develop immunity in its victim.

❖ Measles and mumps virus belong to **paramyxovirus**. They are RNA enveloped viruses.

- **Polio:** Poliomyelitis is caused by Polio virus.
  - **Polio virus** is smallest RNA virus. It occurs in children.
  - It is present all over the world.

**26. What is retroviruses.** ★★

- **Retroviruses:** They are RNA viruses.
  - They are spherical & 100 nm in diameter.
  - They use reverse transcriptase to convert single stranded RNA into double stranded DNA.
  - **Example: HIV** cause AIDS in human belong to retroviruses.

**27. Define reverse transcriptase.** ★★

- **Reverse transcriptase:** Reverse transcriptase is special enzyme present in retrovirus.
  - **Function: Reverse transcriptase** convert single stranded RNA into double stranded DNA & this phenomenon called **revesrse transcription**.

**28. How AIDS spread & prevent.**

- **AIDS: A**IDS (acquired immune deficiency syndrome) is caused by **HIV**.
  - HIV belongs to **retroviruses.**
  - HIV virus attack **T-lymphocyte**.
- **Spread of AIDS:**
  - By blood transfusion.
  - By sexual contact.
  - By using contaminated syringes & surgical instruments.
- **Prevention:** (i) Avoid infected syringes & surgical instrument.
  - Avoid sexual contact.
  - Avoid AIDS infected blood transfusion.

**29. Draw labeled diagram of HIV.** ★★★

**30. Write the symptoms & prevention of Hepatitis.**

- **Symptoms:** Symptoms of hepatitis are jaundice, abdominal pain, liver enlargement, fatigue & fever.
- **Prevention:** (i) Adopt hygienic measure
  - Routine vaccination
  - Screening of donor blood
  - Avoid sexual contact
  - Use sterilized syringes.

**31. What is hepatitis. Write its cause.** ★★★

- **Hepatitis:** Inflammation of **liver** called hepatitis.
- **Types:** Hepatitis A, B, C, D, E, F etc.
- **Symptoms:** Fever, fatigue, vomiting, loss of appetite & jaundice.
- **Cause:** It is caused by following.

(i) Viral infection (ii) Toxic agents (alcohol) (iii) Drugs.

**32. How hepatitis A is transmitted.** ★★

- **Hepatitis A:** Hepatitis A is also called **infectious hepatitis** caused by HAV.

(ii) It is RNA virus.

- **Transmission:** It is transmitted by feces.

- **Symptoms:** Yellow skin & eyes, fever, diarrhea & upset stomach.

## MULTIPLE CHOICE QUESTIONS
## (SELECTED FROM PAST PAPERS)

**1)** Which is independent evolutionary unit = **Species**
**2)** A family contain related = **Genera**
**3)** Eukaryotic multicellular autotrophs include in = **Plantae**
**4)** Bacteriophage discover independently by = **Twort & D' Herelle**
**5)** Bacteriophage replicate only within = **Bacteria**
**6)** 1st step in replication of bacteriophage is = **Adsorption**
**7)** Temperate phage may exist as = **Prophage**
**8)** Influenza virus are = **Enveloped RNA virus**
**9)** Hepatitis B is also called = **Serum hepatitis**
**10)** Hepatitis D is also called = **Delta hepatitis**
**11)** Hepatitis leads to chronic liver disease = **Hepatitis C**
**12)** Genetically engineered vaccine is not available for = **HCV**
**13)** Kingdom protoctista was proposed by = **J. Hogg**
**14)** ___ not viral disease = **Tetanus**
**15)** Size of parvo virus = **20nm**
**16)** ___ bacteriophage formed after **25 min** of infection = **200**
**17)** Hepatitis C is caused by __ virus = **RNA enveloped**
**18)** An elongated, pyramidal and hexagonal structure of bacteriophage = **Head**
**19)** Absorptive mode of nutrition = **Fungi**
**20)** Enzyme of bacteriophage that dissolve cell wall = **Lysozyme**
**21)** ___ insect = **Silver fish**
**22)** HIV uncoated in ____ part of host cell = **Cytoplasm**
**23)** *Solanum esculentum* is scientific name of = **Tomato**
**24)** Tooth and mouth disease caused by = **Virus**
**25)** The first infection disease against which factory method of prevention was developed = **Smallpox**
**26)** Which of the following is not RNA in virus = **Herpes virus**
**27)** Orders include related = **Families**
**28)** Eukaryotic multicellular reducer = **Fungi**
**29)** A virion is **= Virus**
**30)** Eukaryotic, multicellular autotroph included in Kingdom = **Plantae**
**31)** Which of the following is prokaryotes = **Blue green algae**
**32)** In 5 Kingdom system of classification member of kingdom plantae are autotrophic, eukaryotic and = **Multicellular**
**33)** Icosahedral viruses have nearly = **20 faces**
**34)** Bacteriophage exhibit life cycle that are = **Lytic and lysogenic**

**35)** Influenza viruses are = **RNA enveloped**

**36)** Pig is a source of infection of = **Hepatitis C**

## EXERCISE MCQs

1. The enzymes involved in viral replication are synthesized by = **The host cell**
2. A virion is a = **Virus**
3. An isolated virus is not considered living since = **Cannot metabolize**
4. In a lytic cycle of a bacteriophage the host DNA is = **Digested into its nucleotide**
5. In the lysoogenic cycle DNA of a bacteriophage = **Joins the bacterial chromosome**
6. Temperate phage exist as = **Prophage**
7. Phylogeny describe a species = **Evolutionary history**
8. In the binomial system of taxonomy developed during 18th century by Carlos linneus the first world of an Organisms name = **Genus**
9. In the five kingdom system of classification members of kingdom plantae autotrophic and = **Multicellular**
10. Five kingdom system of classification is not based on = **Nucleic acid**
11. The common name of Allium cepa is = **Onion**
12. Arrangement of Texas = Species, genus, family, order, class, Phylum & Kingdom
13. Pigs are reserve to = **Hepatitis E**
14. Which one of the following is false about AIDS = **HAV**

## LONG QUESTIONS
## (SELECTED FROM PAST PAPERS)

1. **Write biological classification of corn.** ★★★
2. **Explain Linnaeus system of binomial nomenclature.**
3. **Explain two to five kingdom system of classification.**
4. **Explain five kingdom system of classification.** ★★
5. **Discuss characteristics & structure of virus.** ★★★★★
6. **Write a detail note on life cycle of bacteriophage.** ★★★★★
7. **Explain some viral disease.** ★★★
8. **Explain retrovirus with reference to AIDS.** ★★★★★★★
9. **Explain hepatitis.** ★★★★★

# CH # 6: KINGDOM PROKARYOTAE

## SHORT QUESTIONS (SELECTED FROM PAST PAPERS)

1. **Difference b/w eubacteria & archaeobacteria.**

| Eubacteria: | Archaeobacteria: |
|---|---|
| They are true bacteria. | **Archeabacteria** are ancient bacteria. |
| Cell wall of bacteria made of **peptidoglycan**. | Cell wall of archeabacteria lack **peptidoglycan**. |
| Present everywhere. | Present in extreme environments. |
| Introns are absent. | Introns are present. |
| **Example:** E. coli. | **Example**: Methanogenic bacteria. |

2. **Why leeuwenhoek & Louis pasture famous**.

- **Leeuwenhoek: Leeuwenhoek** was first scientist who study microorganism in rain water.
  - He used simple microscope to study bacteria & protozoa. He named them animalcules.
- **Louis Pasteur:**
  - He confirmed the existence of microorganism.
  - He developed vaccine against Anthrax & Rabies.
  - He also developed pasteurization process.

3. **Write postulate of germ theory of disease.** ★★★★★★

- **Postulate of germ theory**:
  - A specific organism is always found in given disease.
  - The organism can be isolated & grown in laboratory.
  - The pure culture produce disease when enter into animal.
  - It is possible to recover organism in pure culture from experimentally infected animal.
  - **Formulation:** Germ theory was formulated by **Robert Koch.**

4. **Write morphological classification of bacteria.**

- **Cocci: Cocci** are spherical or oval shape.
  - **Example:** *D. pneumoniae*
- **Bacilli: Bacilli** are rod shape bacteria.
  - **Example:** *E. coli*
- **Spiral:** They are spirally coiled bacteria**.**
  - **Example: Vibrio** is spiral/curved/comma shape.

5. **What is pleomorphic bacteria**.

- **Pleomorphic bacteria:** A bacteria which can exist in many shapes called pleomorphic bacteria.
  - **Example**: Azotobacter.

6. **Difference b/w streptococcus & staphylococcus.**

- **Streptococcus**: In streptoccus, cocci arranged in long chain of cells.
  - **Example**: *Streptococcus pneumonia*.
- **Staphylococus**: In **staphylococcus,** cocci arranged in irregular like cluster of grapes.
  - **Example**: *Staphylococcus aureus*.

7. **Difference b/w tetrad & sarcina.** ★★★

| Tetrad: | Sarcina: |
|---|---|
| In tetrad, division of cell is in two planes. | In **sarcina**, division of cell is in three planes. |
| **Tetrad** is square of 4 **cocci.** | **Sarcina** is cube of 8 cocci. |

| Example: Micrococcus species. | Example: *Sarcina ventriculi.* |
|---|---|

**8. Define atrichous & monotrichous.** ★★

- **Atrichous:** In **atrichous**, bacteria are without flagella.
  - **Example:** Lactobacillus.
- **Monotrichous:** In **monotrichous,** bacteria have single polar flagella.
  - **Example:** Vibrio

**9. Define lophotrichous, peritrichous & amphitrichous.** ★★★

- **Lophotrichous:** In **lophotrichous**, bacteria has tuft of flagella at one pole.
  - **Example:** Pseudomonas.
- **Amphitrichous:** In **amphitrichous**, bacteria has tuft of flagella at two poles.
  - **Example:** Spirilum
- **Peritrichous:** In **peritrichous**, whole bacteria is surrounded by flagella.
  - **Example:** E. coli

**10. Define chemotaxis.**

- **Chemotaxis**: Flagellate bacteria detect & move in response to chemical signal. This behavior is called **chemotaxis.**
  - Chemotaxis is shown by bacteria (obtain food) & flagellated sperm (fertilized the egg).

**11. Define pili. Write its function.** ★★★

- **Pilli:** It is hollow, non helical & filamentous.
  - Pilli is made of **pilin** protein.
  - Pilli is present only in gram –ve bacteria.
- **Function**:
  - It is involved in attachment to surface.
  - **Pilli** is involved in **conjugation** process.

**12. What is capsule & slime.** ★★★★

- **Capsule:** Bacterial capsule made of polysaccharide & protein, or both. It bound to cell.
  - **Function:** Capsule gives sticky character to colonies of encapsulated bacteria.
- **Slime:** Slime is loose & made of soluble shield of macromolecules.

❖ **Function:**

- **Slime** provides pathogenicity to bacteria.
- It protects bacteria from phagocytosis.

**13. Name bacterium that has no cell wall.**

- **Mycoplasma**: **Mycoplasma** is the smallest bacteria.
  - **Mycoplasma** has no cell wall.
  - Diameter of mycoplasma is **10-200nm**.

**14. Write function of cell membrane, cell wall and flagella.**

- **Cell membrane:**
  - Cell membrane contains enzymes for cellular respiration.
  - Regulate chemistry of cell ie transport of proteins, nutrients, sugar and electrons.
  - Cell membrane (mesosome) also involved in DNA replication.
- **Cell wall:**
  - It protects bacteria from osmotic lysis.
  - It determines cell shape.

- **Flagella:**
  - It is also involved in chemotaxis (move in response of chemicals).
  - It helps bacteria in motility.

**15. What is peptidoglycan.**

- **Peptidoglycan:** Cell wall of bacteria made of **peptidoglycan**.
  - **Composition:** Peptidoglycan is made of long glycan chain and crossed linked with peptides.

**16. What is nucleoid.**

- **Nucleoid:** DNA of bacteria present in centre of cell. It is single, circular & double stranded DNA molecule. They form irregular shape. Area where DNA presents in bacteria called nucleoid.

**17. Difference b/w gram positive & gram negative bacteria.** ★★★★★

| Gram positive bacteria | Gram negative bacteria. |
|---|---|
| Gram +ve bacteria stained **purple**. | They stained pink. |
| They have no outer wall. | They have outer wall. |
| **Peptidoglycan** (50%) | **Peptidoglycan** (10%) |
| Teichoic acid present. | Teichoic acid absent. |
| Plasma membrane is more permeable | Plasma membrane is less permeable. |
| **Example:** Staphylcoccus | **Example:** Pseudomonas. |

**18. Define plasmid.** ★★★★★

- **Plasmid: Plasmid** is extra circular, double stranded DNA.
  - It is self replicating.
  - It is not essential for bacterial growth & metabolism.
  - **Function: Plasmid** is used as vector in genetic engineering.
  - **Example:** pSC 101 & pBR 322.

**19. What is mesosome & ribosome.**

- **Mesosome**: **Cell membrane** invaginates to form **mesosomes.**
  - **Function**: **Mesosome** is involved in DNA replication. (ii) They also contain enzyme.
- **Ribosome**: It consists of RNA & protein. There is thousand of ribosome in bacterial cell.
  - Bacterial ribosomes are smaller (70S) than eukaryotic cell (80S).
  - **Function**: They synthesize proteins.

**20. What is humus. How bacteria absorb it.**

- **Humus:** It is formed from decay of plant & animal. Bacteria secrete enzyme on humus which breaks humus into simpler substance. Then bacteria absorb & utilize as source of energy.

**21. Difference b/w saprophytic & parasitic bacteria.**

- **Saprotrophic bacteria:** They get their food from dead organic material (humus).
  - They are decomposer.
  - **Example:** Mycobacterium.
- **Parasitic bacteria:** They get their food from their host.
  - They are heterotrophic.
  - **Example:** Streptococus.

**22. Difference b/w photosynthetic & chemosynthetic bacteria.** ★★★

- **Photosynthetic bacteria:** It has chlorophyll & gets their food through photosynthesis.
  - They use $H_2S$ in place of water.
  - Photosynthetic bacteria lack **chloroplast**.
  - **Example:** Purple sulphur bacteria (ii) Purple non sulphur bacteria.

- **Chemosynthetic bacteria:** They get their energy through oxidizing inorganic compound like ammonia, nitrate & nitrites etc**.**
  - **Example:** Nitrifying bacteria. (ii) Ammonifying bacteria.

**23. Define aerobic & anaerobic bacteria.**

- **Aerobic bacteria**: **Aerobic** bacteria can grow in the presence of oxygen.
  - **Example: Pseudomonas.**
- **Anaerobic bacteria:** Anaerobic bacteria can grow in the absence of oxygen.
  - **Example: Spirochete.**

**24. Define facultative & microaerophilic bacteria.**

- **Facultative bacteria: Facultative** bacteria can grow in the presence or absence of oxygen
  - **Example: *E. coli.***
- **Microaerophilic bacteria:** They can grow in low concentration of $O_2$**.**
  - **Example**: **Campylobacter.**

**25. Give different phase in bacterial growth.** ★★★★

- **Growth phase in bacteria:** There are four different growth phase in bacteria.
  - **Lag phase:** No growth occurs. Bacteria prepare themselves for division.
  - **Log phase:** In **log phase,** rapid growth occurs. Bacteria divide at exponential rate.
  - **Stationary phase:** Bacterial death rate is equal to reproduction rate.
  - **Decline phase:** Bacteria start dying. Bacterial death rate is more than reproduction rate.

**26. Define conjugation.**

- **Conjugation:** Some bacteria transfer genetic material from donor bacterium to recipient bacteria. This process called **conjugation.**

❖ **Advantage:**

- Conjugation produces genetic recombination in bacteria.
- This allows bacteria to survive under severe condition.

**27. Give ecological & economical importance of bacteria.** ★★★★★

- **Ecological importance:** Bacteria are ecologically very important.
  - They found everywhere.
  - They decompose dead organic matter & play important role in completion of cycles of nitrogen, phosphorus, sulfur & carbon.
- **Economical importance:** Bacteria are economically very important.
  - Bacteria are used in many industries like food industry, drugs industry & biotechnology.
  - They also adversely affect agricultures.
  - They also spoil food & vegetables.

**28. Give medical importance of bacteria.**

- **Medicinal importance**: Bacteria are common pathogen of human.
  - Their 200 species of bacteria cause disease in human.
  - They also cause disease in animals and plants.
  - Many antibiotics obtained from bacteria.

**29. Give different method to control bacteria.**

- **Physical method: I**n physical method, we use high temperature, radiation & antibiotics.
- **Chemical method:** In chemical method, we use antiseptic, disinfectant & chemotherapeutic agents.
- **Vaccination:** In vaccination, we use vaccine against bacteria.

**30. Write microbicidal & microbistatic effect on bacteria★★★**

- **Microbicidal:** They kill microbes immediately**.**
  - **Example:** Tetracycline
- **Microbistatic: T**hey inhibit microbe reproduction & maintain population at constant rate
  - **Example:** Sulfonamide

**31. Define antiseptic & disinfectant.★★★★**

- **Antiseptic:** Chemical substance are use to inhibits growth of microorganism on living tissue.
  - **Example**: (i) Silver nitrate (ii) Iodine tincture.
- **Disinfectant:** Redox agents are use to inhibit growth of microorganism on nonliving tissue.
  - **Example**: Alcohols (ii) Phenols (iii) Halogen.

**32. Write the misuse of antibiotics. ★★★★**

- **Antibiotics:** Antibiotics are chemicals which inhibit the growth of **bacteria**. Antibiotics secreted by certain **bacteria**.
- **Misuse:** Misuse of antibiotic is very dangerous for human beings & can cause death.

❖ **Example:**

- Penicillin cause **allergy**.
- **Streptomycin** causes **deafness.**
- Tetracycline causes discoloration of teeth.

**33. Write two character of cynobacteria.**

- **Characteristics of cyanobacteria:** They are also known as blue green algae.
  - Chain of cells surrounded by mucilage sheath called **trichome.**
  - They are prokaryote & autotroph.
  - Reserve food material of cyanobacteria is **glycogen.**
  - They reproduce asexually.
  - **Cyanobacteria** are true prokaryotes.

**Use of cyanobacteria:** Cyanobacteria help in reclamation of alkaline soil.

- **Nostoc** (heterocyst) helps in $N_2$ fixation.
- They are complete food (contain 60% protein) and are edible.
- **Oscillatoria** is used as pollution indicator.

34. **What is phycobilisome.**

- **Phycobilisome**: Photosynthetic pigment & electron transport chain attach to thylakoid membrane to form phycobilisome. They involve in photosynthesis.
  - **Example**: It is present in cyanobacteria.

35. **Define water blooms & heterocyst.★★★**

- **Water bloom**: **Cyanobacteria** grow extensively to form **water bloom.**

❖ **Disadvantage**:

- It gives bad smell to water.
- Due to presence of organic matter water become unfit for use.

- **Heterocyst**: Heterocysts are large, round, light yellow & thick walled cells in trichome.

❖ **Function**:

- They involves in photosynthesis.
- They involve in nitrogen fixation.

**36. Write asexual reproduction in Nostoc.★★**

- **Hormogonia:** Hormogonia formed when filament break at different points.

It is due to death of heterocyst.

- **Akinetes:**
  - **Akinetes** are thick walled & vegetative cell with reserve food.
  - Under favourable condition they grow.

## Exercise Short Questions

1. **Name general characteristics that could be used to define the prokaryotes.**
   **Characteristics:** They lack prominent nucleus (nuclear memebrane absent). They lack double membrane bound organelle. They have small ribosome (70 S).
2. **Do any other microbial groups beside bacteria have prokaryotic cells.**
   Yes, cyanobacteria have prokaryotic cell.
3. **In what habitats are bacteria found. Give some general means by which bacteria derive nutrients.**
   **Habitat:** Bacteria found everywhere on earth.
   **Nutrients:** Some bacteria are autotroph (chemoautotroph & photoautotroph) & some are heterotrophy (saprotroph & parasitic).
4. **List function that the cell membrane performs in bacteria.**
   **Cell membrane:** Regulate transport of materials (proteins, nutrients, sugar & electrons), contain respiratory enzyme & invaginate to form mesosome.
5. **What term mesosomes and some of their possible functions.**
   See question number: 19
6. **What is unique about the structure of bacterial ribosome.**
   **Bacterial ribosome:** Bacterial ribosome is smaller (70 S) then eukaryotic ribosome (80 S).
7. **Draw the three bacterial shape.**
   **Cocci:** They are spherical/oval shaped.
   **Bacilli:** They are rod shaped.
   **Spiral:** They are spirally coiled, comma or curved shape.
8. **Name a bacterium that has no cell wall.**
   See question number: 13
9. **A gram stained discharge from abscess shows cocci in irregular grape like cluster what is the most likely Genus of this bacteria staphylococcal.**
   Staphylococcus.

## MULTIPLE CHOICE QUESTIONS
## (SELECTED FROM PAST PAPERS)

**1)** Who proved microorganism cause disease = **Loius Pasteur**
**2)** Flagella originate from = **Basal body**
**3)** Primary function of flagella is = **Motility**
**4)** Bacterial membranes different from eukaryotic in lacking = **Cholesterol (sterol**)
**5)** Plasma membrane & every thing within them called = **Protoplast**
**6)** Which structure are dormant, thick walled & dessicication resistance = **Cyst**
**7)** Bacteria reproduce asexually by = **Binary fission**
**8)** Attenuated/less virulent bacteria stimulate host to produce = **Antibodies**
**9)** Antibiotic is a word = **Greek**

**10)** Which is not found in all bacterial cell = **Capsule**

**11)** Bacterial endospore function in = **Reproduction**

**12)** ___ is prokaryotes = **Bacteria and Cyanobacteria**

**13)** Bacteria breakdown dead plants/animals and release = **Nitrates**

**14)** Interval of time until completion of next division called = **Generation time**

**15)** *E. coli* is = **Gram Negative bacteria**

**16)** Which of the following is primary function of bacterial cell wall = **Support**

**17)** Bacteria that cause disease in human beings called = **Pathogenic**

**18)** Agent responsible for rabies = **All (dogs Fox is cats)**

**19)** Chemicals produced by microorganism which are Capable of destroying bacteria = **Antibiotics**

**20)** Most wide spread problem of antibiotic misuse is = **Increase resistance in pathogens**

**21)** Antibiotics produce by fungi and ___ group of bacteria = **Actinomycetes**

## LONG QUESTIONS
## (SELECTED FROM PAST PAPERS)

1. **Discuss different classes of bacteria on basis of flagella.** ★★
2. **Write a note on cell wall of bacteria.** ★★★
3. **Explain nutrition of bacteria.** ★★★★★★★★★
4. **Discuss growth & reproduction of bacteria.** ★★★★★★★★★★★
5. **Discuss different method to control of bacteria.** ★★★★★★★★★★★★
6. **Explain use & misuse of antibiotics.** ★★★★★★★
7. **Discuss characteristics & economic importance of cyanobacteria.** ★★★★★★
8. **Write a note on Nostoc.** ★★★★

# CH # 7: KINGDOM PROTISTA

## SHORT QUESTIONS (SELECTED FROM PAST PAPERS)

1. **Why kingdom protista exclude from other kingdom?** ★★
- **Kingdom protista:** Basically kingdom protista defined by exclusion. All members have characteristics that exclude them from other kingdoms. These characters are followings.
- **Characteristics:** (i) Diverse body form. (ii) Types of reproduction. (iii) Mode of nutrition (iv) Life style.

2. **What are protista, how they differ from plant and animals.** ★★
- **Protista:** Protista are unicellular, colonial or simple multicellular organism which possess eukaryotic cell organization. Plants and animals have their origin from protista.
  - **Difference:** Protista do not develop from **blastula/embryo** while plants and animals develop from embryo.

3. **Difference b/w protista & monera.**

| Protista | Monera |
|---|---|
| They have prominent nucleus. | They lack prominent nucleus. |
| It include unicellular, colonial & simple multicellular organism. | It include unicellular organism |
| They are most diverse group. | They are less diverse group. |
| **Example**: **Euglena,** algae & amoeba. | **Example**: Bacteria & cyanobacteria. |

4. **Why kingdom protista is regarded as polyphyletic group of organism.**
- **Polyphyletic group:** Biologist regard kingdom **Protista** as polyphyletic group of organism due to following reasons.
  - **Reasons:** Diversity among organism. (ii) They do not have single common ancestor.

5. **What is giant amoeba.** ★★★★★★★★★
- **Giant amoeba**: The scientific name of giant amoeba is ***Pelomyxa palustris***.
  (ii) They have multiple membrane bound nuclei.
  - **Mode of nutrition**: Giant amoeba gets their food from **methanogenic** bacteria**.**
  - **Habitat:** They live in mud & bottom of freshwater ponds.

6. **Write major group of kingdom protista**.
- **Major group**: Protozoa animal like Protists. (They are unicellular, heterotroph & eukaryotes).
  - Algae (plant like)
  - Slime mold & water mold (fungi like).

7. **What is pseudopodia and flagella.**
- **Pseudopodia:** It is cytoplasmic projection involve in movement of organism.
  - **Function:** It also helps organism to taking food into body.
  - **Example:** Pseudopodia found in **Amoeba**.
- **Flagella:** Flagella are long structure that helps in movement of organism.
  - **Example:** Flagella found in Bacteria.

8. **Name parasitic amoeba.** ★★★
- **Parasitic amoeba**: ***Entamoeba histolytica*** is intestinal parasite which causes **amoebic dysentery** in human.

**9. What are zooflagellates.**

➢ **Zooflagellates:** They are unicellular & colonial.

- They possess many flagella which help in **movement.**
- They may be free living, symbionts or parasite.
- **Mode of nutrition**: They obtain their food from ingesting organism or decomposing organic matter.
- **Example**: **Trypanosoma** (ii) Euglena.

**10. What is trichonymphas.** ★★

➢ **Trichonymphas:** They are complex & symbiont zooflagellates with many flagella.

- **Role:** They live in gut of termites & help in digestion of dry wood.

**11. What is sleeping sickness & trypanasoma.** ★★★★★★★★

➢ **Trypanosoma:** Trypanosome is example of parasitic **zooflagellates.**

- **Disease: Trypanosoma** cause African sleeping sickness disease in human.
- It is transmitted by **tsetsefly.**

**12. What is choanoflagellates.** ★★★★★★★★★★

➢ **Choanoflagellates:** They are sessile zooflagellates**.**

- Their flagella are surrounded by collar.
- They have similarity to collar cells of sponges.
- **Habitat**: They are found in marine or freshwater.

**13. What are ciliates.** ★★★★★★★

➢ **Ciliates:** They are unicellular.

- They ingest tiny organism.
- Ciliates have flexible outer covering called **pellicle**.
- **Ciliates** differ from other protista having two types of nuclei.
- **Movement:** They move by cilia but some are sessile.
- **Example:** paramecium (ii) stentor.

**14. Write role of contractile vacoule.**

➢ **Contractile vacoule:** It involve in water regulation.

- Example: Contractile vacoule present in fresh water cilliates.

**15. What is pellicle. Write its function.** ★★★

➢ **Pellicle:** Flexible outer covering of ciliates called pellicle.

- **Function:** Pellicle gives definite but changeable shape to ciliates.

**16. How ciliates differ from other protista.** ★★★★ ★★★★★★★

➢ **Ciliates**: **Ciliates** are differs from other protista having two types of nuclei.

❖ **Micro nuclei**: There are many micronuclei. (ii) They are diploid (2n).

- **Function**: Micronuclei are involves in **sexual process.**

❖ **Macronucleus**: There are single macronuclei. (ii) They are polyploidy**.**

- **Function**: They help in cell metabolism & growth.

**17. Define conjugation.** ★★★ ★★★

➢ **Conjugation:** During conjugation, two individuals come together and exchange their genetic material. Conjugation is type of sexual reproduction.

- **Example:** Conjugation is seen in ciliates, alage and bacteria.

**18. What are foraminifera & actinopods.** ★★★★★★★★★

- **Foraminiferan:** Shells of foraminiferans are made of **calcium.**
  - Their shell has pores.
  - **Example:** Forams.
- **Actinopods**: Shells of actinopods are made of **silica**.
  - Their shell is glassy.
  - **Example**: **Radiolarians.**
  - Foraminifera & actinopods are marine protozoans. Their shells called tests.
  - Foraminifera & actinopods are move by **pseudopodia.**
- **Formation of chalk/limestone deposit**: Dead **foraminiferans** sink into bottom of ocean & their shell change into mud. This mud gradually changes into chalk.

**19. What is apicomplixans. How they move.** ★★★★★

- **Apicomplaxans:** They are parasitic protozoan.
  - They cause disease in human like Malaria. (iii) They have many hosts.
  - **Movement:** Apicomplexans move by **flexing** & lack locomotary organ.
  - **Example**: **Plasmodium.**

**20. What is plasmodium. Write symptoms of malaria.** ★★★★★

- **Plasmodium**: **Plasmodium** causes malaria in human.
  - It is transmitted in human by female Anopheles mosquito.
  - First enter into liver & then destroy RBCs.
  - Bursting of millions of RBCs show symptoms of malaria.
- **Symptoms of malaria**: Chill & high fever caused by toxic substance.

**21. How algae differ from plants.** ★★★★★

**Difference b/w algae & plant:** Algae are different from plants due to following reasons.

| Algae | Plants: |
|---|---|
| Sex organs of algae are **unicellular.** | Sex organs of algae are multicellular. |
| **Embryo** formation is absent in algae. | Embryo formation is present in a plants. |
| Zygote of algae is not protected by parent body. | Zygote of plant is protected by parent body. |
| **Example: Red algae & green algae.** | **Example: Corn & rose.** |

**22. What is thallus.** ★★★

- **Thallus:** Body which is not differentiated into true root, stem and leaves and lack vascular tissue (xylem & phloem) called thallus.
- **Example:** Algae & fungi.

**23. Name pigments found in algae.** ★★★★★★

- **Pigments:** Algae contain following pigments.

(i) Chlorophyll a, b & c. (ii) Yellow & orange carotenoids
(iii) Xanthophylls (iv) phycoerythrin.

**24. How euglenoids close to zooflagellates.** ★★★★★★★★★

- **Euglenoids:** They are many times classified into plant & animal kingdom.
  - Based on molecular data it is thought that euglenoids are closely related to **zooflagellates**.
  - They have chlorophyll when grown in light.
  - Euglena losses chlorophyll when grown in dark & becomes heterotrophic.
  - Some are always colorless & heterotrophic.
  - **Example:** Euglena.

**25. What are dinoflagellates.** ★★★★★★★

➢ **Dinoflagellates:** Most dinoflagellates are unicellular. (ii) Their shell made of silica.

- **Dinoflagellates** are most unusual group of protista.
- Pyyrophyta are commonly called **Dinoflagellates**.

❖ **Ecological Importance:**

- Dinoflagellates are second major **producer** in marine after diatoms.
- Dinoflagellates are occasional population explosion or blooms. The colors of these blooms are orange, red or brown & known as red tides.

❖ **Example: Ceratium.**

**26. What are red tides?** ★★★★★★

➢ **Red tides**: Dinoflagellates are occasional population explosion or blooms. These blooms color the water orange, red or brown & known as red tides.

- **Effect of water bloom**: They cause serious disease in plants & animals.

**27. What are diatoms. Write its importance.** ★★★★★★★

➢ **Diatoms:** Cell wall of **diatoms** consists of **two** shells & overlap like a petri dish.

- Shell of diatom is glasslike made of **silica**.
- They are autotrophic.
- Common name of **chrysophyta** is **diatoms**.

❖ **Importance**:

- **Diatoms** are major producer in marine ecosystem due to their large numbers. They are important in aquatic food chain.
- **Example**: **Diatoma** (ii) **Pinnularia** (iii) **Fregularia**

**28. Write few characters of brown algae.**

➢ **Brown algae: Brwon algae** contain giant of kingdom protista.

- All brown algae are multicellular (5cm-75m).
- Brown algae are common in cooler marine water (rocky coastline).
- Largest brown algae called kelps. **Brown algae** possess leaf like blades, stem like stipes & root like holdfast
- **Example:** Kelps & fucus.

**29. Define kelps. Write its part.** ★★★★★★★★★★★

➢ **Kelps:** The largest **brown** algae called **kelps.** (ii) They live in cooler marine water.

- **Structure: Kelps** (Brown algae) possess leaf like blades, stem like stipes & root like holdfast.

**30. What is red algae & green algae.** ★★★

➢ **Red algae:** It is multicellular & has complex filament.

- They attach to rock through holdfast.
- Their cell wall made of calcium carbonate.
- **Red algae** involves in building of coral reefs.

❖ **Pigments:** Chl a, carotene and **phycoerythrin**.

- **Example:** Chondrus and **polysiphonia**.

➢ **Green algae:** Green algae have chlorophyll a, b & carotenoids.

- Cell wall of green algae made of **cellulose.**
- Their reserve food is starch.
- Green algae are ancestors of plant kingdom.
- **Example:** Ulva (ii) Chlorella (iii) Spirogyra.

**31. Why green algae consider ancestors of plants.** ★★

➢ **Green algae:** Due to following similarities green algae consider ancestor of plants.

- It has chlorophyll a, b & carotenoids.
- Its reserve energy is starch.
- Their cell wall made of cellulose.
- **Example:** Ulva (ii) Chlorella (iii) Spirogyra.

**32. Write importance of algae.** ★★★★★★★★★★

➢ **Importance of algae:** Some algae are edible like **kelps.**

- Some algae give useful substance like agar & antiseptics.
- They provide oxygen to other organism by photosynthesis.

**33. What is chlorella.** ★★★★★★★★

➢ **Chlorella: Chlorella** is **unicellular & non motile** green alga.

- **Habitat:** It is found in fresh water ponds & ditches.
- **Use:** It is used as experimental organism for photosynthesis.

**34. How fungus like protista differ from fungi.** ★★★★★★

| Fungus like protists | Fungi |
|---|---|
| They have centrioles. | They lack centrioles. |
| Their cell wall made of cellulose. | Their cell wall made of chitin. |
| They are mostly aquatic. | They are mostly terrestrial. |
| **Example**: Slime mold & water mold. | **Example:** Rust & smut |

**35. What is slime mold.** ★★★★★

➢ **Slime mold:** The feeding stage of slime mold is **plasmodium** with multinucleate.

- It has slimy appearance.
- It is found on dead & decaying material.
- It ingests bacteria & yeast.
- **Example:** *Physarum polycephalum*.

**36. How slime mold reproduce.** ★★

➢ **Reproduction in slime mold:** During unfavorable condition, it form haploid spores through meiosis in sporangia. Under favorable condition, spores germinate to form biflagellate cells that form diploid zygote. Zygote produces plasmodium.

**37. What is *Physarum polycephalum*.** ★★★★★

➢ ***Physarum polycephalum:*** It belongs to slime mold group.

- **Uses:** It is model organism for study of many biological processes like growth, differentiation & cytoplasmic streaming etc.

**38. What is oomycota.** ★★★★★★

➢ **Oomycota:** They have similar structure to fungi.

- Cell wall of oomycota is made of **cellulose.**
- Their hyphae are aseptate.
- It has many pathogenic organisms.
- **Example:** ***Phytophthora infestans***.

**39. What is *Phytophthora infestans*.** ★★★★★★

➢ ***Phytophthora infestans*: Phytophthora** cause late blight disease in potato.

- This disease cause Irish potato famine in 19th century. Due to rainy summer water mold multiplied unchecked & potato rots in fields.
- About 1 million people died due to starvation.

## Exercise Short Questions

**Write characteristics of each of the following groups.**

a) **Protozoa:** See question number: 6
b) **Dinoflagellates:** See question number: 25
c) **Diatoms:** See question number: 27
d) **Slime mold:** See question number: 35
e) **Oomycotes:** See question number: 38

## MULTIPLE CHOICE QUESTIONS
## (SELECTED FROM PAST PAPERS)

1) Who proposed kingdom protista = **John Hogg**
2) Unicellular eukaryotes are placed in = **Protista**
3) Margullis & Schwartz listed how many phylum = **27**
4) Amoeba move & obtain food by = **Pseudopodia**
5) Sexual reproduction in ciliates through = **Conjugation**
6) Which develop spore at some stages in their life = **Apicomplexans**
7) Mosquito inject saliva in human in form of = **Sporozoites**
8) ___ edible alga = **Kelps**
9) Laminaria is example of ___algae = **Brown**
10) ____ phylum has no flagella = **Red algae**
11) Pinnularia belong to ____ algae = **Chrysophyta**
12) Blade, stipe and hold fast found in = **Laminaria**
13) Foraminiferans & actinopods move with the help of = **Pseudopodium**
14) Functions of cytoplasmic projection extend out from Foraminifera & actinopods are = **Trap prey**
15) RNA Sequencing indicates that a green algae and plants form = **Monophyletic lineage**
16) Which of the following is not an example of phylum chlorophyta = **Fucus**

## EXERCISE MCQs

1. Amoeba move and obtain food by means of = **Pseudopodia**
2. The sexual process exhibited by most is called = **Conjugation**
3. Parasitic protozoans that forms spore at some stage in their lives belong to which group = **Apicomplexans**
4. Algae sales composed of two halls that fit together like pattery dish belong to = **Diatoms**
5. Algae in which body is differentiated into blades types and hold first belong to = **Kelps**
6. Chlorophyll a, chlorophyll b and carotenoids are found in =
7. The feeding stage of of Slime mould is called = **Plasmodium**
8. Cell wall in Oomycotes is chemically composed of = **Cellulose**

# CH # 8: KINGDOM FUNGI

## SHORT QUESTIONS (SELECTED FROM PAST PAPERS)

1. **What is fungus.**

➢ **Fungus:** Eukaryotic multicellular organisms that are hetertroph found on moist area rich in organic matter.

- There are more than one lakh species found on earth.
- Their body made of hyphae.
- **Fungi** are achlorophyllous. Cell wall of fungi made of **chitin**.
- **Example:** Mushrooms, morels & truffles etc.

2. **How fungi resemble with plants and animals.** ★★★

➢ **Resemblance with plants:**

- Both fungi & plant have **cell wall**.
- Both fungi & plant lack centrioles.
- Both fungi & plant are non-motile.

➢ **Resemblance with animals:**

- Both fungi & animals are heterotroph.
- Both fungi & animals lack cellulose in their cell wall.
- Cell wall of fungi and exoskeleton of arthropods both are made of **chitin.**

3. **How fungi different from animals.** ★★★

➢ **Difference:** Fungi are different from animals due to following reasons.

| Fungi | Animlas |
|---|---|
| Fungi have cell wall | Animals lack cell wall. |
| Fungi are absorptive heterotrophic | Animals are ingesive heterotroph. |
| Fungi are non-motile | Animals are motile. |
| **Example:** Mushroom & Morels | **Example:** Lion & tiger. |

4. **Define nuclear mitosis.** ★★★★

➢ **Nuclear mitosis:** In nuclear mitosis, nuclear membrane does not break & mitotic spindle forms in nucleus. Nuclear membrane compress b/w two daughter chromosome. In some fungi nuclear envelope breaks late.

- **Example:** fungi

5. **Define mycelium & hyphae.** ★★★★★★★★

➢ **Mycelium:** Body of fungus called mycelium. Mycelium consists of bundles of hyphae.

➢ **Hyphae:** It is long, slender & thread like filaments. It forms body of fungus.

6. **Define hyphae. Give its types.** ★★★★★★★★★★★★

➢ **Hyphae:** It is long, slender & thread like filaments. (ii) It forms body of fungus.

❖ **Types:** There are two types of hyphae.

- **Septate hyphae:** They are divided by cross walls.
  Their cells have one or more nuclei.
- **Example:** Hyphae of Ascomycota.
- **Aseptate hyphae:** They are without cross walls. Such hyphae are also called coenocytic hyphae.
  Their cells are long & multinucleated. Incomplete/no septa helps cytoplasm to move freely.
- **Example:** Hyphae of zygomycota.

7. **What do you know about armillaria.**

➢ **Armillaria:** Armillaria is a pathogenic fungus of conifers plants.

- They grow upto 15 hectare from centre.
- It is thought to be the largest organism on earth.

8. **Define haustoria.**

➢ **Haustoria: Haustoria** are special hypheal tip present in parasitic fungi.

- **Functions: Haustoria** are used to absorb nutrients from host cytoplasm.

9. **Define predatory fungi. Or carnivorous fungi.** ★★★★★★

➢ **Predatory fungi:** Some fungi act as predators. They paralyzed nematodes, penetrate them & absorb nutrition to fulfill nitrogen & glucose requirement.

- **Example:** Soil dwelling **carnivoures fungus** is **Arthrobotrus & oyster mushrooms.**

10. **Difference b/w obligate & facultative parasite.**

| **Obligate parasite:** | **Facultative parasite:** |
|---|---|
| They can grow only on living host & cannot grow in laboratory. | They can grow on living host & also grow in laboratory. |
| Cannot live primarily as saprophytes. | Live primarily as saprophytes. |
| **Example**: Mildew (ii) Virus. | **Example:** Yeast (ii) Bacteria |

11. **What is lichens.** ★★★★★

➢ **Lichens: Lichen** is **mutualistic** association b/w fungi & **algae/cyanobacteria** (sometime both).

- Visible part of lichen is **fungi** & algae live inside the fungi.
- Fungi protect algae & in return get food from algae.
- **Role**: **Lichens** are bioindicators of **air** pollution.
- **Example: Reindeer moss** & Physcia.

12. **What is mycorrhizae.** ★★★★★★★★★★

➢ **Mycorrhizae: Mycorrhizae** are **mutualistic** association b/w fungi & roots of vascular plants.

- **95%** vascular plant show mycorrhizae.
- Fungi increase the **absorption area** for plant to absorb nutrients & in return get organic carbon from plant.

13. **Difference b/w ectomycorrhizae & endomycorrhizae.** ★★★★★★

| **Endomycorrhizae:** | **Ectomycorrhizae:** |
|---|---|
| Hyphae penetrate into root cells. | Hyphae do not penetrate into root cells. |
| Hyphae form coils and minute branches in cells. | Hyphae extend between the root cells. |
| It is more common type. | It is less common type. |
| **Example**: Endomycorrhizae found in orchid. | **Example**: Ectomycorrhizae found in pine & firs. |

14. **Difference b/w spore & conidia.** ★★★★★★★★

| **Spore:** | **Conidia:** |
|---|---|
| Spore produced inside the **sporangium.** | Conidia are produced on conidiophores. |
| They are haploid, non motile & produce in large amount. | **Conidia** are non motile & asexual spores. They produced in large amount. |
| They produce by sexually & asexually. | Conidia are asexual spore. |
| It cannot survive for weeks. | It can survive for weeks. |
| **Example:** Ascospore(ii) Basidiospore (iii) Zygospore | **Example:** Ascomycota & deutromycota reproduce asexually through conidia. |

15. **Difference b/w fragmentation & budding.** ★★★★★

➢ **Fragmentation:** Breaking of mycelium of fungi called fragmentation.

- Each broken fragment gives rise to new plant.

- **Example:** Plasmodiophora reproduce through fragmentation.
- **Budding:** Division in which tiny bud produce on body of fungi & grow to form new organism. It grows by simple cell division.
- **Example:** Yeast reproduces through budding.

**16. Define karyogamy & plasmogamy.** ★★★★★★★★★★

➢ **Plasmogamy:** During sexual reproduction, fusion of cytoplasm of two compatible hyphae called plasmogamy.
- It takes place immediately after fusion of hyphae.

➢ **Karyogamy:** During sexual reproduction, fusion of nuclei called karyogamy.
- It does not take place immediately after plasmogamy in basidiomycetes & ascomycetes.

**17. Define dikaryotic hyphae.** ★★

➢ **Dikaryotic hyphae**: Hyphae having two different genetic types of nuclei called dikaryotic hyphae. It is also called heterokaryotic hyphae.
- **Example**: Dikaryotic hyphae found in ascomycota & basidiomycota.

**18. Give sexual & asexual reproduction in fungi.**

➢ **Asexual reproduction:** Asexual reproduction in fungi occurs by following methods.
(i) By spore (produce in sporangia). (ii) By conidia (produce on conidiophores).
(iii) By fragmentation (division of mycelium). (iv) By budding (bud formed on body).
Reproduction rate is high.

➢ **Sexual reproduction:** In sexual reproduction, two compatible hyphae come close together, their cytoplasm fuse & then nucleus fuse.
- Reproduction rate is low.
- Sexual reproduction occurs by haploid sexual spore such as basidiospore & ascospore.

**19. What are zygomycetes.**

➢ **Zygomycetes:** They are also called conjugating fungi. Their hyphae are aseptate.
- **Name:** Zygote forms dormant, thick walled resistant zygospore. Hence name zygomycota. Zygote is formed by fusion of two hyphae during sexual reproduction.
- **Example: Rhizopus.**

**20. How sexual reproduction take place in rhizopus.** ★★★

➢ **Sexual reproduction in rhizopus:** During sexual reproduction, zygote formed by fusion of two hyphae. Then they forms zygospore (dormant & thick walled). Zygospore form haploid spore by meiosis. Spores germinate to form new mycelium.

**21. Compare basidiospore & ascospore. / compare ascus with basidium.** ★★★★★

| Ascospore | Basidiospore: |
|---|---|
| It is found in ascomycetes. | It is found in basidiomycetes. |
| It is formed in asci. | It is formed in basidia. |
| Commonly **8** ascospores formed within each ascus. | Commonly 4 basidiospores produced in each basidiam. |
| Their fruiting body is ascocarp. | Their fruiting body is basidiocarp. |

**22. Name sexual & asexual spore of ascomycota.**

➢ **Sexual spore:** Sexual spore of ascomycetes is ascospore.
- Ascospores are formed within asci by meiosis.

➢ **Asexual spore:** asexual spore of ascomycetes is conidia.
- It is formed on conidiophores & dispersed by wind.

**23. Why basidiomycota called club fungi.**

- **Club fungi:** Basidiomycota called club fungi due to their club shape basidium (reproductive structure).
  - **Example:** Mushroom and puff balls.

**24. What is rust & smut.** ★★★★★★★★★★

- **Rust:** Rust is called because of rusty, orange yellow spot on their host mostly on stem & leaves. They later form rust red spore in wheat.
  - **Cause: Puccinia** is most common rust fungi.
- **Smut:** Smut is called because of **black dusty** spore that resemble to smut.
  - These spores replace the grain kernels in wheat.
  - **Cause: Ustilago** is most common **smut fungi**.

**25. Define parasuxuality.** ★★★★★★★★★★

- **Parasexuality: Parasexuality** is special kind of genetic recombination shown by imperfect fungi. In parasexuality, chromosome of two nuclei lying in same hyphae are exchanged.
  - Parasexuality is modified form of sexuality.

**26. Give reproduction in pencilium.**

- **Reproduction in pencillium:** It is reproduced asexually by conidia.
  - Condia is formed on conidiophores that give different color to mycelium.
  - Brush like arrangement of conidia is characteristic of **pencillium**.
  - They are easily dispersed.

**27. Write ecological importance of fungi.** ★★★

- **Ecological importance of fungi:** Fungi are ecologically very important.
  - They are very important decomposers & symbionts.
  - They play important role in recycling of nutrients.
  - They show mycorrhizae & lichen association.

**28. Define bioremediation.** ★★★★

- **Bioremediation:** Removal of environmental pollutants by living organism called **bioremediation.**
  - **Example:** Some fungi used in bioremediation.

**29. Write name of some edible fungi.**

- **Edible fungi:** Mushrooms (agaricus). (ii) Morels (morchell). (iii) Truffles (ascomycetes).

**30. What is toadstool.** ★★★★

- **Toad stool:** Poisonous mushrooms are called **toad stool**. (ii) It is very fatal. **Toadstool** is non-edible.
  - **Example: Amanita** **(ii) Jack-O lantern.**

**31. Name four antibiotic obtained from fungi/ medicinal importance of fungi.** ★★★★★

- **Antibiotics:** Penicillin (source of 1st antibiotic **pencillin**) kills bacteria.
  - **Lovastatin** (lowering blood **cholesterol**).
  - **Ergotine** (relieve migraine).
  - **Griseofulvin** (antifungal)
  - **Cyclosporine** (tissue rejection after organ transplantation).

**32. Write importance of yeast.** ★★★★★★★

- **Yeast:** Yeast was first eukaryotes used in genetic research.
  - Yeast was first eukaryote whose genome was completely studied.
  - Yeast belongs to ascomycetes. Yeast is unicellular & other fungi are multicellular.

❖ **Importance:** Yeast is used in biological research due to rapid reproduction rate.

- **Yeast** is used in production of bread & liquor.
- Yeast is also used for production of hormones.
- Neurospora is used in genetic research.

**33. What is mycotoxins & aflatoxins.** ★★★★★★

➢ **Mycotoxins:** Toxin produced by any fungi called mycotoxins.
- **Example:** Citrinin (ii) Ergot alkaloids (iii) Ergotamine.

➢ **Aflatoxins:** Toxin produced by **aspergillus** called aflatoxins.
- **Example:** B1 toxin (ii) B2 toxin
- **Source:** Milk, egg & meat also contain small amount of aflatoxins.

**34. Name two superficial infection cause by fungi. / Write four plant disease caused by fungi.**

➢ **Superficial infection:** Ring worm and athlete feet are caused by imperfect fungi.

➢ **Plant disease:** Powdery mildew, apple scab, red rot of sugar cane, cotton root rot & potato wilt.

**35. What is ergotism & ringworm.** ★★★★★★

➢ **Ergotism:** It is caused by eating bread made from purple ergot contaminated rye flour.
- **Effects:** It causes nervous spasm (ii) Convulsion
  (iii) Psychotic delusion (iv) Gangrene.

➢ **Ringworm:** Ringworm is superficial fungal infection.
- **Cause:** It is caused by imperfect fungi.

**36. What is histoplasmosis. Write its cause.** ★★★★★

➢ **Histoplasmosis:** Histoplasmosis is serious infection of **lung.**
- **Cause:** It is caused by inhaling spore of fungi which is common in soil contamination.
  (ii) If it spread in blood (occur occasionally), it can be serious.

**37. What is rhodotrula.**

**Rhodotrula:** Rhodotrula (Pink yeast) grows on shower curtains and moist area.

## Exercise Short Questions

1. **What is hyphae. What is advantage of having incomplete septa.**
   See question number: 6
   **Advantage:** Incomplete septa has advantage in efficient transport of material in hyphae.
2. **What is composition of fungal cell wall and how is this composition advantages to fungi.**
   **Fungal cell wall:** Fungal cell wall is made of chitin.
   **Advantage:** Chitin is more resistant than cellulose and lignin.
3. **To which phylum is yeast belong how do they differ from other fungi.**
   See question number: 32
4. **Name sexual and asexual spores of ascomycetes.**
   **Sexual spore:** Sexual spore of ascomycota is ascospore.
   **Asexual spore:** Asexual spore of ascomycota is condidia.
5. **What are mycorrhizae.**
   See question number: 12
6. **By what means and individual in imperfect fungi classifide.**
   **Classification of imperfect fungi:** Imperfect fungi classified on basis of DNA sequence.
   Other fungi classified on sexual reproduction.

7. **Give a single characteristics that differentiate zygomycota and basidiomycota.**

| Zygomycota: | Basidiomycota: |
|---|---|
| They have non-septate hyphae. | They have septate hyphae. |
| They have short dikaryotic phase. | They have long dikaryotic phase. |

8. **Why is green mold more likely to contaminate an orange kept in refrigerator than our bacteria.**
   Green mold survive in extremely low temperate ($-3^0$C) where bacteria cannot survive.
9. **What is fungus.**
   See question number: 1
10. **State two parallel characteristics of ascomycetes and basidiomycetes.**
    **Characteristics;** Both have septate hyphae. Both have lenghthy dikaryotic phase. Both reproduce sexually by sexual spore.

## MULTIPLE CHOICE QUESTIONS
## (SELECTED FROM PAST PAPERS)

**1)** Ecological role of fungi as decomposer is parallel to = **Bacteria**
**2)** Study of fungi called = **Mycology**
**3)** Closet relative of fungi is = **Slime mold**
**4)** A single mycelium produce new hyphae upto kilometer in = **One day**
**5)** Fungi obtain food from dead organic matter called = **Saprotrophs**
**6)** Which is principal decomposer of cellulose & lignin = **Fungi**
**7)** Fungi grow on dead organic matter called = **Saprotrophic**
**8)** Example of **foliose lichens** is = **Parmelia**
**9)** Fungi can tolerate a wide range of PH = **2-9**
**10)** Unicellular yeasts reproduce by = **Budding**
**11)** Members of basidiomycota commonly called **= Mushrooms**
**12)** Example of deutromycota is = **Alternaria, Aspergellius** & **Pencillium**
**13)** Yeast are unicellular microscopic = **Fungi**
**14)** Rust of wheat is caused by **= Fungi**
**15)** Sexual reproduction is absent in = **Deutromycota**
**16)** How many species of mushroom are edible = **200**
**17)** Species used for giving flavor, aroma & characteristics color = **Pencillium**
**18)** First antibiotic ever discovered = **Pencillium**
**19)** Citric acid obtained from = **Aspergillus**
**20)** Disease caused by fungus = **Ringworm**
**21)** Which is not a symptom of ergotism = **Indigestion**
**22)** Fungi reproduce asexually by = **Budding**
**23)** Imperfect fungi called = **Deutromycota**
**24)** ___ group of fungi lack sexual phase = **Deutromycota**
**25)** *Omphalotus oleatrus* is = **Jack o latern**
**26)** *Sacchromyces cerevisiae* is = **Yeast**

**27)** *Candida albicans* is = **Yeast**
**28)** Unicellular, non hypheal fungi = **Yeast**
**29)** Karyogamy occurs immediately after plasmogamy = **Zygomycota**
**30)** ___ mushrooms gills glow during dark = **Omphalotus**
**31)** Yeast belong to = **Ascomycota**
**32)** Fungi grow best in ___ habitat = **Moist**
**33)** Agaricus are ___ Fungi **= Edible**
**34)** Nuclear mitosis occur in = **Fungi**
**35)** Which of the following structure are associated with a sexual reproduction = **Conidia**
**36)** Exoskeleton of arthropod is made of = **Chitin**
**37)** Example of Fruticose lichen is = **Ramalina**
**38)** Members of basidiomycota are commonly called = **Mushrooms**
**39)** Naked Sporangia is known as = **Conidia**

## EXERCISE MCQs

1. Which statement about fungal nutrition is not true = **Parasitic fungi can grow only on their specific host**
2. That's obtained nutrition of fungi is aided by = **Their large surface area volume ratio**
3. Zygomycota = **Have hyphae without regularly occurring cross walls**
4. Which of the following cells are associated with asexual reproduction in fungi = **Conidia**
5. The closest relatives of fungi are probably = **Slime mold**
6. E. Coli of fungi are = **Yeast**
7. An ascus is to ascomycete as is a ___ is to basidiomycetes = **Basidium**
8. Which statement is not true about zygomycetes = **They have both sexual and asexual reproduction**

## LONG QUESTIONS
## (SELECTED FROM PAST PAPERS)

1. Explain taxonomic status of fungi. ★★
2. Discuss nutrition in fungi. ★★★★
3. Discuss fungi with reference to predator, lichen & mycorrhizae. ★★★★★
4. Discuss asexual reproduction in fungi. ★★★★★★★★
5. Discuss sexual reproduction in fungi. ★★★★★★
6. Explain zygomycote & ascomycota. ★★★★
7. Describe life cycle of loose smut of wheat. ★★★★★★
8. Write land adaptation of fungi. ★★★★★★★★
9. Explain ecological importance of fungi.
10. Discuss economic loss & gains of fungi. ★★★★★★★★★★

# CH # 9: KINGDOM PLANTAE

## SHORT QUESTIONS (SELECTED FROM PAST PAPERS)

1. **Define phylogentic system of classification.**

➢ **Phylogenetic system:** There is natural relationship among living organism & has common origin. This system is called **phylogenetic system of classification.**

- This system is based on similarities & differences among plants. There are more than 3,60,000 known species of plants

2. **Write four characters of bryophytes.** ★★★★★★

➢ **Bryophyte:** Bryophytes are first land plants.

- **Bryophytes** are also called amphibian of plant.
- Bryophytes are nonvascular & **flowerless** plant.
- They have dominant gametophyte
- **Example:** Liverworts (ii) Mosses.

3. **Why bryophytes called amphibians of plants.** ★★★★

➢ **Amphibian of plant:** Bryophytes are called amphibian of plant because they can't live without water.

- They need water for reproduction/fertilization.
- Their sperms are motile & need water to fertilize the egg..

4. **List four adaptation of bryophytes to land habitat.**

➢ **Adaptation to land habitat:**

- Presence of cuticle which reduce transpiration.
- Formation of rhizoids for absorption of water.
- Multicellular embryo is formed.
- Show alternation of generation.

5. **Name male & female part of bryophytes.**

➢ **Male part:** Male part of bryophytes called antheridia.

- **Function:** They produce antherozoid.

➢ **Female part:** Female part of bryophyte called archegonia.

- **Function:** They produce egg.

6. **Define bryophytes.** ★★★★

➢ **Bryophyte: Bryophyte** defined as, nonvascular plant, gametophyte dominant, sporophyte attaches to gametophyte & are homosporous.

- **Example:** Liverworts (ii) Mosses.

7. **Write name of three subdivision of bryophytes.**

➢ **Subdivision of bryophyte:** Bryophytes are divided into three subdivisions.

(i) Hepaticopsida (ii) Musci (iii) Anthoceropsida.

8. **What is antheridiophores & archegoniophores.** ★★★

➢ **Antheridiophores:** Male sex organ (antheridia) develops on special branch on gametophyte called antheridiophore.

- Sperms are produced in antheridiophore

➢ **Archegoniophore:** Female sex organ (archegonia) develops on special branch on gametophyte called archegoniophore.

- Eggs are produced in archegoniophore.
- **Example;** Marchantia

**9. Define paraphysis & protonema.** ★★★

➢ **Paraphysis:** Archegonia & antheridia form cluster & mix with sterile hairs called **paraphysis.**

- **Example;** Paraphysis found in mosses.

➢ **Protonema:** Spore of moss plant develop into alga like structure called protonema.

- **Function:** Protonema germinates to form moss plant.

**10. Why anthoceropsida consider advance than other bryophytes.** ★★★★

➢ **Anthoceropsida:** Sporophyte of anthoceropsida is independent.

- Their sporophyte is photosynthetic.
- They have waxy cuticle to prevent transpiration.
- Saprophyte of antheoceropsida has **meristematic** tissue between foot & capsule.
- **Example:** Anthoceros.

**11. Define alternation of generation.** ★★★★★★★★★★

➢ **Alternation of generation:** Plant has two generations, gametophyte (gametes producing & haploid) & sporophyte (spore producing & diploid) generation. These generations alternate with each other. This is called alternation of generation.

**12. Difference b/w sporophyte & gametophyte.**

| Sporophyte: | Gametophyte: |
|---|---|
| Spore producing generation called sporophyte. | Gamete producing generation called gametophyte. |
| It is diploid generation. | It is haploid generation |
| Dominant in tracheophytes. | Dominant in bryophytes. |
| Developed from zygote. | Developed from meiospore. |
| Asexual phase of plant. | Sexual phase of plant. |

**13. Write significance of alternation of generation.**

➢ **Significance of alternation of generation:**

- Spores have different genetic recombination due to meiosis & produce gametophyte with better genetic makeup.
- Gametes have no genetic recombination because gametes are produced by mitosis.

**14. Difference b/w bryophytes & tracheophytes.**

| Bryophytes | Tracheophytes |
|---|---|
| Non vascular plant & Non flowering plant | Vascular & flowering plant. |
| They are found on damp shady place. | They are found on land. |
| Dominant generation is gametophyte. | Dominant generation is sporophyte. |
| **Example:** Mosses & liver worts | **Example:** Sphenopsida & pteropsida |

**15. Name four subdivision of tracheophytes.**

➢ **Subdivision of tracheophytes:** Tracheophyte divided into **four** subdivisions.

(i) Psilopsida (ii) Lycopsida (iii) Sphenopsida (iv) Pteropsida.

**16. What is the earliest group of vascular plant. Give example of extinct and living plant.**

➢ **Earliest group: Psilopsida** is earliest group of vascular plants.

➢ **Extinct genera**: Cooksonia (ii) Horneophyton.

➢ **Living genera:** Psilotum (ii) Tmesipeteris

**17. What is microphyll & megephyll leaves.** ★★★★★★★

| Microphyll: | Megaphyll: |
|---|---|
| It is small leaf | It is broad leaf |
| **Microphyll** has single undivided vein. | It has divided vein & has expended lamina. |
| Without leaf gaps. | Contain leaf gaps. |
| **Example:** Lycopodium. | **Example:** Fern & seed plant. |

**18. Define overtopping & planation.** ★★

- **Overtopping:** On stem, some branches remain short while other branches grew faster and large. These unequal developments of branches called **overtopping**.
- **Planation:** Arrangement of unequal dichotomously branches in one plane called **planation.**

**19. What is webbing in evolution of leaf.**

- **Webbing:** The space b/w overtopped dichotomously branches occupied by parenchyma cells to form flat lamina having many dichotomously branched vein.

**20. What is reticulate & circinate venation.** ★★★★

- **Reticulate venation:** Fusion of vascular strand in leaf in net like pattern called reticulate venation.
  - **Example:** Dicots.
- **Circinate venation**: Leaves of ferns called fronds. When frond is immature & young it is coiled. This pattern called circinate venation.
  - **Example:** Pteropsida.

**21. Difference b/w homospory & heterospory.** ★★★★★★★★★★★

| Homospory: | Heterospory: |
|---|---|
| Production of one type of spore by sporophyte called **homosporous**. | Production of two type of **spore** by sporophyte called **heterosporous.** |
| This condition called homospory. | This condition called heterospory. |
| Homospore produce single type of gametophyte. | Heterospore produce two type of gametophyte. |
| Found in primitive plants. | Found in advance plants. |
| **Example;** Bryophytes. | **Example:** Selaginella. |

**22. What are arthrophytes. Give example.** ★★★★★

- **Arthrophytes:** Leaves of sphenopsida is expanded & arranged in whorls.
  - Complete plant body has many joints. That's why they are called **arthro (joints) phytes (plant**). Horsetail belongs to **sphenopsida.**
  - **Example:** Equisetum**.**

**23. Define fronds & rhizome.** ★★★

- **Frond:** Leaves of ferns called fronds. Fronds are megaphylls.
  - Immature frond show circinate vernation.
  - **Example:** Fronds of pteridophytes.
- **Rhizome:** Stem is short, thick, underground & laying horizontally called rhizome.
  - Rhizome involve in vegetative reproduction.
  - **Example:** Rhizome of adiantum.

**24. Give four example of ferns.**

- **Ferns:** (i)Dryopteris (ii) Pteridium (iii) Adiantum (iv) Pteris.

**25. Give common name of adiantum.**

- **Common name:** Common name of adiantum is maiden hairfern.

**26. Define prothallus.** ★★

- **Prothallus:** Spore fall on moist soil, it germinate at suitable temperature to form haploid gametophyte or prothallus. Prothallus is autotroph, small, flat & heart shape structure. Prothallus is monoecious (male & female organ found on same prothallus)
  - **Example:** Prothallus of adiantum.

**27. Write two steps involved in evolution of seed habit.**

- **Evolution of seed:** Evolution of heterospory.
  (ii) Development of protective layer around megasporangium.

**28. Define seed & fruit.**

- **Seed:** **Seed** may be defined as fertilized **ovule.**
  - **Example:** Seed is found only in gymnosperm and angiosperm.
- **Fruit:** Mature ovary called **fruit.** It surround & protects seed & help in dispersal /
  - **Ovary** changes into fruit after fertilization.
  - **Example**: Ovary is found in angiosperm.

**29. Difference b/w gymnospermae & angiospermae. Write their literary means.** ★★★★★

| Angiospermae: | Gymnospermae: |
|---|---|
| They are flowering plants. | They are non flowering plants. |
| Their seed are covered by ovary. | Their seed are not covered by ovary. |
| **Literary means:** Term angiosperm means enclosed seed. Angio means close & sperm mean seed. | **Literary means:** Term **gymnosperm** means naked seed. Gymno means naked & sperm means seed. |
| **Example:** Apple & water lily. | **Example:** Pinus, taxus, cedrus & cycus. |

**30. Difference b/w ovule & seed.** ★★

- **Ovule:** **Ovule** can be defined as integument indehiscent megasporangium.
  - Ovule changes into **seed** after fertilization.
- **Seed:** Seed may be defined as fertilized ovule.
  - **Example:** Seed is found only in gymnosperm and angiosperm.

**31. Define pollen grain & embryo sac.** ★★

- **Embryo sac:** Megaspore retained with the megasporangium germinated to form an egg containing female gametophyte called **embryo sac.**
  - Embryo sac is seven celled structure. Embryo sac found in ovule.
- **Pollen grain:** Microspore of seed plants that contains microgametophyte including gametes called pollen grain.
  - Pollen grain is three cell structures. Pollen grain found in stamen.

**32. Difference between microgametophyte and Maga gametophyte.** ★★★★★

| Microgametophyte | Magagametophyte |
|---|---|
| Microgametophyte is male gametophyte. | Maga gametophyte is female gametophyte. |
| Microspore germinates to produce male gametophyte. | Megaospore germinates to produce female gametophyte. |
| Consist of three cells. | Consist of seven cells. |
| Disintegrate after fertilization. | Form seed after fertilization. |

**33. Difference b/w fertilization & double fertilization.** ★★★★★★★★★★★★

- **Fertilization:** Fusion of egg & sperm to form diploid zygote called fertilization.
  - **Example:** Gymnosperms.

- **Double fertilization:** In double fertilization, one sperm fuse with egg to form oospore. Second sperm fuse with nucleus to form endosperm. This process called double fertilization.
  - **Example:** Double fertilization is only found in **angiosperms.**

**34. Difference b/w monocots & dicots.** ★★★★★★

| Monocots: | Dicots: |
|---|---|
| They have one cotyledon. | They have two cotyledons. |
| Show parallel venation. | Show reticulate venation. |
| Petals are 3 /multiple of 3 | Petals are 4, 5/multiple of 5. |
| **Example:** Rice & maize | **Example:** Peanuts & almond. |

**35. What is essential & non-essential part of flower.** ★★★

| Essential parts: | Non-essential part: |
|---|---|
| Reproductive part of flowers called essential parts of flowers. | Non-reproductive part of flower called non-essential part of flower. |
| They are necessary for reproduction. | They are not necessary for reproduction. |
| **Example:** Stamens (ii) Carpels. | **Example:** Sepals (ii) Petals. |

**36. What is function of thorns & tendrils.**

- **Thorns:** Thorn is outgrowth on stem.
  - **Function:** It protects plants.
  - **Example:** Leaves of mimosaceae family.
- **Tendril:** Tendril is modification of leaf or stem.
  - **Function:** It helps the plant to climb.
  - **Example:** Leaves of fabaceae family.

**37. Write three member of solanaceae, fabaceae & poaceae.**

- **Solanaceae:** Potato (*Solanum tuberosum*) (ii) Tobacco (*Nicotiana tabacum*) (iii) Tomato (*Lycoperiscum esculentum*).
- **Fabaceae:** Sweet pea (*Lathyrus odoratus*) (ii) Peanut (***Arachis hypogeal***) (iii) Shisham (*Dalbergia sissoo*).
- **Poaceae:** Wheat (*Triticum vulgare*) (ii) Corn (*Oryza sativa*) (iii) Bamboo (*Bambusa*).

**38. Describe the corolla of family fabaceae.**

- **Corolla:** Papilionaceous, 5 petals, usually clawed & dissimilar.
  - Upper posterior petal is large & conspicuous.
  - 2 lateral petals are free.
  - 2 anterior petals fuse to form boat shaped structure called keel.

**39. Write medicinal importance of *Accacia nilotica* & Bambusa.**

- **Importance of *Accacia nilotica*:** It is used as blood purifier.
- **Importance of bamboo:** Leaves of bamboo are used to cure cough & cold of horses.

**40. Define spikelets & floret.**

- **Floret:** Whole lemma, palea & flower called floret.
- **Spikelet:** Dry spike which has two or three sessile flower called spikelet.

**41. Name scientific name of following plants.**

**Sweet pea, peanut, wheat, rice, tomato, potato & sheesham.**

**Sweet pea:** *Lathysis odoratus.* **Peanut:** *Arachis hypogea* **wheat:** *Triticum vulgare.*

**Rice:** *Oryza sativa*. **Tomato:** *Solanum lycopersicum*. **Sheesham:** *Dalbergia sissoo*.
**Potato:** *Solanum tuberosum*.

## Exercise Short Questions

1. **How are ferns are better adapted to life on land then Liver worts and Moses.**
   **Ferns:** Ferns are heterosporous, autotrophic sporophyte & have vascular tissue.
2. **Which of the following are nutritionally self supporting.**
   Mature liverwort and moss gametophyte.
3. **The chances of Survival and development of wind blown pollen grains are much less than those of spores of adiantum.**
   Spores of adiantum germinate to form gametophyte which is autotrophic in nutrition.

a) **Account for fact that megaspore are large then microspore.**
   **Megaspore**: Megaspore is large and has more cells than microspore.

b) **What importance advance have angiosperm made towards seed plant life.**
   Flower and seed (inside the ovary)

4. **Write a note on alternation of generation.**
   See question number: 13
5. **What is the importance of following**
   **Seed:** Seed provide protection to embryo to pass unfavorable conditions. Seed enable plants to colonize land.
   **Double fertilization:** Helps the plant to economize food resources.
   **Heterospory:** Heterospory is important for seed habit.

## MULTIPLE CHOICE QUESTIONS
## (SELECTED FROM PAST PAPERS)

**1)** Hepaticopsida are commonly called = **Livervorts**
**2)** Bryopsida/Musci are commonly called = **Mosses**
**3)** Sphenopsida is called = **Horsetail**
**4)** Which is vascular plants = **Tracheophytes**
**5)** Sporophyte of bryophyte is = **Diploid**
**6)** In bryophytes, fertilization take place in = **Water**
**7)** Bryophytes evolve from = **Green algae**
**8)** Which group is simplest of all bryophytes = **Liverworts**
**9)** Marchantia is example of = **Liverworts**
**10)** Mosses belong to subdivision of = **Bryophytes**
**11)** Example of mosses is = **Polytrichum & Funaria**
**12)** Gametophyte of moss plant is = **Haploid**
**13)** Haploid spermatozoid fuse with haploid egg to form diploid = **Oospore**
**14)** Group of plants with rootless sporophyte = **Psilopsida**
**15)** Reproductive organ of sporophyte is = **Sporangia**

**16)** Structure produced at tip of branches in psilopsida = **Sporophyte**
**17)** Living genera of psilopsida is = **Psilotum & Tmesipeteris**
**18)** Evolution of leaf completed in more than million years = **15-20**
**19)** Lycopsida is also called = **Club mosses**
**20)** Selaginella resemble seeded plants because of = **Heterospory**
**21)** Plants belong to sphenopsida are also called = **Arthrophytes/Horsetail**
**22)** Circinate vernation show = **Development of leaf**
**23)** Fern Prothallus is = **Gametophyte**
**24)** First complete seeds appeared during which time = **Late Devonian**
**25)** Evolution of heterospory leads to evolution of = **Seed**
**26)** Sago palm is also called = **Cycas**
**27)** Flowering plant belong to = **Angiosperms**
**28)** Male gametophyte produced by = **Microspore**
**29)** Microspore containing male gametophyte = **Pollen**
**30)** Megaspore develop into female gametophyte & contain how many cells = **7**
**31)** Female gametophyte in angiosperms are also called = **Embryo sac**
**32)** Egg & sperm fuse to form = **Oospore**
**33)** Endosperm is = **Triploid**
**34)** How many genera of family rosaceae in Pakistan is = **29**
**35)** Apple & pear (pyrus) belong to family = **Rosaceae**
**36)** Tomato & potato belongs to family = **Solanaceae**
**37)** *Capsicum frutescens* & atropine belong to family = **Solanaceae**
**38)** *Clitoria ternatea* used against = **Snake bite**
**39)** Fruit of leguminoseae is = **Legume**
**40)** *Bauhinia variegata* = **Kachnar**
**41)** *Cassia fistula* = **Amaltas**
**42)** Pulse producing plant belong to = **Fabaceae**
**43)** Leaves of cassia alata are used to cure = **Ring worm**
**44)** *Zea mays* is biological name of = **Corn**
**45)** Sugar is obtained from juice of = ***Saccharum officinarum***
**46)** Lodicules refers to = **Perianth**
**47)** Flower is modified ___ = **Shoot**
**48)** Male and female sex organ on same plant = **Monoecious**
**49)** Whisk fern belong to = **Psilopsida**
**50)** Seedless plant with foliar sporangia = **Filicinae**
**51)** Rhizome of adiantum protected by = **Ramenta**
**52)** 1st complete seed appear ____ million years ago = **365**
**53)** ___ 1st land plant that formed true roots and leaves = **Lycopods**
**54)** The male gametophyte of an angiosperm is = **Germinated pollen grain**
**55)** Arrangement of leaves in lycopods = **Spiral**

**56)** Placentation of potato family = **Axile**

**57)** ___ not belonge to gymnosperm = **Crataegus**

**58)** Sporophyte of ____, has stomata and chloroplast in epidermis & prepare their own food = **Anthoceropsida**

**59)** In psilopsida, **sporangia** are produce at = **Branch tip**

**60)** Two kinds of spore produce in = **Selaginella**

**61)** Ferns belong to = **Pteropsida**

**62)** All seed producing plants = **Spermatophytes**

**63)** Megaphylls not joint at margin to form ovary = **Gymnosperm**

**64)** Pollen grain develops into sperm bearing = **Gametophyte**

**65)** Male reproductive part of flower = **Androecium**

**66)** Triploid endosperm nucleus is result of = **Double fertilization**

**67)** Role of Nectar is = **Attract pollinators**

**68)** Family of sweet pea / *Arachis hypogea* = **Fabaceae**

**69)** *Lycopersicum esculentum* belongs to = **Solanaceae**

**70)** *Casia fistula/Tamarindus indica* belongs to = **Caesalpiniaceae**

**71)** Empty brackets at base of spike let wheat = **Glumes**

**72)** Gramineae family has = **Wheat, rice & corn**

## EXERCISE MCQs

1. All Bryophytes your certain characteristics = **Reproductive cells in protective Chambers and a waxy cutical**
2. Heterosporous plant is one that = **Produces microspores and mega spores in separates sporangia, giving rise to separate male and female gametophyte**
3. The male gametophyte of an angiosperm is = **Germinated pollen grain**
4. Important Terrestrial adaptation that evolved exclusive in seed plants include all of the following except = **Transport of water through vascular tissue**

## LONG QUESTIONS

## (SELECTED FROM PAST PAPERS)

1. Write adaptation of bryophytes to land plants. ★★★★★
2. Explain hepaticopsida & lycopsida.
3. Discuss alternation of generation & its significance. ★★★★★★★★
4. Discuss evolution of leaf & evolution of seed. ★★★★★★★
5. What is megaphyll. Write its evolutionary steps.
6. Explain life cycle of adiantum & angiosperm plant. ★★★★
7. Discuss life cycle of pinus. ★★★
8. Compare monocots with dicots. ★★
9. Write vegetative, floral character & economic importance of family rosaceae.
10. Write floral character & economic importance of family solanaceae.
11. Write economical importance of family poaceae. ★★★★

# CH # 10: KINGDOM ANIMALIA

## SHORT QUESTIONS (SELECTED FROM PAST PAPERS)

1. **Difference b/w metazoan & protozoa.**

| Metazoan: | Protozoa: |
|---|---|
| In traditional 2 kingdom system multicellular animals called metazoan | In traditional 2-kingdom system, unicellular animals called protozoa. |
| Well developed organism. | Not well developed organism. |
| Multicellular organization present. | Lack multicellular organization present. |
| **Example:** Birds (ii) Mammals | **Example:** Amoeba (ii) Paramecium |

2. **What is eumetazoa & parazoa.**

| Eumetazoa: | Parazoa: |
|---|---|
| Eumetazoa are complex animals than parazoa. | Parazoa are simplest animals. |
| Animals of eumetazoa have organ & organ system formation. | They lack organ and organ system organization. |
| They have radial symmetry. | They are asymmetrical. |
| **Example:** Cnidaria (ii) Chordates | **Example:** Sponges. |

3. **Define acoelomata, pseudocoelomata & coelomata.** ★★★★★

- **Acoelomata:** Animals without body cavity called **acoelomata.**
  - **Example:** Phylum platyhelminthes.
- **Pseudocoelomata:** Animals with false body cavity called pseudocoelomata.
  - **Example: Phylum Aschelminthes/nematode/round worms**.
- **Coelomata:** Animals with true body cavity called coelomata.
  - **Example:** Phylum annelid.

4. **Difference b/w radiate & bilateria.** ★★★★★★★

| Radiata: | Bilateria: |
|---|---|
| This group includes animals with radial symmetry. | This group includes animals with bilateral symmetry. |
| **Radiata** are diploblastic animals. | They are triploblastic animals. |
| Central axis divides their body into many equal halves. | Imaginary line divides body of **bilateria** into two equal halves. |
| **Example:** Cnidaria. | **Example:** Chordata & hemichordata. |

5. **Difference b/w protostome & deutrostome.** ★★★★★

| Protostome | Deutrostome |
|---|---|
| Division is spiral & determinate. | Division is radial & indeterminate. |
| **Mouth** is formed from blastopore. | Mouth is formed from anterior to blastopore |
| Mesoderm formed from blastopore. | Mesoderm formed from archentron. |
| **Example**: Annelida & nematode. | **Example**: Chordate & hemichordate. |

6. **Difference b/w schizocoelous & enterocoelous.**

| Schizocoelous: | Enterocoelous: |
|---|---|
| Coelom formed by splitting of mesoderm called schizocoelous. | Coelom formed by out pouching of archenterons called enterocoelous. |
| Cleavage is determinate. | Cleavage is indeterminate. |
| Occurance: protostome. | Occurance: deutrostome. |
| **Example:** Nematode & annelid etc. | **Example:** Chordate & hemichordate etc. |

7. **Difference b/w spiral & radial cleavage.**

| Spiral cleavage: | Radial cleavage: |
|---|---|
| In **spiral & determinate cleavage,** lines of cleavage are not symmetrical to polar axis & produce unequal cells around axis of polarity. | In radial & indeterminate cleavage, lines of cleavage are symmetrical to polar axis & produce tiers of cells on top of each other. |
| Fate of blastomere is predetermined. | Fate of blastomere is not pre-determined. |
| **Example:** | **Example:** |

8. **Difference b/w diploblastic & triploblastic organization.** ★★★★★

| Diploblastic: | Triploblastic: |
|---|---|
| They belong to division radiate. | They belong to division bilateria. |
| Their body consists of two layers. | Their body consists of three layers. |
| They show less degree of specialization. | They show greater degree of specialization. |
| They have sac like digestive system. | They have tube like digestive system. |
| **Example:** Cnidaria | **Example:** Chordate & hemichordata. |

9. **Define coelom & spongocoel.** ★★

➢ **Coelom:** Cavity present b/w body wall & alimentary canal & lined by mesoderm.

➢ **Spongocoel:** Single body cavity of sponges called spongcoel.

10. **What is ostia, osculum & choanocytes.** ★★★★★

➢ **Ostia:** Pore through which water/food enter into body of porifera called **ostia.**

➢ **Osculum:** Pore through which water leaves the body of porifera called **osculum.**

➢ **Choanocytes:** In porifera, food is ingested by flagellated cells called choanocytes.

11. **How sponges reproduce asexually.**

➢ **Asexual reproduction in sponges:** Sponge reproduces asexually by **budding**.

- Bud may be internal (gemmules) or external. (iii) Bud develops into new organism.

12. **What is protandrous & gemmule.** ★★★★★★★

➢ **Gemmules:** Sponge reproduces asexually by gemmule.

- In **gemmule**, bud formed within body & develops into new sponge.

➢ **Protandrous:** Sponge reproduces sexually.

- They are hermaphrodite & protandrous.
- Protandrous means male sex cells develop first.

13. **Write two example of sponges.**

➢ **Example of sponges: Sycon** (marine sponge).

- **Spongella** (freshwater sponge).

14. **Give importance of sponges.** ★★★★★

➢ **Importance of sponges:** They are used in washing & bathing.

- They are used for sound absorption in buildings.
- They absorb water so used in surgical operation for absorption of blood & fluids.

15. **What is cnidocytes & nematocysts.** ★★★

➢ **Cnidocytes:** Cnidarians has special cells called cnidocytes.

- They form nematocyst.

➢ **Nematocyst: Nematocysts** are stinging cells formed from cnidocytes.

- Nematocysts are characteristics of phylum **coelenterta.**
- Nematocyst and cnidocytes are present on tenticles of hydra.

16. **Difference b/w polyp & medusa. / Two forms of cnidarians.** ★★★★★★★

| Polyp: | Medusa: |
|---|---|
| Polyps are cylindrical animals. | They are umbrella like. |

| | |
|---|---|
| **Function**: They are nutritive in function called gastrozoids | **Function**: They are involves in reproduction. They have gonads. |
| Polyp is sessile organism. | Medusa is free swimming organism. |
| Reproduce asexually by budding. | Reproduce sexually by gametes. |
| **Example**: Hydra | **Example:** Jelly fish |

**17. What is polymorphism.** ★★★★

- **Polymorphism;** Occurrence of structurally & functionally more than two different types of individuals (zooids) within same organism called polymorphism.
  - **Example:** Obellia.

**18. What is coral & coral reef. Write importance.** ★★★

- **Coral:** Coral are formed from secretions of specialized polyps of coelenterates.
- **Coral reefs:** Living Polyps are found on surface of corals where underneath mass are dead stony. There is no polyp inside. That stony mass made of calcium carbonate called coral reefs.
  - **Importance:** Coral reefs serve as living place for sea life.

**19. What is flame cell.** ★★★

- **Flame cell:** Excretory system of platyhelminthes/**flat worms** consists of branching tubes ending in bulb like cells called **flame cell** (looks like flickering flame).

**20. How reproduction take place in platyhelminthes.**

- **Reproduction in platyhelminthes:** Platyhelminthes reproduce both by sexually & asexually.
- **Asexual:** platyhelminthes reproduce asexually by binary fission. Animal break from middle into two pieces. Each piece regenerates missing part.
- **Sexual:** Sexually reproducing species are hermaphrodite.
  - **Hermaphrodite:** In **hermaphrodite**, both male & female reproductive organ present in same individual.

**21. Write names of members of platyhelminthes.**

- **Members of platyhelminthes:** Planaria (**Dugesia**) (ii) **Liver fluke** (iii) **Tape worm**.

**22. Parasitic adaptation of flat worms.** ★★★★★

- **Parasitic adaptation:** They have cuticle instead of epidermis.
  - They have hook & sucker for attachment.
  - They have simple digestive system.
  - They have complex reproductive system.

**23. Difference b/w infestation & disinfestations.** ★★★★★★

- **Infestation:** In tape worm, development of zygote starts within uterus. Their uteri contain zygote. Mature zygote removes from man through feces. Embryo within egg show limited movement. For development they need second host cow. They enter again in man by eaten improperly cooked beef.
- **Disinfestations;** Once parasite enters into intestine of man they are difficult to remove. Always use properly cooked beef. Its complete removal is necessary. Physicians give anema to patient to remove parasite.

**24. Define blastocoels.**

- **Blastocoels:** Hollow cavity which develops in blastula.
  - Blastula is developmental stage of embryo.

**25. Write scientific name and characteristics of pin worm & hook worm.**

- **Pin worm:** Scientific name of **pin worm** is *Enterobius vermicularis*.

- **Characters:** Pin worm live in human alimentary canal (caecum, colon & appendix). Their movements cause itching of anus and inflammation of colon.

➢ **Hook worm:** Scientific name of **hook worm** is *Acyclostoma duodenale*.

- **Characters:** Hook worm found in small intestine in human. It sucks blood from villi.it produce anticoagulant during feeding, after feeding leave the wound bleeding. It cause anemia in children and retard the growth of patient.

**26. What is metameric segmentation. Which phylum it is present.**

➢ **Metameric segmentation:** Metameric segmentation means body is divided into similar segments. These divisions indicated externally by constrictions on body. Internally segments are separated by septa.

- **Phylum: Metameric** segmentation present in phylum **annelida.**

**27. Excretory organ of annelida.**

➢ **Excretory organ of annelid:** Excretory organ of **annelids** is **nephridia.** These are ciliated organs present in each segment

**28. Write name of different classes of annelid.** ★★

➢ **Classes of annelid:** There are three classes of annelid.
(i) Class polychaeta (ii) Class oligochaeta (iii) Class hirudinea.

**29. Write name of two organism belong to class oligochaeta.**

➢ **Class oligochaeta:** *Lumbricus terrestris* (ii) *Pheretima posthuma*.

**30. Excretory organ of arthropods.**

➢ **Excretory organ of arthropods:** Excretory organ of arthropods is **malpighian tubules**. Nitrogenous waste excreted in form of uric acid via malpighian tubules.

**31. How transfer of gases occur in arthropods.**

➢ **Terrestrial arthropods:** Arthropods possess extensive air tube called trachea for exchange of gases. Trachea opens outside through paired spiracles.

➢ **Aquatic arthropods:** Aquatic arthropods respire through **gills** & book lungs.

**32. What is metamorphosis & incomplete metamorphosis.** ★★★★★★

➢ **Metamorphosis:** Abrupt change in structure during life cycle of arthropods.

❖ **Stages:** There are following different morphologically stages.
(i) Egg (ii) Larva (iii) Pupa (iv) Adult

- **Example:** Insects.

➢ **Incomplete metamorphosis:** If larva resembles adult called **nymph/instar.**
(ii) It lives in same habitat as adult.

- **Example:** Primitive insects.

**33. What is class polychaeta & myriapoda.** ★★

➢ **Polychaeta:** They have head region with eye called palp & tentacles.

- Sexes are separate.
- Locomatory organ is parapodia.
- They are aquatic.
- **Example: Nereis.**

➢ **Myriapoda:** Their body divided into many segments having pair of legs.
(ii) Pair of antenna & eye is present on head.

- **Example:** Centipedes (ii) Millipedes.

**34. Write fundamental features of insects.** ★★★

- **Features of insects:** Insects/**Arthropods** have jointed legs.
  - They have two pair of wings.
  - There body is metamerically segmented.
  - Sexes are separate.
  - Their body is divided into three parts head, thorax & abdomen.
  - **Example:** Wasp (ii) Butterfly (iii) Mosquito.

**35. Define ecdysis.** ★★★★

- **Ecdysis:** Young arthropods shed their chitinous exoskeleton with passage of time. This process called ecdysis or moulting.

**36. Why annelids & arthropods have common origin.** ★★

- **Common origin:** Both have segmented body, however body of arthropods are not metameric segmented.
  - Both have jointed appendages (involve in locomotion & defence).

**37. Difference b/w harmful & beneficial insects. / Importance of arthropods.** ★★★★★★

- **Harmful insects:** Mosquito cause malaria & dengue fever in human.
  - Trypanosome causes sleeping sickness. Their larvae destroy crops & fruits.
  - House fly contaminate food & cause cholera & hepatitis.
- **Beneficial insects:** Honey bee provides honey & wax.
  - Silk worm provide silk.
  - Some insects prey harmful insects.
  - Insect larvae are source of food for many animals.

**38. What is mantle & radula. Which phylum it is present.** ★★★★★

- **Mantle:** Body of mollusca covered by glandular envelope called mantle.
  - Mantle secretes calcareous shell.
  - Shell is protective but reduces locomotion.
- **Radula:** Mouth cavity of **mollusca** has many horny teeth & rasping tongue like radula.
  - **Phylum:** Mantle & radula is present in phylum **mollusca**.

**39. Name common example of gastropoda.**

- **Gastropoda:** *Helix aspersa* (ii) Limax.

**40. What do you know about bivalvia.**

- **Bivalvia:** This class includes aquatic molluscs with bilateral symmetry.
  - Their body compressed b/w two shells. That's why called bivalvia.
  - They respires trough gills.
  - **Example:** Marine mussel (ii) Fresh water mussel.

**41. Write harms of molluscs.**

- **Harms of mullascus:**
  - Slugs are injurious to gardens & crops. They not only eat leaves but also destroy stem & root.
  - Shipworm (**Teredo**) eats wooden parts of ships.

**42. What is regeneration.** ★★★

- **Regeneration:** Ability to reform lost organ called regeneration.
  - **Example:** It is common in echinoderms like starfish & sea cucumber.

**43. Why echinoderms places closes to chordates.** ★★★★

- **Common character:** Common character of echinoderm & chordate is followings.

- Both have mesodermal skeleton.
- Both are deutrostome.
- Both have similar early development.

**44. Write character of echinodermata.**

➢ **Echinodermata:** Echinodermata are triploblastic & show radial symmetry.

- They show regeneration.
- Blastopore form anus.
- They show low degree of organization

**45. Write common example of hemichordates.**

➢ **Example of hemichordates: Balanoglossus** (ii) **Saccoglossus**.

**46. Difference b/w notochord & nerve cord.** ★★★

| Notochord: | Nerve cord: |
|---|---|
| Notochord is rod like semi rigid body filled with proteinaceous material. | They are present in vertebral column. |
| **Function:** They support & stiffen the body & act as skeletal axis. | **Function:** They transmit & receive message. |
| Found in chordates. | Found in vertebrates and invertebrates. |
| Originates from mesoderm. | Originates from ectoderm. |

**47. Write three basic character of chordate.** ★★★★★

➢ **Character of chordata: Chordates** possess notochord.

- They have hollow & dorsal central nervous system.
- They have paired gill opening in embryonic stage.
- **Example:** Frogs (ii) Fishes.

**48. What is tunicates.**

➢ **Tunicates:** Adults organisms of urochordata are sessile & enclosed in a covering called tunic. Therefore they are called tunicates.

- **Example: Molgula**.

**49. What do you know about urochordata & cephalochordate.**

➢ **Urochordata:** Notochord &nerve chord present only in free swimming larvae.
(ii) Adults are sessile & enclosed in tunic. That's why called tunicates.

- **Example:** Molgula.

➢ **Cephalochordate:** Notochord & nerve chord extend in whole body & remains throughout life.

- **Example:** Amphioxus.

**50. Write name of classes of sub-phylum vertebrae.**

➢ **Sub-phylum vertebrae:** Sub-phylum vertebrae have five classes which is followings.
(i) Pieces (ii) Reptilian (iii) Amphibian (iv) Aves (v) mammalia

**51. Write economic importance of shark.** ★★★★

➢ **Economic importance of shark:** They are used as food.

- Shark liver oil used in medicines & source of vitamin **A & D.**
- Shark skin used for making articles.

**52. Write four characters of class osteichthyes (bony fishes).** ★★★

➢ **Bony fishes:** They have more/less bony skeleton.

- Notochord may persist in body parts.
- Mouth is terminal & jaw with/without teeth.
- Sexes are separate & fertilization is external.

**53. Write two adaptations in fishes to aquatic ecosystem.**

- **Stream line body:** They have stream line body to reduce friction during swimming.
- **Circulatory system:** Heart has two chambers with afferent & efferent branches.

**54. What is swim bladder.** ★★★★★★

- **Swim bladder:** This is found in most bony fishes.
  - It may or may not connect to pharynx.
  - They change gravity of fish by filling with gas ($O_2$, $CO_2$ OR $N_2$). These gases secreted by their glands.

**55. Write some characteristics features of amphibians.**

- **Features of amphibian:** Bony skeleton & body with/without tail.
  - Usually four limbs but some are legless.
  - Sexes are separate & external fertilization.
  - Respiration takes place by skin, gills & lungs.

**56. What is archaeopteryx. Write reptilian character of archaeopteryx.**

- **Archaeopteryx:** Archaeopteryx is connecting link between reptiles and birds. Archaeopteryx has both birds and reptilian characters. This is fossil bird.
- **Birds like characters:**
  - Size is like crow. Small skull like birds. There is long tail and presence of wings.
- **Reptilian character:** Reptilian characters of archaeopteryx are followings.
  - Presence of teeth in jaw socket.
  - Presence of three claws.

**57. Define syrinx.** ★★★★

- **Syrinx:** They organ of voice in **bird** called **syrinx.**
  - It is situated at lower end of trachea near origin of two bronchi.
  - **Example:** In sparrow (ii) In crow.

**58. Write characters of class mammals.** ★★★★

- **Character of mammals:** Their body covered with hairs.
  - External ear is present.
  - They have 4 chambers heart.
  - They are warm blooded.
  - They give birth to young.

**59. Write name of bone of internal ear in mammals.**

- **Bones of internal ear**: (i) **Malleus** (ii) **Incus** (iii) **Stapes.**

**60. Write name of subclasses of mammals.**

- **Sub-classes of mammals:**There are three sub-classes of mammals(prototheria,metatheria,Eutheria)
- **Prototheria:** Egg laying mammals include in **prototheria.**
  - **Example:** Spiny ant eater
- **Metatheria:** Pouched mammals are includes in **metatheria**.
  - **Example**: kangroo
- **Eutheria:** Placental mammals are included in eutheria.
  - **Example:** Human.

**61. Difference b/w class prototheria & metatheria.**

- **Prototheria:** They have characteristics of both reptiles & mammals.
  - They are adopted for aquatic life.

- They have thick fur.
- They have mammary gland.
- **Example: Duck bill platypus** (ii) Spiny ant eater.

➢ **Metatheria:** They are most primitive mammals.
- They have abdominal pouch called marsupium.

➢ **Metatheria** are also called pouch or marsupial mammals.
- **Example: Opossum** (ii) **Kangaroo** (mammal) (iii) Tasmania wolf.

**62. What is marsupium.**

➢ **Marsupium:** Metatheria has abdominal pouch called marsupium for rear their young.
- Immature young carried in marsupium till mature. During this period, they develop on milk produced by milk gland present in marsupium.
- **Example: Kangaroo** (ii) Tasmania wolf.

**63. What is placenta & placental mammals. / what is eutheria.** ★★★★★★

➢ **Placenta:** During development, a structure is formed through which fetus is nourished called placenta.
- **Function:** Placenta has endocrine function (secrete hormone).
- Exchange of material between mother & fetus.

➢ **Placental mammals:** Placenta has endocrine function due to hormones production.
- That's why mammals are called placental mammals.
- **Placental** mammals are belongs to Eutheria.
- These mammals have maximum mammalian character.
- **Example:** Man (ii) **Bat** (iii) **Dolphin**

## MULTIPLE CHOICE QUESTIONS
## (SELECTED FROM PAST PAPERS)

**1)** Animal having body cavity filled with parenchyma = **Acoelomate**
**2)** In sponges, body wall made of outer layer called = **Pinacoderm**
**3)** In sponges, body wall made of inner layer called = **Choanoderm**
**4)** Which is commonly called venus flower basket = **Euplectella**
**5)** Commercial sponges found in warm water of = **Mediterranean sea**
**6)** Exoskeleton of coral is formed of = **Calcium carbonate**
**7)** Which is portuguese man of war = **Physalia**
**8)** Which is motile organism of coeleterata = **Jelly fish**
**9)** Individual member of coelenterate colony called = **Zooids**
**10)** Tenticals is characteristics of = **Hydra**
**11)** Polymorphism is characteristics feature of = **Cnidaria**
**12)** Hydra is fresh water = **Coelenterate/Cnidaria**
**13)** Polyp is reduced & medusa is dominant in = **Aurelia (jelly fish)**
**14)** Body consists of polyp only in = **Actinia / Hydra**
**15)** Sea anemone belongs to phylum = **Coelenterate**
**16)** Blood fluke is also called = **Schistosoma**
**17)** *Ascaris lumbricoides* is an intestinal parasite of = **Man**
**18)** A single rotting apple contain upto worms = **90000**

**19)** First group of invertebrates have closed circulatory system = **Annelids**
**20)** Parapodia is locomotary organ of = **Nereis**
**21)** Nereis belong to phylum = **Annelids**
**22)** Blood color of arthropods is = **Colorless**
**23)** Skeleton of arthropods are made of = **Chitin**
**24)** Which is largest group of animal kingdom = **Class insecta**
**25)** Most **spiders** have eyes = **8**
**26)** How many pair of legs in class arachnida = **4**
**27)** Example of class arachnida is = **Scorpions**
**28)** Hepatitis & cholera spread through = **House fly**
**29)** Second largest phylum of invertebrates is = **Mollusca**
**30)** Color of blood of mollusca is = **Blue**
**31)** Locomotary organ of mullusca is = **Foot**
**32)** Garden snail belong to = **Class gastrapoda**
**33)** Which is largest invertebrate animal is = **Giant Squid**
**34)** Loligo is also called = **Squid**
**35)** Spiny skinned animals belongs to phylum = **Echinodermata**
**36)** Which phylum is exclusively marine = **Echinodermata**
**37)** Madroporite present in = **Echinodermata**
**38)** Bipinnaria & brachiolaria larvae belong to = **Echinodermata**
**39)** Balanoglossus & saccoglossus are common example = **Hemichordate**
**40)** Notochord is common characteristics of phylum = **Chordate**
**41)** Placoid scale is absent in = **Trout**
**42)** Which is border line b/w aquatic & terrestrial animals = **Amphibian**
**43)** Animals live in both aquatic & terrestrial conditions = **Amphibian**
**44)** Earliest known bird fossils is = **Archaeopteryx**
**45)** Most important advancement evolution in mammals = **Brain**
**46)** Mammals have evolved from reptilian ancestor = **Cotylosaurs**
**47)** Mammals become dominant in era = **Cenozoic era**
**48)** Which group characterized by abdominal pouch = **Metatheria**
**49)** In animals, reproductive system is formed from = **Mesoderm**
**50)** Blastocoels persist throughout life in = **Nematode**

**51)** ___ not a proterostome = **Echinodermata**
**52)** ___ not a platyhelminthes = **Crab**
**53)** A free swimming larvae is produce in = **Annelida**
**54)** ___ has closed blood circulatory system = **Snail and octopus**
**55)** ___ lack bilateral symmetry = **Gastropod**
**56)** Sepia belong to = **Cephalopod**
**57)** ___ has exceptionaly large brain = **Octopus**
**58)** ___ not sub Phylum of chord ata = **Hemichordata**
**59)** Single circuit heart present in = **Fish**
**60)** ____ not amniote = **Amphibians**
**61)** Lungs of birds have thin walled ducts = **Parabronchi**
**62)** ___ correct sequence of ear ossicles = **Malleus, incus and stapes**
**63)** Mammals have only ____ aortic arch = **Left**

**64)** Haemocyanin (blue pigments) is found in = **Mollusca**
**65)** ____ cnidaria has five different zooids in a colony = **Physalia**
**66)** Scientific name of planaria = **Dugesia**
**67)** Ancient/fossil fish that has lungs = **Dipnoi**
**68)** Sea urchin belong to = **Echinodermata**
**69)** 80% food of sponge consist of = **Detritus**
**70)** Flat worn with ciliated outer surface = **Planaria**
**71)** Mob of insect that cause damage to crop = **Locusts**
**72)** Cartilaginous fish have ___ scales = **Placoid**
**73)** J shape stomach present in = **Shark**
**74)** Larvae of annelida = **Trochophore**
**75)** Free living fresh water worm = **Dugesia (planaria)**
**76)** ___ intermediate host of Tania = **Snail**
**77)** ___ example of polymorphosis = **Obelia**
**78)** Aschelminthes is important parasite because = **Cause disease**
**79)** Blastopore form anus in = **Echinodermata**
**80)** ___ parasite produce anticoagulant to stop blood clotting = **Hook worm**
**81)** ___ not arachinoid = **Beetles**
**82)** Pheretima posthuma is = **Earthworm**
**83)** Swim bladder fill with air in some fishes, so their swim bladder connected with = **Pharynx**
**84)** A leathery shelled egg with massive yolk = **Shelled egg**
**85)** ___ not reptile = **Salamander**
**86)** Blood of andonta contain = **Haemocyanin**
**87)** Paired gill opening present in all vertebrates but non-functional in = **Rat**
**88)** Animals evolve from = **Protista**
**89)** Integumentary and nervous system develop from = **Ectoderm**
**90)** Muscular and skeletal system develop from = **Mesoderm**
**91)** Sponges lack symmetry and called = **Asymmetrical**
**92)** Skeleton of sponges have needle like structure called = **Spicule**
**93)** Phylum porifera (sponges) = **Maximum regeneration capacity**
**94)** Largest sponge found in Antarctica is = **S. Joubuni**
**95)** In coelentrata, Between ectoderm and endoderm, non cellular ____ present = **Mesoglea**
**96)** Polyps and Medusa found in = **Coelentrata**
**97)** Flat worms belong to = **Platyhelminthes**
**98)** Primary host of tape worm = **Man**
**99)** Liver fluke is = **Parasite in bile duct**
**100)** Ascaris has = **Triploblastic**
**101)** Pin worm belong to ___ phylum = **Aschelminthes**
**102)** Respiratory pigment of mollusca = **Haemocyanin (Blue colored)**
**103)** Animal with exceptional large brain = **Octopus**
**104)** Pairs of legs present in ___ region of insects = **Thorax**
**105)** ____ legs in arachnida = **8**
**106)** ____ lacks antenna = **Arachnida**
**107)** ____ economically important for man = **Silkworm**
**108)** ____ animals have bilateral symmetry in larvae and radial symmetry in adults = **Echinodermata**

**109)** Cyclostome (most primitive vertebrates) lacks = **Jaw**
**110)** Shark and Rays belong to = **Chondrichthyes**
**111)** Sphendon found in = **New zealand**
**112)** Slow worms belong to = **Reptiles**
**113)** Birds skeleton are light due = **Air spaces in bones**
**114)** Hind limb of birds are modified for = **Perching**
**115)** ___ early reptiles = **Varanope**
**116)** Scales of pangolin = **Modified feathers**
**117)** Birds have only ___ aortic arch = **Right**

## EXERCISE MCQs

**1)** Vertebrates that developed embryonic membranes around their embryo are called = **Amniotes**
**2)** In animals, the bodies of which can be divided into equal halves only in one plane are = **Bilateral**
**3)** Animals that have their body cavity filled with parenchyma are = **Acoelomate**
**4)** The vertebrates in which placenta are formed during development of foetus = **Mammals**
**5)** In amphibians the necessary requirement to spend their life history = **Both**
**6)** Trypanosoma cause = **Sleeping sickness**
**7)** In annelids the organs for excretion are = **Nephridia**
**8)** In arthropod the body cavity is = **Haemocoel**
**9)** In molluscs the foot is used for **= Locomotion**

## LONG QUESTIONS
## (SELECTED FROM PAST PAPERS)

**1.** Write general characters of phylum porifera & coelenterata.
**2.** Write adaptation for parasitic mode of life.
**3.** Write general character, classification & economic importance of phylum mollusca.
**4.** Write different adaptation in fishes for aquatic mode of life.
**5.** Write characteristics feature of reptiles & mammals.

# CH # 11: BIOENERGETICS

## SHORT QUESTIONS (SELECTED FROM PAST PAPERS)

1. **Define bioenergetics. Does it obey thermodynamic law.** ★★★★

➢ **Bioenergetics:** **Bioenergetics** is the study of energy relationship & energy transformation in biological system.

- **Thermodynamic law:** Yes, bioenergetics obeys laws of thermodynamics.

2. **Name energy releasing & energy capturing process.** ★★

➢ **Energy releasing process:** Respiration is energy releasing process.

➢ **Energy capturing process:** Photosynthesis is energy capturing process.

3. **Difference b/w photosynthesis & respiration.** ★★★★

| Photosynthesis | Respiration |
|---|---|
| It occurs during day time. | It occurs during day & night time. |
| It is anabolic process. | It is catabolic process. |
| It is energy capturing process. | It is energy releasing process. |
| **Example:** In plant & algae | **Example:** In all organisms. |

4. **Define photosynthesis. Write equation.** ★★★★★

➢ **Photosynthesis:** The process in which inorganic compound of Carbon & Hydrogen is reduced to form glucose using light & chlorophyll.

- **Equation:** $6CO_2 + 12\ H_2O + LIGHT \xrightarrow{Chl} C_6H_{12}O_6 + 6O_2 + 6H_2O$

5. **What is compensation point.** ★★★★★

➢ **Compensation point:** When the rate of respiration is equal to rate of photosynthesis. At this point no net gas exchange b/w the leaves & atmosphere. This is called **compensation point**.

- **Occurrence:** It occurs at dawn and dusk when light intensity is low.

6. **How it was proved that source of $O_2$ in photosynthesis is water.**

➢ **Source of $O_2$ in photosynthesis is water:** Oxygen released during photosynthesis come from **water**. It was confirmed in 1940. It was confirmed by using heavy oxygen isotope $O^{18}$. Experimental group provided water ($O^{18}$) while control group provided $CO_2$ ($O^{18}$). It was found that experimental group produced $O^{18}$.

7. **Write products of light reaction.** ★★★★★

➢ **Products of light reaction:** There are following products of light reaction.

(i) $NADPH_2$ (ii) ATP

8. **Difference b/w thylakoid & stroma.**

➢ **Stroma:** Chloroplast filled with fluid called **stroma.**

- **Function:** It has many enzymes that produce carbohydrate.

➢ **Thylakoid:** Thylakoid are flat & disc like sac present in stroma.

- **Function:** Involve in ATP synthesis.

9. **Difference b/w accessory & photosynthetic pigment.** ★★★★★★★★

➢ **Accessory pigment:** **Carotenoids & chlorophyll b** are called **accessory pigment.**

- Carotenoids are yellow & red to **orange.** Xanthophyl are **yellow** colored pigment.
- **Function:** They absorb light & transfer energy to chlorophyll a to start light reaction.

➢ **Photosynthetic pigment:** Chlorophyll a is most important pigment called photosynthetic pigment.

- **Chl a** are found in all photosynthetic organism except photosynthetic **bacteria.**

- **Function:** They convert light energy into chemical energy by light reaction. They absorb red light.

**10. What is spectrophotometer.** ★★

➢ **Spectrophotometer: Spectrophotometer** is an instrument, used to measure the ability of pigments to absorb light of different wavelengths. It is also called photometer.

**11. What is Porphyrin ring of chlorophyll.**

➢ **Porphyrin ring:** Head of chlorophyll is complex **porphyrin ring.** Porphyring ring is made of four smaller **pyrrole ring** (made of carbon and nitrogen). One Magnesium atom present in center of porphyrin ring. Magnesium atom connected with four Nitrogen atom of pyrrole ring.

**12. Write similarity b/w haemoglobin & chlorophyll.**

➢ **Similarity:** Head of chlorophyll & haem of haemoglobin both contain porphyrin ring.

➢ **Difference:** Haem contain **iron** atom while chlorophyll contain **Mg** atom in center.

**13. Write difference b/w chlorophyll a & b.** ★★★★★★

| Chlorophyll a: | Chlorophyll b: |
|---|---|
| $C_{55}H_{72}O_5N_4Mg$. | $C_{55}H_{70}O_6N_4Mg$. |
| Function group of Chlorophyll a is **methyl** group ($CH_3$). | Functional group of Chlorophyll b is carbonyl group (CHO). |
| Chlorophyll a is **blue-green.** | Chlorophyll b is yellow-green. |

**14. What is action & absorption spectrum.** ★★★★★★★

➢ **Absorption spectrum:** Absorption spectrum shows that absorption is maximums in **blue (430nm) & red (670nm)** parts of spectrum shown by two peaks.

➢ **Action spectrum:** Graph showing the effectiveness of different wavelength of light in photosynthesis is called action spectrum.

- **Discovery:** 1st action spectrum was obtained by **T.W. Engelmann** during work on **spirogyra** in **1880.**
- **How action spectrum is obtained:** It is obtained by showing plant with light of different wavelength & then estimating use of $CO_2$ or release of $O_2$ during photosynthesis.

**15. Why action spectrum does not parallel to absorption spectrum of chlorophyll.**

| Action spectrum | Absorption spectrum |
|---|---|
| Peaks of action spectrum are broader. | Peaks of absorption spectrum are narrower. |
| Peaks of action spectrum are not deeper. | Peaks of absorption spectrum are deeper. |
| Peaks of action spectrum are not steeper. | Peaks of absorption spectrum are more steeper. |

**16. Define redox reaction.** ★★★

➢ **Redox reaction:** Oxidation & reduction reaction are collectively called redox reaction.

- **Example:** Photosynthesis & Respiration
- **Oxidation reaction:** Loss of electron called oxidation reaction.
- **Reduction reaction:** Gain of electron called reduction reaction.

**17. Difference b/w light dependent reaction & light independent reaction.**

| Light dependent: | Light independent: |
|---|---|
| Light dependent reaction use light directly. | Light independent reaction does not use light directly. |
| They occur in thylakoid. | They occur in stroma |
| **Raw material:** Light, water, NADP and ADP. | **Raw material**: $CO_2$, NADPH & ATP. |
| **Products:** It produces **ATP and NADPH.** | **Products:** It produces glucose. |
| They are also called light reaction. | They are also called dark reaction. |

**18. What is photosystem.** ★★★

- **Photosystem:** Photosynthetic pigment organized into clusters called **photosystem.**
  - **Types:** Photosystem I & photosystem II.
  - **Composition:** It consists of antenna complex (light gathering) & reaction centre.
  - **Function:** Photosynthetic pigments absorb light **(380-750nm)** & utilize solar energy for photosynthesis.

**19. What is antenna complex & reaction center.**

- **Antenna comple:** It consists of chlorophyll a, b & carotenoids.
  - **Function:** They gather light energy & transfer energy to reaction center.
- **Reaction center:** It consists of chlorophyll a with primary electron acceptor & electron transport system.
  - **Function:** They convert light energy into chemical energy (ATP).

**20. Difference b/w photosystem I & II.**

| Photosystem I: | Photosystem II: |
|---|---|
| They discover first so named photosystem I. | They discover later so named photosystem II. |
| Their chlorophyll a absorbs light of **700nm** & called $P_{700}$. | Chlorophyll a of PS II absorbs light of **680**nm & called $P_{680}$. |
| Involved in both cyclic and non-cyclic photophosphorylation. | Involved in cyclic photophosphorylation. |
| No photolysis of water occurs. | Photolysis of water occurs. |

**21. Difference b/w cyclic & non cyclic electron flow.** ★★★★★

| Non-Cyclic electron flow: | Cyclic electron flow: |
|---|---|
| When electron pass through two photosystem called non-cyclic electron flow. | When electron passes through only photosystem I called cyclic electron flow. |
| It is common type of electron transport. | It is less common type of electron transport. |
| $O_2$ is evolved. | No $O_2$ evolved. |
| Both photosystem I & II are involved. | Only photosystem I is involved. |
| **Products: NADPH, ATP** & $O_2$ produced. | **Products:** Only **ATP** produced. |
| **Cause**: Light | **Cause:** Less ATP (for Calvin Cycle) & rise in NADPH (chloroplast). |

**22. Define photolysis.** ★★★★

- **Photolysis:** Splitting of water in the presence of light called **photolysis.**
  - It releases oxygen during photosynthesis. It also release electron which used in light reaction.

**23. Difference b/w photo & oxidative phosphorylation.** ★★

| Photophosphorylation: | Oxidative phosphorylation: |
|---|---|
| The synthesis of ATP in the presence of light called **photophosphorylation.** | The synthesis of ATP in the presence of oxygen called **oxidative phosphorylation.** |
| Photophosphorylation occurs in **chloroplast.** | Oxidative phosphorylation occurs in **mitochondria**. |
| It occurs in only autotrophs. | It occurs in heterotrophs & autotrophs. |

**24. What is NAD?** ★★

- **NAD:** NAD stands for nicotinamide adenine dinucleotide.
  - **Function:** It is coenzyme & source of energy. (iii) They receive electron & H ion to form NADH.

**25. Write function of NADP reductase.**

- **NADP reductase:** This is enzyme which transfer electron from ferrodoxin (iron containing protein) to NADP. This is redox reaction which forms NADPH (Provide reducing power in Calvin cycle).

**26. What is Z scheme. Why it is called so.**

- **Z scheme:** The path of electron during non-cyclic photophosphorylation (involve two photosystem) called Z scheme.
  - **Name:** It is called Z scheme due to its shape.

**27. Define cyclic phosphorilation. Write its cause.**

- **Cyclic phosphorylation:** Formation of ATP during cyclic electron flow called cyclic phosphorylation. During cyclic phosphorylation, only photosystem-I involved.
  - **Causes:** It occurs when chloroplast has low ATP for Calvin cycle. NADPH accumulates in chloroplast. This NADPH starts cyclic electron flow temporary.

**28. What is chemiosmosis.** ★★★★★★★★

- **Chemiosmosis:** The mechanism for ATP synthesis is called **chemiosmosis** by redox reaction. In this mechanism, Energy come from electron & store in form of $H^+$gradient. ATP produced by ATP synthase by moving $H^+$ across proton gradient.

**29. What is Calvin Benson cycle.** ★★★★★

- **Calvin Benson cycle:** Cyclic series of reaction catalyzed by enzyme in which carbon reduced to form sugar during dark reaction of photosynthesis called Calvin cycle.
  - Dark reaction takes place in **stroma**.
  - Calvin cycle is also called **$C_3$ pathway.**
  - **Discovery:** This cycle was discovered by Calvin & his colleagues at university of California.
  - Calvin awarded Noble prize in **1961.**

**30. What is rubisco.** ★★★★★★

- **Rubisco:** Rubisco is also called ribulose bisphosphate carboxylase oxygenase.
- **Function:** Incorporation of $CO_2$ with ribulose bisphosphate (RUBP) is catalyzed by Rubisco enzyme.
  - Rubisco is important **enzyme** involve in carbon fixation.
  - **Rubisco** is most abundant protein on earth as well as in **chloroplast**.

**31. Difference b/w cellular & external respiration.**

| External respiration: | Cellular respiration: |
|---|---|
| Exchange of respiratory gases ($O_2$ & $CO_2$) b/w organism & environment called **external respiration**. | It is energy yielding process by breakdown of Carbon molecules in cells. |
| It is only mechanical process. | It is mechanical & biochemical reaction. |
| ATP used. | ATP formed. |

**32. Difference b/w aerobic & anaerobic respiration.** ★★★★

| Aerobic respiration: | Anaerobic respiration: |
|---|---|
| It occurs in presence of $O_2$. | It occurs without $O_2$. |
| They release more energy. | They release less energy. |
| They yield 36 ATP molecules. | They yield 2 ATP molecules. |
| Glucose is completely oxidized. | Glucose is incompletely oxidized. |

**33. What is glycolysis. Where it occurs.** ★★★★★

- **Glycolysis:** Breakdown of **glucose** called **glycolysis**.
  - Glucose molecule converted into two molecule of pyruvic acid with release of energy.
  - **Occurrence:** Glycolysis process occurs in **cytoplasm**.

**34. Difference b/w alcoholic & lactic acid fermentation.** ★★★★★★★★

| Alcoholic fermentation: | Lactic acid fermentation: |
|---|---|
| In this fermentation, pyruvic acid is converted into **alcohol** & $CO_2$. | In this fermentation, pyruvic acid is converted into lactic acid **($C_3H_6O_3$)**. |

| | |
|---|---|
| **Equation:** 2 ($C_3H_4O_3$) --→ 2 ($C_2H_5OH$) + 2 $CO_2$ | **Equation:** 2 ($C_3H_4O_3$) ---------→ 2 ($C_3H_6O_3$) |
| Used in production of wine, beer & vinegar. | Used in production of cheese & yogurt. |
| **Example:** Yeast & microorganism. | **Example:** In skeletal muscle (human) & bacteria (milk). |

**35. Write role of mitochondria in respiration.**

- **Role of mitochondria**: (i) It is called power house of cell because they produce energy for cell functioning.
  - Mitochondria distributed throughout the cytoplasm. Inner membrane of mitochondria has many folds called **cristae.** Cristae increase the area for respiration.

**36. What is ATP & give its importance.**

- **ATP:** ATP stands for adenosine triphosphate. (ii) It is energy currency for cell.
  - **Importance:** Breaking of terminal phosphate of ATP release **7.3 Kcal** energy. This energy is used by many cellular functioning.
  - **2%** of energy within glucose changed into ATP by anaerobic respiration.

**37. What do you know about glycolysis phase & payoff phase.**

- **Glycolysis phase:** In glycolysis, glucose molecule breaks into two **pyruvic acids**.
- **Phases:** Glycolysis divided into two phase. (i) Preparatory phase (ii) Oxidative phase.
- **Preparatory phase:** In this step, energy (2ATP) is used to break Glucose.
  - In 1st step, Transfer of Phosphate from ATP to glucose to form glucose 6-P.
  - In 2nd step, glucose 6-P is converted into its isomer fructose 6-P.
  - Then transfer of phosphate from ATP to fructose 6-P to form 1,6 bis phosphate.
- **Payoff phase:** In payoff phase two $e^-/H^+$ removed from 3-PGAL (phosphoglyceraldehyde) & transferred to NAD.
  - So 3-PGAL oxidized & NAD reduced.
  - Second phosphate group donated to Pi (inorganic phosphate) in cell to form 1,3-BPG (bisphosphoglycerate).

**38. What do you know about pyruvic acid oxidation & Krebs cycle.** ★★

- **Pyruvic acid oxidation:** Pyruvic acid does not enter into Krebs cycle directly.
  - 1st pyruvate (3-C molecule) change into acetic acid (2-C) by decarboxylation (removal of $CO_2$).
  - Then acetic acid enters into mitochondria & unites with coenzyme-A to form acetyl Co-A **(active acetate)**.
- **Krebs cycle:** Acetyl Co-A enter into cyclic series of reactions to complete oxidation reaction.
  - This reaction called Krebs cycle (name of biochemist who discover).
  - In Krebs cycle, CO-A is oxidized by series of reactions to release energy (3 NADH +1 $FADH_2$ + 1 ATP).
  - Krebs cycle occurs in mitochondria.

**39. What is cytochrome.** ★★

- **Cytochrome:** They are iron containing protein related to haem group of heamoglobin. They are carrier in electron transport chain.
- **Types:** Cytochrome b (ii) Cytochrome c (iii) Cytochrome a (iv) Cytochrome $a_3$.

## Exercise Short Questions

1) **List four features of a leaf which show that it is able to carry out photosynthesis effectively.**
   **Features of leaf:** Large surface area, vascular bundles (transport of food & water), chloroplast in mesophyl (site of photosynthesis) & stomata (exchange of $O_2$ & $CO_2$).
2) **Summarise the role of water in photosynthesis.**
   **Role of Water:** Water is source of electron/$H^+$ in light reaction. Electron/$H^+$ released during splitting of water.
3) **Why are TW Englemann and Malvin Calvin famous for.**
   See question number: 14 & 29
4) **What is difference between an action spectrum and an absorption spectrum.**
   See question number: 15
5) **What is the role of accessory pigments in light absorption.**
   See question number: 9
6) **When and why is there no net exchange of carbon dioxide and oxygen between the leaves and the atmosphere.**
   See question number: 5
7) **What is the net production of ATP during glycolysis.**
   Only net 2 ATP formed during glycolysis.
8) **What is the main difference between photophosphorylation and oxidative phosphorylation.**
   See question number: 23
9) **What is the location of ETC and chemiosmosis in photosynthesis and cellular respiration.**
   **Location of ETC & Chemiosmosis in photosynthesis:** Thylakoid membrane of cholorplast.
   **Location of ETC & Chemiosmosis in mitochondria:** Inner membrane of mitochondria.
10) **How did the evolution of photosynthesis affect the metabolic pathway.**
    Photosynthesis is source of oxygen in atmosphere. This oxygen is used in many metabolic pathways i.e aerobic respiration.
11) **How does absorption spectrum of chlorophyll a differ from that of chlorophyll b.**
    **Absorption spectrum of chl a:** Chlorophyll a absorbs violet (430nm) & orange/red (660nm) light.
    **Absorption spectrum of chl b:** Chlorophyll b absorbs blue (450nm) and yellow (640nm) light.
12) **Why are the carotenoids usually not obvious in the leaves they can be seen in the leaves before leaf all why.**
    **Carotenoids:** Carotenoids are present in leaves are often not obvious because of chlorophyll (masks the carotenoids). When chlorophyll not present in leaves ie in autumn, carotenoids are predominant and seen in leaves.
13) **How is the formation of Vitamin A linked with eating of carrot.**
    **Vitamin A:** Carrot contains large number of carotene. Carotene is source of Vitamin A.

## MULTIPLE CHOICE QUESTIONS
## (SELECTED FROM PAST PAPERS)

**1)** Chemical link b/w catabolism & anabolism is = **ATP**

**2)** All life on earth is powered by = **Solar energy**

**3)** Energy poor inorganic compound oxidized into energy rich organic compound through = **Photosynthesis**

**4)** $NADPH_2$ is used to reduce $CO_2$ to form sugar called = **Dark reaction**

**5)** Each mesophyll cell has chloroplast = **20-100**

**6)** Photosynthesizing cells of leaf is = **Mesophyll**

**7)** Thylakoid membrane involved in ATP synthesis by = **Chemiosmosis**

**8)** Photosynthetic prokaryotes lack = **Chloroplast**

**9)** Chlorophyll convert light energy into = **ATP & NADPH**

**10)** Which light is least absorbed by chlorophyll = **Yellow**

**11)** Long hydrocarbon chain attach to pyrrole ring is = **Phytol ($C_{20}H_{39}$)**

**12)** Chlorophylls are insoluble in = **Water**

**13)** Which is not accessory pigment = **Chlorophyll a**

**14)** How many photosynthesis is carried by terrestrial plants = **10**

**15)** Percentage of $CO_2$in air is = **0.03-0.04%**

**16)** Electron transport chain plays role in generation of ATP by = **Chemiosmosis**

**17)** Plastocyanin is **Copper** containing protein while ferredoxin is = **Iron containing**

**18)** Which is not concerned with non-cyclic phosphorylation = **Isocitrate**

**19)** During calvin, carbon is fixed & reduced to form = **Sugar**

**20)** NADPH provide reducing power for synthesis of sugar during = **Calvin cycle**

**21)** Large amount of energy is released during = **Respiration**

**22)** The end product of glycolysis is = **Pyruvic acid**

**23)** FAD & NAD are = **Coenzymes**

**24)** 1st step of kreb cycle, union of acetyl Co A with oxaloactate form = **Citrate**

**25)** The product formed after succinate is = **Fumarate**

**26)** In ETC, NADH oxidize by = **Coenzyme Q**

**27)** Co enzyme Q is oxidize by = **Cytochrome b**

**28)** Cytochrome b is oxidized by = **Cytochrome c**

**29)** Which is not concerned with oxidative phosphorylation = **Plastocyanin**

**30)** Movement of proton across which membrane of mitochondria = **Inner**

**31)** One pyruvate passing Krebs cycle produce $FADH_2$ = **1**

**32)** Conversion of one pyruvic acid into acetyl CoA gives one molecule of = **NADH**

**33)** Magnesium is important nutrient in plants are essential component of = **Chlorophyll**

**34)** Plant split water as a source of oxygen given by = **V. Neil**

**35)** ___ formed during muscle fatigue = **Lactic acid**

**36)** In mitochondria, pumping of proton across____, during chemosmosis = **Inner membrane**

**37)** Glycosis is breakdown of glucose upto = **Pyruvic acid**

**38)** One pyruvic acid converted into one acetyl CoA with = **NADH**

**39)** Proton gradient drives formation of ATP across membrane called = **Chemosmosis**

**40)** Reducing and assimilatory power formed in ___ form = **NADPH and ATP**

**41)** ___ organ is protected by carotenoids = **Eye**

**42)** Immediate acceptor of CO2 in Calvin cycle = **Ribulose bisphosphate**

**43)** Lactic acid fermentation take place in = **Muscle**

**44)** Oxidative phase of glycolysis starts with dehydrogenation = **G3P**

**45)** ___ molecule of G3P are required to produce 1 glucose = **2**

**46)** In alcoholic fermentation, acetyldehyde ___ to form ethanol = **Reduce**

**47)** __ NADH produce when one pyruvate pass through kreb cycle and pyruvic acid oxidation = **3**

**48)** ___ part of spectrum produce more oxygen = **Red**

**49)** For production of sugar from CO2 and ____ is needed = **ATP**

**50)** ___ Redox reaction is enedergonic = **Photosynthesis**

**51)** ___ molecule of CO2 is required to produce one triose sugar = **3**

**52)** ___ not occur during dark/ Calvin reaction = **Relaese of $O_2$**

**53)** ___ produce during reaction that occur in thylakoid = **ATP & NADPH**

**54)** The compound formed as a result of anaerobic respiration in the body muscles = **Lactic acid**

**55)** Entry of carbon dioxide into leaves depends upon the opening of = **Stomata**

**56)** In yeast products of anaerobic respiration = **Alcohol**

**57)** Chlorophyll absorbs mainly wavelength = **Violet blue**

**58)** Engleman used in his experiment in 1883 = **Aerobic bacteria**

**59)** When equal intensity of light given, more photosynthesis takes place in = **Red**

**60)** The area of leaf surface covered by stomata is only = **1-2%**

**61)** Daily rhythmic opening and closing of stomata is due to = **Internal clock**

**62)** Which of the following is stimulus for Cyclic photophosphorylation = **Low ATP**

**63)** Respiration is universal process by which organism breakdown Complex compounds containing = **Carbon**

**64)** In which process stored energy in carbohydrates is released = **Respiration**

**65)** Pyruvic acid before enterning Krebs cycle is changed into two carbon compounds = **Acetic acid**

**66)** Conversion of 1 pyruvic acid into one acetyl Co A gives off 1 molecule of = **NADH**

**67)** At the beginning of Krebs cycle acetyl Co A combines with which substrate to form citrate = **Oxaloacetate**

**68)** 1 molecule of $FADH_2$ is produced in Krebs cycle during conversion of = **Succinate to fumarate**

**69)** Number of oxidation steps during one Krebs cycle is = **4**

**70)** Total NADH formed by one Glucose molecule during Krebs cycle = **6**

**71)** Terminal electron acceptor in electron transport chain is = **Oxygen**

**72)** In ___ process, ATP produced = **All (photosynthesis, aerobic respiration & aerobic respiration)**

**73)** Enzyme involved in glycolysis are found in = **Cytoplasm**

## EXERCISE MCQs

**1)** Magnesium is an important a nutrient iron in green plants as it is an essential component of = **Chlorophyll**

**2)** When a green plant performed photosynthesis at its maximum rate = **The water content of plant will be low**

3) During the dark reaction of photosynthesis the main process which occur is = **Addition of hydrogen to $CO_2$**
4) Which statement about ATP is not true = **It is formed only under aerobic conditions**
5) Glycolysis = **Reduce 2 NAD for every glucose**
6) The citric acid cycle = **Take place in mitochondria**
7) Which statement about the chemiosmotic mechanism is not true = **Protons return through membrane by channel protein**
8) Which statement about oxidative phosphorylation is not true = **Its function can be served equally well by fermentation**
9) Before pyruvate enter the citric acid cycle it is decorboxylated oxidized and combined with coenzyme forming acetyl Co A, carbon dioxide and one molecule of = **NADH**
10) In the first step of citric acid cycle acetyl Co A reacts with oxaloacetate to form = **Citrate**
11) When deprived of oxygen yeast cell obtain energy by fermentation producing carbon dioxide ATP and = **Ethyl alcohol**

## LONG QUESTIONS
## (SELECTED FROM PAST PAPERS)

1. Discuss water in photosynthesis. ★★★★
2. Difference b/w chlorophyll a & chlorophyll b.
3. Explain role of $CO_2$ in photosynthesis.
4. Write a note on non-cyclic phosphorylation. Also draw diagram. ★★★★
5. Explain cyclic phosphorylation & chemiosmosis. ★★★
6. Discuss Calvin cycle with help of sketh. ★★★★★★
7. Define respiration. Discuss anaerobic respiration. ★★★
8. Describe glycolysis. Also sketch it. ★★★★★★
9. Explain Krebs cycle & ETC. ★★★★

# CH # 12: NUTRITION

## SHORT QUESTIONS (SELECTED FROM PAST PAPERS)

1. **Difference b/w nutrients & nutrition.** ★★★★★★

➢ **Nutrients:** Any substance that supply necessary element to body for metabolism.

- **Example:** Carbohydrate (ii) Lipid (iii) Proteins.

➢ **Nutrition:** All process involved in taking & utilization of food for maintains all activities (growth & repair) in organism called nutrition.

2. **Difference b/w autotrophic & heterotrophic.** ★★

| Autotrophic: | Heterotrophic: |
|---|---|
| They prepare their own food from inorganic materiel ($CO_2$ & $H_2O$) of environment. | They can't prepare their own food from inorganic material & they obtain food from environment/other organism. |
| At first level in food chain. | At 2nd & 3rd level in food chain. |
| They are called producer. | They are called consumer. |
| Chlorophyll present. | Lack chlorophyll. |
| **Example:** Plants (ii) Algae. | **Example:** Animals (ii) Fungi. |

3. **Write effects of nitrogen, potassium & magnesium deficiency on plant.**

➢ **Nitrogen:** Nitrogen found in proteins and nucleic acid.

- **Deficiency symptoms:** Deficiency of nitrogen cause stunted growth & chlorosis.

➢ **Phosphorus:** Phosphorus is present in ATP.

- **Deficiency symptoms:** Deficiency of **phosphorus** cause stunted growth of **roots.**

➢ **Potassium:** Deficiency of potassium cause leaf margin yellow & immature death of plant

➢ **Magnesium:** Magnesium is found in **chlorophyll.**

- **Deficiency symptoms:** Deficiency of **magnesium** causes chlorosis.

4. **What is chlorosis.** ★★★★

➢ **Chlorosis:** Lack of chlorophyll called chlorosis.

- It results in yellowing of leaves.
- **Cause:** Deficiency of $N_2$ (ii) Deficiency of Mg.

5. **What is symbiotic & parasitic nutrition.** ★★★★★

➢ **Symbiotic nutrition:** It is mutual association b/w two different species in which both species get benefit.

- **Example:** Lichen (fungi+algae) (ii) Mycorrhizea (fungi + plant).

➢ **Parasitic nutrition:** It is parasitic association of two different species in which one species get benefit & harm other species.

- **Example: Dodder/Cascuta** is parasitic plant.

6. **What do you know about insectivore plant with references to sundew.**

➢ **Insectivore:** Plants which feed on insects & digest them to full fill their energy requirements. Insectivores are true autotrophs.

- Carnivoures plants live in **nitrogen** defecit soil.
- They capture prey for rapid growth.
- **Example:** Pitcher plant (ii) Sundew.

❖ **Pitcher plant (*Sarracenia pupurea*):**

- In pitcher plant, leaves are modified into pitcher.

- End of leaf modified to form. Hood which covers pitcher.
- When insects fall into pitcher, insects are digested by enzyme and products are absorbed by plant.

❖ **Venus fly trap (*Dionaea muscipula*):**

- Leaf is bilobed. There are long stiff bristles along margins of leaves.
- When insect touch the hairs, bristles interlocked the the insect.
- Then insect digested by enzyme and products are absorbed.

❖ **Sundew (*Drosera intermedia*):** Sundews modify leaves for insectivoures activity.

- Leaves of sundew have many **tentacles & gland at tip.**
- Insects attracted by their odour of plants & entangled.

**7. Write names of four method of animal nutrition.**

➢ **Animal nutrition:** Methods of animal nutrition are followings.

(i) Detrivore (ii) Herbivore (iii) Carnivore
(iv) Omnivore (v) Fluid feeder (vi) Filter feeders.

**8. What is detrivores & herbivores.** ★★★★★★

➢ **Detrivores:** Animal that feed on dead organic material called **detrivores.**

- They ingest decaying organic matter as a food.
- **Example: Earthworm** (ii) Nematodes.

➢ **Herbivores:** Animals that feed on plant called **herbivores.**

- Canine teeth are absent in herbivore
- **Example: Deer, sheep**, rodent & ungulates are example of **herbivores.**

**9. What are ungulates. Give example.**

➢ **Ungulates:** Ungulates mammals walk on tips of toes.

- Their toes modified into hooves.
- **Example:** Horse (ii) Cow (iii) Goat.

**10. What are carnivores & omnivores.** ★★★★★★

➢ **Carnivores:** Animals that feed on other animals called **carnivores**.

- Teeth of **carnivore** include large canine (tearing & catching), incisor, molar & premolars are present.
- **Example:** Cats (ii) Dogs.

➢ **Omnivores:** Animal that feed on animals & plant both called **omnivores.**

- Their teeth are structurally b/w herbivore & carnivores.
- **Example: Bear** (ii) Man.

**11. What is macrophagous feeder & filter feeding.** ★★

➢ **Filter feeder:** These animals filter water & extract food from it. (ii) They live in aquatic environment.

- **Example;** Certain whales are **filter feeder** & Mussel.

➢ **Macrophagous feeder:** Animals that take food in form of large pieces called macrophagous feeder.

- Tenticular feeding and scraping are common method of macrophagous feeding.
- **Example:** Snail (land) (ii) Hydra (aquatic). (iii) **Spotted dog fish**

**12. What do you know about fluid feeder.** ★★★★

➢ **Fluid feeder: fluid feeder** animals ingest food in liquid form.

- **Aphid: Aphids** (fluid feeder) suck phloem juice from green stem through stylets.
- **Mosquito:** Mosquito sucks blood from skin capillaries through mouth part.

**13. Difference b/w obligate & facultative parasite.** ★★★★★

| Obligate parasite: | Facultative parasite; |
|---|---|
| They live parasitically on host & can't live without their host (in labs). | They live on host as well as without their host (in labs). |
| They are not primarily saprotroph. | They are primarily saprotroph. |
| **Example:** Virus | **Example:** Bacteria (ii) Leech |

**14. Write two harms caused by endoparasite.**

- **Harms of endoparasite:** They absorb digested food of host.
  - Endoparasites weaken the host.
  - Excretory products of parasite upset the metabolism of host.
  - **Example:** Tape worm (ii) Hook worm (iii) Amoeba.

**15. Define parasite. Difference between endoparasite and ectoparasite.** ★★★★★

| Endoparasite | Ectoparasite |
|---|---|
| Endoparasite lives within the host. | Ectoparasite lives on the host. |
| They more dangerous than ectoparasite. | They are less dangerous than endoparasite. |
| **Example:** Flea, lice & leech. | **Example:** Aphid, ticks & mites. |

- **Parasite:** Organism that lives upon/in another organism (host) to get food and in turn harms the host.
  - **Example:** Bacteria & Virus

**16. Name process involved in holozoic nutrition.** ★★★★★

- **Holozoic nutrition**: In Holozoic nutrition, organism eats solid food.
- **Steps of holozoic nutrition:** There are following steps of holozoic nutrition.
  (i) Ingestion (ii) Digestion (iii) Absorption
  (iv) Assimilation (v) Egestion.

**17. Define ingestion, egestion & absorption.** ★★★★★

- **Ingestion:** Taking in complex material called **ingestion**.
- **Absorption:** Uptake of diffusible food from digestive region into cell or blood stream.
- **Egestion:** Elimination of undigested material from body called **excretion/egestion.**

**18. Define digestion & assimilation.** ★★★★★

- **Digestion:** Breakdown of complex organic food into simple diffusible food through enzymes called digestion.
- **Assimilation**: Utilization of digested food for production of energy or cell metabolism.

**19. Difference between intracellular and extracellular digestion.** ★★

| Intracellular digestion | Exbratracellular digestion |
|---|---|
| Breakdown of food occurs within the cell. | Breakdown of food occurs outside of the cell. |
| Enzymes secreted within cell for digestion. | Enzymes secreted outside of cell for digestion. |
| Simple mechanism of digestion. | Complex mechanism of digestion. |
| Ingestion occurs via phagocytic vesicle. | Ingestion occurs via mouth. |
| **Example:** Digestion in amoeba. | **Example:** Digestion in human/fungi. |

**20. Difference b/w tube & sac like digestive system.** ★★★

| Sac like digestive system: | Tube like digestive system: |
|---|---|
| There is only one opening for ingestion & egestion. | There is separate opening for ingestion & digestion. |
| Undigestable food expelled out from body through mouth. | Food ingested from mouth & egested by another opening (anus). |
| It is primitive type of digestive system. | It is advance type of digestive system. |
| **Example:** Hydra. | **Example:** Human. |

**21. Define gastrovascular cavity in coelenterates.** ★★★★

➢ **Gastrovascular cavity in coelenterates:** Central cavity of hydra called digestive cavity. It has single opening for ingestion & digestion & surrounded by mobile tentacles. This is called gastrovascular cavity of coelenterons. Digestion of hydra takes place in **enteron**.

**22. What is nematocyst.** ★★★★★

➢ **Nematocyst:** Stinging cells of tentacles called nematocyst. (ii) These tentacles are present in **hydra**.

- **Structure:** Nematocysts are hollow thread within capsule & hair like trigger.
- **Function:** They involve in capturing of prey.

**23. Name four structure involved in digestion of cockroach.** ★★★

➢ **Parts of cockroach**: Foregut, midgut and hindgut.

➢ **Structure of cockroach:** Structures involve in digestion of coackroach are followings.
(i) Hepatic caecae (ii) Gut (iii) Gizzard (iv) Crop.

**24. Write role of gizzard & crop in cockroach.** ★★★

➢ **Crop:** **Crop** store partly digested food temporarily.

➢ **Gizzard:** Gizzard grinds the food. (ii)It transfers food into midgut.

**25. Name enzyme found in saliva.**

➢ **Enzyme of saliva:** Ptylin or **amylase** which digest carbohydrate (starch into maltose).

**26. Write down ingredients of saliva.** ★★★★★

➢ **Saliva:** Saliva is produce by 3 pairs of salivary gland located in mouth.

❖ **Ingredients of saliva:**

- Water & mucous.
- Sodium bicarbonate & other salt.
- Amylase/ptyalin.

**27. Write name of three pairs of salivary gland in human.** ★★★★

➢ **Salivary gland:** Sublingual gland is situated below the **tongue**.

➢ **Submaxillary gland**: It is situated behind jaw.

➢ **Parotid gland:** **Parotid** gland (**mouth**) is situated in front of **ears.**

**28. Define bolus & chyme.** ★★★

➢ **Bolus:** After mastication, lubrication & semi digestion, food is converted into small oval shape structure called bolus.

➢ **Chyme:** Muscle of stomach wall mix up the food with gastric juice & converted into semi sold mass called **chyme.**

**29. Difference b/w peristalsis & antiperistalsis.** ★★★★★★★★★★★★

| Peristalsis: | Antiperistalsis: |
|---|---|
| Waves of contraction & relaxation in smooth muscle of alimentary canal. | The movement of food is reversed. |
| **Function:** It moves the food along digestive tract. | Food passed from intestine back into stomach & even into mouth. |
| It is very common during digestion. | It is less common during digestion. |

**30. What is hunger pang.** ★★★★

➢ **Hanger pang:** Hunger contractions are peristaltic contraction that produce uncomfortable sensation called hanger pang.

- It starts after 12-24 hours after meal.
- **Cause:** It is caused by low glucose level in blood.

**31. Write location of stomach.**

➢ **Location of stomach:** Stomach is situated below the **diaphragm** on left side of abdominal cavity.

- **Function:** It store & digest food.

**32. What is heart burn or pyrosis.** ★★★★★

➢ **Pyrosis:** Pyrosis is burning sensation in chest due to back flush of acidic chyme into esophagous.

- **Cause:** Overeating (ii) Eating fatty food
  (iii) Lying down after meal (iv) Using too much alcohol.

**33. Write name of gastric gland & their secretion.** ★★★

➢ **Gastric gland:** Gastric juice is secreted by wall of stomach.

❖ **Composition:** It consists of following things.

- Mucous (secreted by mucous cell)
- **HCl** (secreted by **oxyntic/parietal cell**)
- Pepsinogen (secreted by **zymogen** cell).

**34. How secretions of gastric juice is regulated.**

➢ **Regulation of gastric juice:** Secretions of gastric juice are regulated by followings.
(i) Smell (ii) Sight (iii) Quality of food.

**35. Write hormonal control of gastric juice.**

➢ **Hormonal control of gastric juice:** Proteinecous food stimulates gastric hormone production. Gastric hormone is carried by blood to gastric gland. It stimulate gastric gland to secrete gastric juice. Thus more protein in food more gastric juice production.

**36. Difference b/w pepsin & pepsinogen. / how pepsinogen activated.** ★★

| Pepsin: | Pepsinogen: |
|---|---|
| Pepsin is active form of pepsinogen enzyme. | Pepsinogen is inactive form of **pepsin**. |
| It digests protein. | It does not digest protein. |
| Pepsinogen is not converted into pepsin. | Pepsinogen is converted into pepsin by acidic medium (HCl)/already pepsin stomach. |

**37. What is gastrin & secretin.** ★★★

➢ **Gastrin:** Gastrin is hormone secreted from gastric **endocrine lining** of **pyloric region of stomach**.

- It produced when more protein food is present in meal.
- **Function:** It enter into blood & stimulate gastric gland to produce more gastric juice.

➢ **Secretin:** It is hormone secreted from intestinal mucosa into duodenum.

- It is produced when more acidic food is present in meal.
- **Function:** **Secretin** enters into blood & stimulates hepatic & pancreatic juices.
  **Secretin** inhibits the secretion of gastric gland.

**38. Name enzymes of pancreatic juice.** ★★★

➢ **Enzymes of pancreatic juice:** Enzymes of pancreatic juice are followings.

- **Amylase** (digest carbohydrate). (ii) Lipase (digest lipid)
- Trypsin (digest protein).

**39. Define trypsin & trypsinogen. / How trypsinogen activated.**

➢ **Trypsin:** Trypsin is present in pancreatic juice.

- **Function:** It splits protein into peptones & polypeptides.

➢ **Trypsinogen:** Trypsinogen is inactive form of trypsin. Trypsinogen is converted into trypsin by **enterokinase** (release from **duodenum**) enzyme.

**40. Write function of liver.**

➢ **Function of liver:** Liver secretes **bile** juice in **duodenum** which helps in **emulsification of fat**.

- Liver converts ammonia (toxic) into urea (less toxic).
- Liver store fat soluble vitamins.
- Liver store glycogen for energy.

**41. What is jaundice.** ★★★

➢ **Jaundice:** If bile pigment is not released from digestive tract, they accumulate in blood & cause **jaundice.**

**42. What is gall stone.**

➢ **Gall stone:** **Cholesterol** accumulate in gall bladder to produce gall stone.

- **Disadvantage**: They block the release of bile juice.

**43. Name enzymes secreted from jejunum.** ★★

➢ **Enzymes of jejunum:** Enzymes secreted from jejunum are followings.

- Amino peptidase (digest polypeptides)
- **Erypsin** (digest dipeptides into amino acid)
- Lipase (digest lipids)
- Maltase (digest maltose)
- Lactase (digest lactose)

**44. How Absorption of food take place in small intestine.**

➢ **Absorption of food:** Absorption of food takes place in small intestine (ilium). **Ilium** has many fingers like projections called villi and microvilli. Villi increase the surface area of ilium for more absorption of food.

- Sugar and amino acid by diffusion/active transport. Some fatty acid and glycerol also absorb in blood.

**45. What is lacteal.**

➢ **Lacteal:** Lymphatic vessels present in villi of the small intestine called lacteal.

- **Function:** Lacteal transport lipoprotein into blood.

**46. What is large intestine. Write its role.**

➢ **Large intestine:** It is last part of human digested system.

❖ **Parts:** It consists of caecum, colon & rectum.

➢ **Role:** It absorbs water & salt.

- They harbor use full bacteria (E. coli) that forms vitamin K.
- It temporary store feces before removal.

**47. Difference b/w appendix & appendictis.** ★★★★

➢ **Appendix:** Appendix is a finger like processes arise from blind end of **caecum.**

➢ **Appendicitis:** Inflammation of appendix called appendicitis.

- **Cause:** Entrapping food in appendix.

**48. What is diarrhea & constipation.** ★★★

➢ **Diarrhea:** If absorption of water & salt does not take place called **diarrhea.**

- **Cause:** (i) Infection (ii) Drug action (iii) Emotional disturbance.

➢ **Constipation:** If excessive absorption of **water** take place called constipation.

- **Cause:** Tumor (ii) Dehydration (iii) Use of medicine.

**49. What is dyspepsia. Write symptoms.** ★★★★★

➢ **Dyspepsia:** Incomplete digestion called **dyspepsia.**

- **Symptoms:** Abdominal discomfort (ii) Flatulence (iii) Heart burn (iv) Nausea (v) Vomiting.

- **Cause:** **Dyspepsia** is caused by insufficient quality/quantity of bile secretion & stomach acidity.

**50. What is food poisoning & botulism.** ★★★★★★★★

➢ **Food poisoning:** It is caused due to indigestion of toxic food.
- **Cause:** Toxin produced by bacteria i.e salmonella & campylobacter.
- **Precautions:** Meat cooked properly before used. Pasteurized the milk before use. Don't eat contaminated food.

➢ **Botulism:** A severe form of food poisoning called botulism.
- **Cause:** Toxin produced by bacteria like ***Clostridium botulinum*** cause botulism.
- **Symptoms:** Fatigue (ii) Dizziness (iii) Double vision (iv) Headache (v) Vomiting.

**51. What is obesity. Write its side effects.** ★★★★★

➢ **Obesity:** When a person has abnormal amount of fat on body called obesity.
(ii) Fat stored in abdomen, around kidney & under skin.
- **Disadvantage:** High blood pressure (ii) Heart disease (iii) Diabetes (iv) Stomach disorder.

**52. What is adipose tissue.**

➢ **Adipose tissue:** Adipose tissue store fats.
- **Location:** Adipose tissue found in abdomen, under the skin and around the kidneys.

**53. What are piles.** ★★

➢ **Piles:** Piles/Hemorrhoids are masses of dilated veins in anorectal mucosa. These masses sometime bleeding during bowel movements. Piles may severe during constipation.
- **Treatment:** Hygiene, use of roughage, use of laxatives & sit on soft seats. Sometime hemorrhoids remove surgically.

**54. What is anorexia nervosa. Write its cause & treatment.**

➢ **Anorexia nervosa:** Loss of appetite due to fear of becoming obese called **anorexia nervosa.**
It is more common in female age b/w 12-21 years.

❖ **Treatment:**
- Psychiatric therapy. This is very slow treatment & takes 2-4 years.
- They fed through intramuscularly or intravenously.

## Exercise Short Questions

**1) What is the advantage of a digestive track as compared with a digestive cavity.**
**Digestive tract:** Digestive system is tube like digestive system and consists of many organs which are specialized for functioning. Where digestive cavity is sac like digestive system & lack specialized organs.

**2) What are the functions of human liver.**
See question number: 40

**3) What measure should be taken to avoid food poisoning.**
See question number: 50

**4) Can we get along without large intestine, if not why.**
**Large intestine:** No, large intestine is very important for us. Large intestine absorb water & solute in body. If large intestine removed, person will dehydrate which leads to death.

# MULTIPLE CHOICE QUESTIONS
## (SELECTED FROM PAST PAPERS)

**1)** Cytochromes contain = **Iron**
**2)** Some bacteria breaks protein of dead organism & convert them in= **Nitrates**
**3)** In root nodules, bacteria fix nitrogen into = **Nitrates**
**4)** Which type of feeding occur in garden snail = **Scraping**
**5)** Which has only intracellular mode of digestion = **Amoeba**
**6)** Digestion in hydra & planaria take place by = **Gastro vascular cavity**
**7)** Intestinal caecae are present in digestive system of = **Planaria**
**8)** How many site of digestion in digestive system of man = **3**
**9)** Which is slightly antiseptic = **Sodium bicarbonate**
**10)** PH of fresh saliva is = **8**
**11)** 1st part of small intestine is = **Duodenum**
**12)** 2nd part of small intestine is = **Jejunum**
**13)** 3rd part of small intestine is = **Ileum**
**14)** Most of digestion takes place in = **Small intestine**
**15)** Length of duodenum is = **20-25 cm**
**16)** Dipeptides are converted into amino acid by = **Erypsin**
**17)** Which is neurotic disorder present in slightly older girls = **Bulimia nervosa**
**18)** Most vitamins function as = **Catalyst**
**19)** Human become ill by using milk because they lack = **Lactase**
**20)** Which animal has no need for gall bladder = **Goat**

**21)** Optimum pH of pepsin = **2**
**22)** Excess gastric secretion is important factor for = **Peptic ulcer**
**23)** Hydra has ___ feeding = **Tentacular**
**24)** In hydra, ectodermal cell gets food from endodermal cell by = **Diffusion**
**25)** Common ectoparasite of non human mammal = **Tics**
**26)** One of the following has no upper incisors = **Deer**
**27)** Taste buds of tongue play role in ____ food = **Selection**
**28)** Amylopsin digest starch into = **Maltose**
**29)** All insectivorous plant are = **Autotroph**
**30)** Chyme enter into intestine through ___ sphincter = **Pyloric**
**31)** Anemia is important for patient to = **Full remove parasite**
**32)** Hepatic caeca present in = **Cockroach**
**33)** An organism that lives Upon or within the another organism is called = **Parasite**
**34)** ___ characterize by bouts of over eating of fattening food = **Bulimia nervosa**
**35)** Animals obtained carbohydrates mainly from = **Starch**
**36)** A common Mussels has two large gills covered with = **Cilia**
**37)** Rasping tongue like structure in mollusca called = **Radula**
**38)** Structure in mouth that prevents food from enterning nasal cavity = **Epiglottis**
**39)** Mucus of stomach possess___ cells = **All (mucus, parietal & zymogen)**
**40)** Muscles of stomach walls are of which types = **Smooth**
**41)** Length of jejunum is about = **2.4 m**

**42)** Each villi is richly supplied with blood capillaries and lymphatic vessels = **Lacteals**
**43)** In **large intestine**, vitamin K is formed by activity of = **Symbiotic bacteria**
**44)** Goblet cell secrets = **Mucus**
**45)**___ no upper incissor = **Deer**

## EXERCISE MCQs

**1)** A plant requires nitrogen and sulphur for its = **Enzyme**
**2)** A plant requires potassium for = **Opening and closing of stomata**
**3)** Carnivorous plants live in soils that are deficient in = **Nitrogen**
**4)** Most vitamins function as = **Catalyst**
**5)** Digestion in hydra and planaria takes place within its it's = **Gastrovascular cavity**
**6)** Mucus in sliva is made of = **Glycoproteins**
**7)** The structure in mouth that prevent food from entering the nasal cavity is = **Epiglottis**
**8)** A mammalian herbivore has = **Flatter teeth then a carnivore**
**9)** Many mammals become ill from consuming milk and Milk products because the lack = **Lactase**
**10)** Which of the following animals has no need for gallbladder = **Goat**

## LONG QUESTIONS
## (SELECTED FROM PAST PAPERS)

**1.** Discuss mineral nutrition in plants & their deficiency.
**2.** Write a note on heterotrophic nutrition in plants.
**3.** Describe nutrition in insectivorous plants. ★★★★
**4.** Discuss four method of animal nutrition. ★★★
**5.** Explain parasitic nutrition.
**6.** Describe different process of digestion & absorption in animals.
**7.** Explain digestion in amoeba & hydra. ★★
**8.** Explain digestion in cockroach. ★★★
**9.** Describe digestion in oral cavity. ★★★★★
**10.** Explain digestion in stomach & small intestine. ★★★★
**11.** Explain role of pancreas & liver in digestion.
**12.** Explain absorption of food. ★★★
**13.** Write a note on dyspepsia, food poisoning, anorexia nervosa & bulimia nervosa.
**14.** Explain obesity. ★★

# CH # 13: GASEOUS EXCHANGE

## SHORT QUESTIONS (SELECTED FROM PAST PAPERS)

1. **What is cellular & organismic respiration.** ★★★★★★★★

| Cellular respiration: | Organismic respiration: |
|---|---|
| The process by which cell utilize oxygen, produce $CO_2$ & extract energy (ATP) from food. | Take in oxygen & remove of $CO_2$ from body called breathing. |
| Cellular respiration involve in production of **energy (ATP).** | **Respiration** involves gaseous exchange b/w organism & environment. |
| It occurs in mitochondria. | It occurs in lungs. |
| It is both biochemical and mechanical process. | It is only mechanical process. |

2. **Why air is better respiratory medium then water.** ★★★★★★★★
- **Air is better medium than water:** Oxygen is better respiratory medium than water due to following reasons.
  - Air contains more oxygen than water.
  - Oxygen diffuses **8000** times more in air than water.
3. **Name structure involve in gaseous exchange of plants.**
- **Structure of plant:** Structure involve in gaseous exchange are followings.

  (i) Stomata (ii) Lenticels (iii) Roots
4. **How respiration take place in cork.** ★★★
- **Respiration in cork:** Cork tissue made of dead cells.
  - **Bark**/Cork tissue has lenticels for exchange of gases.
5. **What is photorespiration. Name organelles involved in them.** ★★★★
- **Photorespiration:** Respiration occurs during day time in which $CO_2$ is released and $O_2$ is used in plants called **photorespiration.**
  - It is light dependent reaction.
  - In **photorespiration,** rubisco fix $O_2$ in place of $CO_2$, which lowers the plant growth.
- **Organelles:** Following organelle involved in photorespiration.

  (i) Chloroplast (ii) Peroxisome (iii) Mitochondria.
6. **What is rubisco. Write its function.** ★★★★
- **Rubisco: Rubisco (enzyme)** is most abundant protein in **chloroplast** as well as in world.
- **Function:**
  - Rubisco act as carboxylase by adding $CO_2$to RuBP.
  - It acts as oxygenase by adding $O_2$ to RuBP.
7. **Write any two properties of respiratory surface in animals.** ★★★★
- **Respiratory surface in animals:**
  - **Surface area:** Surface area should be large & moist as in lungs.
  - **Thin epithelium:** In animals, thin epithelium (less distance) separate air & blood. So distance for diffusion is very short.
8. **Name four properties of respiratory surface.** ★★★★★★★★★★★★
- **Properties of respiratory surface:** There are following properties of respiratory surface.
  - Large surface area & moisture
  - Thin epithelium

- Ventilation
- Capillary network.

**9. Write respiration in Hydra & earth worm.** ★★★★★★

➢ **Respiration in Hydra:** **Hydra** has no specialized organ for exchange of gases.
- Respiration takes place by body surface & by digestive cavity (enteron).

➢ **Respiration in earth worm:** Exchange of gases in earth worm take place through **skin**. Skin is richly supplied with capillaries & kept moisture by secretion of mucous gland present in epidermis & coelomic fluid release from dorsal pore. $O_2$ combine with hemoglobin to form oxyhemoglobin. $CO_2$ released from tissue through blood.

**10. Name factors that keep skin of earth worm moisture.** ★★★★

➢ **Moisture skin:** Skin of earthworm kept moisture by secretion of mucous gland present in epidermis.
- Coelomic fluid release from dorsal pore.

**11. Difference b/w spiracles & tracheoles. / Respiration in cockroach.** ★★★★★★

➢ **Spiracles:** Main tracheal trunk communicates with exterior by paired apertures called **spiracles** that present in side of body of **cockroach.**
- There are **10 pairs** of spiracles in cockroach.

➢ **Tracheoles:** The main trachea divide & sub divide to form thin walled tube called tracheoles.
- Gaseous exchange occurs through tracheoles.

**12. Exhalation & inhalation in cockroach.** ★★★

➢ **Inhalation:** During inhalation, abdomen expands & first **four pairs** of spiracles open.
Air enters into tracheoles by these spiracles.

➢ **Exhalation:** During exhalation, abdomen contracts & first four pairs of spiracles close & posterior six pairs open to force air out.

**13. What is operculum.**

➢ **Operculum:** Gills are covered by operculum.
- **Example:** Operculum found in bony fishes.

**14. Name body structure involve in gaseous exchange in frog.**

➢ **Gaseous exchange in frog:** Gaseous exchange occurs in frog through following parts.
(i) Lungs (pulmonary respiration) (ii) Skin (cutaneous respiration)
(iii) Buccal chamber (iv) Cloacal chamber.

**15. What is cutaneous & pulmonary respiration.** ★★★★★

➢ **Cutaneous respiration:** Respiration occurs through skin called **cutaneous** respiration.
- **Example: Frog.**

➢ **Pulmonary respiration:** Respiration occurs through lungs called **pulmonary respiration**.
- **Example:** Human.

**16. What is inspiration & expiration.** ★★★★★★★★

➢ **Inspiration:** Intake of air in body called inspiration.

❖ **Changes:**
- Space of chest cavity increased by muscle contraction of ribs & diaphragm.
- Pressure on lung is removed so air enters into lungs.

➢ **Expiration:** Release of air from body called expiration.

❖ **Changes:**

- Space of chest cavity decrease due to muscle relaxation of ribs & diaphragm. Pressure on lung increased so air leaves lungs.

**17. Write function of parabronchi & counter current exchange.** ★★★★★★★★★

➢ **Parabronchi:** Lungs of **birds** made of thin walled ducts called **parabronchi.**
- **Function:** They involve in gaseous exchange.

➢ **Counter current exchange:** The direction of blood flow in lungs is opposite to air flow in parabronchi.
- **Function:** This increase entry of oxygen into blood.

**18. Write function of nasal cavity & larynx.** ★★★★

➢ **Nasal cavity:** Nasal cavity lined with mucous membrane of ciliated epithelium.
- It opens outside through nostrils.
- **Function:** Air becomes moisture, warm & filters by nasal cavity.

➢ **Larynx:** **Larynx** is cartilaginous structure present on top of trachea.
- It is also called voice box.
- **Function:** Larynx involve in sound production.

**19. Difference b/w glottis & epiglottis.** ★★★

➢ **Glottis:** It is opening of larynx lined by mucous membrane.
- It is covered by lid.

➢ **Epiglottis:** It is lid of glottis made of cartilage.
- **Function:** **Epiglottis** prevents entry of food in trachea.

**20. What are vocal cords. Write its location & function.** ★★★

➢ **Vocal cord:** There are two thin fibrous bands present in glottis called vocal cord.
- They stretched across glottis.
- **Function:** **Vocal cords** vibrate by air & produce voice.

**21. Difference b/w bronchi & bronchioles.** ★★

| Bronchi: | Bronchioles: |
|---|---|
| Trachea divides to form bronchi. | Bronchi divide to form bronchioles. |
| Bronchi made of cartilage. | **Bronchioles** lack cartilage. |
| Diameter of bronchi is 12 mm. | Diameter of bronchiole is **1mm.** |
| There are two bronchi in human body. | There are many bronchi in human body. |

**22. What is alveoli & air sac.** ★★★★

➢ **Alveoli:** Air sac consists of many single layered structure called alveoli.
- **Function:** It involve in gaseous exchange.

➢ **Air sac:** Bronchioles divide & sub divide and open into air sac.
- It is functional unit of lung.

**23. What is diaphragm & pleura.** ★★★★★★

➢ **Diaphragm:** The floor of chest called **diaphragm.**
- Diaphragm is made of **skeletal** muscle.
- **Function:** Diaphragm increase/decreases the area of chest cavity during respiration.

➢ **Pleura:** **Lungs** are covered by double membrane called **pleura**.
- **Function**: They protect the lungs.

**24. Write role of diaphragm in inspiration & expiration.** ★★★★★★

➢ **Role of diaphragm during inspiration**: During inspiration, diaphragm contract & become flat. So volume of chest cavity increase & air enter into lungs.

- **During expiration:** During expiration, diaphragm relaxes & become dome like. So volume of chest cavity decrease & air expel from lungs.

**25. How volume of chest cavity is reduced during expiration.** ★★★

- **Reduction of chest cavity:** During expiration, ribs muscle contracts & chest cavity moves down & back ward. Muscle of diaphragm relax & become dome like. In this way volume of chest cavity reduced.

**26. What is respiratory distress syndrome.** ★★★★★★★★★★★★★

- **Respiratory distress syndrome:** RDS is more common in premature infant (less than **7 month**).
  - **Cause:** it occur when enough surfactant is not produced to reduce the tendency of lungs to collapse.
  - **Surfactant:** Surfactant mixture of **lipoprotein** produced by alveolar epithelium.
  - **Function:** Surfactant form a layer over alveolar fluid to reduce surface tension.

**27. What is carbonic anhydrase. Write its function.**

- **Carbonic anhydrase:** Carbonic anhydrase is enzyme present in red blood cells.
  - **Function:** It breaks oxyhaemoglobin into haemoglobin (purple red in color) & oxygen.

**28. Name three factor that effect $O_2$ carrying capacity of haemoglobin.**

- **Factors:** Factors that affect $O_2$ carrying capacity of haemoglobin are followings.
  (i) Carbon dioxide (ii) Temperature (iii) PH

**29. Give effect of temperature, pH & $CO_2$ on $O_2$ carrying capacity of haemoglobin.** ★★★★

- **Effect of $CO_2$:** When $CO_2$ pressure increase, $O_2$ tension decrease & oxygen holding capacity of haemoglobin **decrease**. In this way more oxygen release from blood to tissue.
- **Effect of temperature:** Rise in temperature decrease oxygen carrying capacity of blood.
- **Effect of pH:** Decline in blood pH, decrease oxygen carrying capacity of haemoglobin. Because an increase in number of H ion in blood, which bind with protein part of haemoglobin. Hence decline in pH, decrease in oxygen transport of haemoglobin. Increase in pH of blood, increase oxygen binding capacity of haemoglobin.

**30. Name two states of transport of $CO_2$.**

- **States:** Two states of transport of carbon dioxide are followings.
  (i) Carboxyhaemoglobin (20%) (ii) Plasma protein **(5%)** (iii) Bicarbonate ions **(70%)**

**31. Give concentration of $CO_2$ in arterial & venous system.** ★★★★★★★★★

- **Arterial system:** Arterial blood contains **50ml** $CO_2$ per 100ml of blood.
- **Venous system:** Venous blood contains **54ml** $CO_2$ per 100ml of blood.

**32. What is lung cancer & TB.** ★★

- **Lung cancer:** Lung cancer is malignant tumor & spread by metastasis.
  - The chances of lung cancer are 10 times more in smoker & living in congested areas than non-smoker.
  - **Cause:** Smoking is major cause of death in adults. 90% lung cancer caused by smoking.
    (ii) Congested area. (iii) Tobacco smoke.
- **Tuberculosis:** TB is **respiratory** disorder. (ii) In TB, lungs are damaged by cough & fever.
  - **Cause:** It is caused by *Mycobacterium tuberculosis*.
  - It is caused by malnutrition & poor people.
  - **Cure:** It is cured by proper medical attention.

**33. What is asthma & emphysema.** ★★★★★★

- **Asthma:** Asthma is serious respiratory disease with difficult **breathing**.

- It is an allergic reaction to pollen, cold, spores & pollution.
- Asthma release histamine in blood which cause contraction of bronchioles.

➢ **Emphysema:** **Emphysema** is break down of **alveoli**.

- It is more common in smoker.
- **Emphysema** is also called smoker's cough.
- Chemicals of smoke break alveoli wall.
- Least exertion make patient breathless.

**34. Difference b/w myoglobin & hemoglobin.** ★★★★★★

| Myoglobin: | Haemoglobin; |
|---|---|
| **Myoglobin** is haemoglobin like **iron** contaning protein present in **muscle**. | HB is **iron** containing protein present in blood. |
| It is also called muscle haemoglobin. | It is also called blood haemoglobin. |
| It consists of one polypeptide chain. | It consists of 4 polypeptide chain. |
| Myoglobin transport **single** oxygen molecule. | It transports four oxygen molecules. |
| Has high affinity to bind with oxygen. | Has low affinity to bind with oxygen. |
| **Function:** It store oxygen.<br>(ii) It transfers oxygen from haemoglobin to muscle cells | **Function:** It transports oxygen.<br>(ii) It also transport small amount of $CO_2$. |

**35. What is diving reflex. How it is activated. Write character of diving mammals.** ★★★★★★

➢ **Character of Diving mammals:** Aquatic mammals like cetaceans can stay in depth of ocean for two hour.

- Diving mammals has twice volume of blood then body weight.
- They have more myoglobin in their muscle.

❖ **Changes during diving reflex:** When mammals dives, diving reflex activated.

- Breathing stops, heart beat slow down, use of oxygen & energy is reduced.
- Their muscle shifts from aerobic to anaerobic respiration.

**36. Define residual volume of lungs.**

➢ **Residual volume:** Volume of air in lungs that cannot be expelled from lungs.

- **Value:** Residual volume of lungs is **1.5 liter**.

**37. Write normal rate of breathing.** ★★★★★

➢ **Normal rate:** Normal rate of breathing is **15-20 times/min.**

➢ **Exercise:** During exercise, rate of breathing is 30 times/min.

**38. What is composition of inhaled & exhaled air.** ★★★★★

| | %inhaled | % exhaled |
|---|---|---|
| Oxygen | 21 | 16 |
| $CO_2$ | 0.04 | 4 |
| Water vapors | Variable | Saturated |
| Nitrogen | 79 | 79 |

## Exercise Short Questions

1. **How does breathing differ from respiration.**

   See question number: 1

2. **How much carbon dioxide is present in venus and arterial blood.**
   See question number: 31
3. **How much air always remains in the lungs of human.**
   1.5 liter air always remains in human lungs.
4. **What are the products which are produced during photorespiration.**
   **Cholorplast:** Glycolate & PGA
   **Peroxisome:** Glycine & $H_2O_2$.
   **Mitochondria:** Serine, $CO_2$ & $NH_3$.
5. **How much denser is a water medium than air medium for exchange of respiratory gases.**
   Water is 50 times denser then air.

## MULTIPLE CHOICE QUESTIONS
## (SELECTED FROM PAST PAPERS)

**1)** Oxygen content in fresh air is = **200 ml/liter**

**2)** A liter of water contain oxygen = **Less than 10 ml**

**3)** Viscosity of water is more = **50 times**

**4)** Main site for exchange of gases in plant is = **Stomata**

**5)** Air spaces comprises of total volume of leaf = **40%**

**6)** Glycolate diffuse into which organelle during photorespiration = **Peroxisome**

**7)** Glycine diffuse into which organelle during photorespiration = **Mitochondria**

**8)** During photorespiration, glycine is converted into serine in = **Mitochondria**

**9)** Pathway in which RuBP is converted into serine called = **Photorespiration**

**10)** Number of paired aperture (Spiracles) for respiration in cockroach is = **10**

**11)** Spiracles are found in = **Cockroach**

**12)** Aquatic animals have highly modified organ for gaseous exchange = **Gills**

**13)** Aquatic arthropods respire through = **Gills**

**14)** Air is directly supplied through tracheoles to tissue in = **Cockroach**

**15)** Fishes respire through = **Gills**

**16)** Respiratory system is most efficient & elaborate in = **Bird**

**17)** In most birds, number of air sac are **= 9**

**18)** When haemoglobin is 98% saturated, it contain how many $O_2$/1ooml = **19.6**

**19)** Which is more important regulator in breathing = **$CO_2$**

**20)** About 70% of $CO_2$ is transported by = **Bicarbonate ion ($HCO_3$)**

**21)** Normal alveolar ventilation regulated by = **$CO_2$**

**22)** Respiratory pigment in human is = **Haemoglobin**

**23)** When lungs are fully inflated, total inside capacity of lung is = **5 liters**

**24)** Volume of air taken inside lungs & expelled during exercise is = **3.5 liter**

**25)** Asthma associated with severe = **Breathing**
**26)** Pairs of spiracles present in abdomen = **8**
**27)** Correct order of air passage = **Nostrils, nasal cavity, Pharynx and larynx**
**28)** During breathing, no stale air present in lungs = **Birds**
**29)** Blood is not involved in transport of Gases in = **Insect**
**30)** Exchange of gases during organismic respiration is carried out by = **Diffusion**
**31)** In earth from the exchange of gases occur mainly through = **Skin**
**32)** Opening in oral cavity through which air enters the wind pipe is called = **Glottis**
**33)** Bronchioles are made of = **Circular smooth muscles**
**34)** When oxygen tension is 150 mm Hg, then hemoglobin saturation is = **98%**
**35)** Transportation of oxygen from lungs to tissue cell is carried by = **RBCs**
**36)** More than 10 compounds of Tar of tobacco smoke included in causing = **Cancer**
**37)** Hemoglobin in man increase the oxygen carrying capacity of blood to about = **75 times**
**38)** Human lungs are ____ in nature = **Spongy**

## EXERCISE MCQs

1. Air spaces between mesophyll cells of a leaf comprises of total volume = **40%**
2. The respiratory system is most efficient in = **Birds**
3. Respiratory pigment present in muscle is called = **Myglobin**
4. Blood contains – oxygen per 100 ml of blood when hemoglobin is 98% saturated in= **19.6 ml**
5. How much air can lungs hold when they are full inflated = **5 liter**

## LONG QUESTIONS
## (SELECTED FROM PAST PAPERS)

1. **Discuss photorespiration.**
2. **Discuss properties of respiratory surfaces in animals.**
3. **Explain respiration in cockroach & fishes.**
4. **Explain respiration in birds & man.**
5. **Discuss mechanical aspects of breathing in man.**
6. **Discuss transport of $O_2$ & $CO_2$.**
7. **Compare haemoglobin & myoglobin.**

# CH # 14: TRANSPORT

## SHORT QUESTIONS (SELECTED FROM PAST PAPERS)

1. **Difference b/w diffusion & facilitated diffusion.** ★★

| Diffusion: | Facilitated diffusion: |
|---|---|
| The movement of molecule from area of higher concentration to area of lower concentration called **diffusion**. | The movement of nutrients from area of higher concentration to area of lower concentration with help of carrier protein called facilitated diffusion. |
| Carrier protein not involved. | Carrier protein involved. |
| Transport small & non-polar molecules. | Transport large & polar molecules. |
| **Example:** Gaseous exchange in lungs. | **Example:** Movements of ions into roots. |

2. **Difference b/w active & passive transport.** ★★

| Active transport: | Passive transport: |
|---|---|
| The movement of molecule from area of lower concentration to area of higher concentration against concentration gradient. | Transport of molecules from are of higher concentration to area of lower concentration. |
| ATP is used. | ATP is not used. |
| **Types:** Endocytosis, exocytosis & Na-P pump. | **Types:** Diffusion, facilitated diffusion & osmosis. |
| **Example:** Transport of ions, proteins & sugar. | **Example:** Transport of water, $O_2$, $CO_2$ & lipids. |

3. **Difference b/w apoplast & symplast pathway.** ★★★★★

➢ **Apoplastic pathway:** In plant root, there is extracellular spaces b/w cell wall of neighboring cells. Water moves through these spaces without crossing plasma membrane.
- This is fast movement

➢ **Symplast pathway:** It is system of interconnected root cells. Cytoplasm of neighboring cells is connected with one another by plasmodesmata.
- Water moves through plasmodesmata.
- This is slow movement.

4. **Define plasmodesmata.** ★★★

➢ **Plasmodesmata:** Cytoplasm of adjacent cells are connected through pore called **plasmodesmata**.
- **Function: Plasmodesmata** connect and exchange materials between sieve tube & companion cells

5. **Define osmosis & water potential.** ★★★★★

➢ **Osmosis:** Movement of water molecule from area of higher concentration to area of lower concentration through partially permeable membrane called **osmosis.**

➢ **Water potential:** Kinetic energy of water molecule is called water potential.
- Water potential ($\Psi_w$) = Solute potential ($\Psi_s$) + Pressure potential ($\Psi_p$).

6. **Define solute & pressure potential.** ★★★

➢ **Solute potential**: Change in water potential of system due to presence of solute called **osmotic/solute potential**. (ii) It is always negative.
- **Pressure potential**: Pressure exerted by protoplast on cell wall called pressure potential. It causes turgidity of cell.

7. **What is plasmolysis, deplasmolysis & incipient plasmolysis.** ★★★★★

➢ **Plasmolysis:** Shrinkage of protoplast due to exosmosis of water called **plasmolysis**.

- **Cause:** It is caused due to exosmosis of water. When a cell placed in solution with low water potential than cell. So water release from cell & cell shrinks.

➢ **Deplasmolysis:** When plasmolysed cell placed in pure water. Water enters into cell & cell become deplasmolysed.

➢ **Incipient plasmolysis:** Point where plasmolysis occurs called **Incipient plasmolysis.**

8. **What is cohesion tension theory.**

➢ **Cohesion tension theory:** This theory provides explanation of flow of water and minerals upward from root to leaves. Water is pulled by xylem due to transpiration. Adhesion of water molecules to xylem wall & cohesion of water molecules to each other. That's why water pulled upward.

- **Proposed:** Cohesion tension theory was proposes by **Dixon.**

9. **What is cohesion & adhesion.**

➢ **Cohesion:** **Cohesion** is attraction among water molecule which holds water together by **hydrogen bonding** in xylem tubes.

➢ **Adhesion:** Water molecule adheres to cell wall of xylem. Thus column of water does not break. Composition of cell wall helps water to creep up.

10. **What is hydathode.**

➢ **Hydathode;** Water secreting gland called hydathode.

- Guttation occurs through **hydathode**.

11. **What is guttation & bleeding in plant.** ★★★★★

➢ **Guttation:** Loss of water from water secreting glands (hydathode) called guttation.

- **Guttation** is also associated with root pressure.

❖ **Factor:** Root pressure (ii) Transpiration.

- **Example:** Dew drops over leaves of grasses or strawberry is **guttation/exudation**.

➢ **Bleeding:** Loss of sap from cut, pruned or wound surface of plant called bleeding.

- **Example:** It is shown in grape wine & palm during spring.

12. **What is imbibitions. Write is significance.** ★★★★

➢ **Imbibitions:** Components of cell wall absorbs water & its volume increased without being dissolved in water.

❖ **Significance:** It is important in germinating seed.

- It breaks seed coat & effective in germination.
- Volume of dry seed increase upto 200time by **imbibitions.**

13. **Define transpiration & cuticular transpiration.**

➢ **Transpiration:** Loss of water from aerial parts of plants called transpiration.

➢ **Factors:** Light, $CO_2$, temperature, wind, Humidity & vapor pressure.

❖ **Types:** (i) Stomatal transpiration. (ii) Cuticular transpiration. (iii) Lenticular transpiration.

➢ **Cuticular transpiration:** Loss of water from cuticle of leaf called cuticular transpiration.

- Cuticular transpiration comprises **5-7%** of total transpiration.
- **Cuticullar** transpiration takes place during **night.**

14. **Difference b/w stomatal & lenticular transpiration.** ★★★★★

| Lenticular transpiration: | Stomatal transpiration: |
|---|---|
| Loss of water from lenticels present in stem called **lenticular transpiration.** | Loss of water from stomata present in leaves called stomatal transpiration. |
| **Lenticular** transpiration comprises 1-2% of total | Stomatal transpiration comprises **90%** of total |

| | |
|---|---|
| transpiration. | transpiration. |
| Occurs during day & night time. | Occurs during day time. |
| Guard cells absent. | Guard cells present. |

**15. What is isobilateral leaves.**

➢ **Isobilateral leaves:** In isobilateral leaves, stomata are present in upper & lower epidermis. Isobilateral leaves transpire through **cuticular & stomatal transpiration**.

- **Example:** Lily (ii) Maize.

**16. What are guard cells.**

➢ **Guard cell:** Stomata consist of guard cells and stoma (pore).

- **Function:** Guard cell opens and closes the stomata.

**17. How stomata open and close.**

➢ **Opening of stomata:**

- Stomata open due to active transport of $K^+$ into guard cells. $K^+$ decrease osmotic potential of guard cell & water enters into guard cell and stomata open.
- Guard cells are only photosynthesizing cell of epidermis. During day time, guard cell form sugar which decrease osmotic potential of guard cell, & water enters into guard cell and stomata open.
- Blue light (acidify guard cell) enable plant cell to take $K^+$, in this way stomata opens.

➢ **Closing of stomata:**

- Stomata close due to passive transport of $K^+$ from guard cell.
- Stomata close during night due to no production of sugar (no photosynthesis during night).
- Stomata close during night due to no blue light.

**18. How sieve tube & companion cells communicate.**

➢ **Sieve tube** (transport food and organic material) & **companion cell** (provide ATP to sieve cell) communicate through **plasmodesmata**.

**19. What do you know about pressure flow theory.**

➢ **Pressure flow theory:** It states that flow of solution in sieve tube is driven by pressure gradient b/w source (exporting organ) & sink (storing organ). In this carbohydrate are moved from mesophyll cell into phloem by diffusion & active transport. Then carbohydrate moved in phloem by pressure flow theory.

- **Proposed:** Pressure flow theory was proposed by **Ernst Munch** in 1930.

**20. Difference b/w source & sink.** ★★

| Source: | Sink: |
|---|---|
| Food exporting part of plant called source. | The part of plant where metabolism & storage of food occur. |
| Phloem loading takes place at source. | Phloem unloading takes place at sink. |
| Produce food in plants. | Store extra food in plants. |
| Photosynthesis takes place at source. | Photosynthesis does not take place at sink. |
| **Example:** Leaves. | **Example: Root**, (ii) Tubers (iii) Fruits. |

**21. Difference b/w open & closed circulatory system.** ★★★★★★

| Open circulatory system | Closed circulatory system |
|---|---|
| Blood does not remain enclose in vessels. | Blood always remain in blood vessels. |
| There are no typical artery, veins & capillilary. | There are artery, veins & capillaries. |
| It is primitive type of blood system | It is advanced type of blood system. |
| Example: **Arthropods (insects) & mollusca** | Example: **Octopus**, annelids & tunicates. |

**22. What is double circuit heart & single circuit heart.** ★★★★★★★

| Single circuit heart: | Double circuit heart: |
|---|---|
| In single circuit heart, blood flows in one direction only. | In double circuit heart, blood flows in two directions. |
| Heart is two chambered. | Mostly Heart is four chambered. |
| Heart of **fishes** never receives oxygenated blood. | Heart of mammals receives oxygenated blood. |
| **Example: Fishes.** | **Example:** Birds (ii) Mammals. |

**23. Difference b/w pulmonary & systemic circulation.** ★★

| Pulmonary circulation: | Systemic circulation: |
|---|---|
| Pulmonary arch carrying deoxygenated blood from heart (right ventricle) to lungs. | Systemic arch send blood to different parts of body. |
| Blood returns to left atrium after oxygenation | Then blood return to right atrium. |
| **Pathway:** Heart ($deO_2$ blood) → Lungs ($O_2$ Blood) → Heart | **Pathway:** Heart ($O_2$ blood) → Body ($deO_2$ blood) → Heart |
| Carries blood to lungs. | Carries blood to body. |
| Helps to release $CO_2$ in lungs. | Helps to provide $O_2$ & nutrients in body. |

**24. Write organic nutrient in blood.** ★★★

➢ **Organic nutrient:** Organic nutrient in blood is followings.

(i) Glucose (ii) Fats (iii) Phospholipids

(iv) Amino acid (v) Lactic acid.

- **Lactic acid:** It is produced in muscle during glycolysis & transported to liver.
- **Cholesterol:** It involve in metabolism. (ii) It also serves as precursor of steroid hormone.

**25. What is RBCs & WBCs.**

| | RBCs | WBCs |
|---|---|---|
| **Colour:** | Their colour is red. | They are colourless. |
| **Amount:** | 4-4.5 million/$mm^3$ (female) **5-5.5** million/$mm^3$ (male) | 7000-8000 In blood $mm^3$ |
| **Function:** | Transport O2 & CO2. | Involve in immune system(kill pathogen) |
| **Age:** | **4 month**. | Depend upon body need. |

**26. What is monocytes & lymphocytes.**

| | Monocytes | Lymphocytes |
|---|---|---|
| **Size:** | 2 to 3 time larger than RBCs. | Slightly larger than RBCs. |
| **Function:** | Involve in phagocytosis. | **Lymphocyte** Produce antibodies. |
| **Percentage:** | 3% of total WBCs. | 32% of total WBCs. |
| **Life span:** | **Monocytes** stay from 10-12 hours in blood, then enter in tissue & become macrophages | **Lymphocytes** have life span of months or even year. |

**27. Difference between agranulocyte and granulocyte.** ★★

| Granulocytes | Agranulocytes |
|---|---|
| Granulocytes have granular cytoplasm. | Agranulocytes have clear cytoplasm. |
| They are formed in red bone marrow. | They are formed in lymphoid tissue. |
| Their life span is short. | Their life span is long. |
| **Types: Neutrophils** destroy small particles by phagocytosis<br>(ii) Eosinophils (kill parasites)<br>(iii) **Basophils** produce **heparin** (prevents **blood clotting**) & Histamine (Cause inflammation). | **Types:** Monocytes (engulf germs)<br>(ii) B & T lymphocytes (produce antibodies & kill the germs). |

**28. What is platelets. Write its function.** ★★★★

- **Platelets:** **Platelets** are not cells but fragment of **megakaryocytes**.
  - They have no pigment & nucleus.
  - **Function:** It converts fibrinogen into fibrin. It prevents bleeding by forming blood clot.

**29. What is leukemia & oedema.**

- **Leukemia:** Production of immature & abnormal **WBCs** called **leukemia**.
  - **Cause**: Cancerous mutation in bone marrow cells.
- ❖ **Cure:**
  - Change patient blood regularly.
  - Bone marrow transplant.
- **Oedema:** Excess fluid in tissue of body called **oedema**. Excess fluid may be inside or outside of cell.
  - **Intracellular oedema:** It is caused by osmosis of water in cell.
  - It causes depression of metabolic system (depression of Na pump).

**30. What is thalassaemia.** ★★★★

- **Thalassaemia:** **Thalassaemia** is also called **Cooley anaemia** due to B. Cooley an American physician.
- ❖ **Cause:**
  - It is genetic disease caused by spleenomegaly.
  - Haemoglobin has F-chain in place of beta-chain in **thalassaemia**.
- ❖ **Cure:**
  - Bone marrow transplant.
  - Change patient blood regularly.

**31. Write layers of heart.**

- **Layers:** Heart is composed of three layers.
  Epicardium, Myocardium and endocardium.

**32. Give location of bicuspid & tricuspid valve.** ★★★

- **Location of bicuspid valve:** **Bicuspid** valve is present b/w left atrium & right ventricle.
  - It has two flaps.
- **Location of tricuspid valve:** It is present b/w right atrium & right ventricle.
  - It has three flaps.

**33. What is systole & diastole.**

- **Diastole:** Relaxation of heart chamber called diastole. During diastole, deoxygenated blood enters into right atrium & oxygenated blood enters into left atrium.
  - It lasts about 0.4 seconds.
- **Atrial Systole:** Contraction of atria called atrial systole. When atria contract blood enter into ventricle via bicuspid & tricuspid valve.
  - It lasts about 0.1 seconds.
- **Ventricular systole:** Contraction of ventricle called ventricular systole. When ventricular contracts, cuspid valve closes and lubb sound produce. When ventricle relaxes semilunar valve close & dubb sound produced.
  - It lasts about 0.3 seconds.

**34. How heart sound produce.** ★★

- **Heart sound:** There are two sounds of heart. These sounds can be heard with stethoscope.
  - **Lubb:** When ventricles contract, bicuspid and tricuspid valve closed and lubb sound produce.
  - **Dubb:** When ventricle relaxes, both semilunar valves close & dubb sound produced.

**35. What is electrocardiogram.** ★★★★

➢ **Electrocardiogram:** Electric current generated by heart can be recorded by electrocardiogram by electrocardiograph machine. It record cardiac impulse passes through the heart.

- **Function:** ECG helps in diagnosis of abnormalities of **heart** chamber.

**36. What is artificial pace maker & blue babies.** ★★★★★★★

➢ **Artificial pace maker:** It is responsible for initiating impulse. If there is block in flow of impulse it causes death of individual. (ii) It is battery operating system produce stimulus.

- Pace maker works like **SA node**.
- **Function:** They send impulse to heart to allow both atria to contract.

➢ **Blue baby:** Failure of interatrial foramens to close that result in mixing of blood, That leads to cyanosis (blueness) of new born. Bloods of both atria mix. This mixed blood supply to body cause blueness of skin. That's why called blue baby.

**37. What are artery, capillary & veins.** ★★

| | Function | | Layers |
|---|---|---|---|
| **Artery** | **Arteries** carry blood away from heart. | All artery carry oxygenated blood except pulmonary artery | Their wall composed of three layers |
| **Capillary** | **Capillary** exchange material b/w blood & tissues. | They are formed by division of artery. | Their wall composed of single layer |
| **Vein** | **Veins** carry blood toward heart from body. | All vein carry deoxygenated blood except **pulmonary vein**. | Their wall composed of three layers. |

**38. What is atherosclerosis.** ★

➢ **Atherosclerosis:** It is coexisting of atheroma & arteriosclerosis.

- Atherosclerosis is degenerative arterial change associative with advance age.

❖ **Effects:**

- **Atherosclerosis** causes narrowing & hardening of arteries.
- It involve in thrombus formation.
- **Atherosclerosis** leads to heart attack.

**39. What is blood pressure. Write normal human blood pressure.** ★★

➢ **Blood pressure:** Measure of force with which blood pushes up against walls of blood vessels. / pressure of blood against/on walls of blood vessels.

❖ **Normal BP:**

- Systolic pressure of normal human is **120 mm Hg**.
- Diastolic pressure is **75-85** mm Hg. (iii) Normal BP is written as 120/80 mm Hg.

**40. What is hypertension & myocardial infarction.** ★★★★

➢ **Hypertension:** High blood pressure called **hypertension**.

- **Effects:** Prolonged hypertension damages blood vessels & weakens heart muscle that lead to congestive heart failure.

➢ **Myocardial infarction:** It is formed from two words myocardium (heart muscles) & infarction (tissue death).

- Myocardial infarction is commonly called **heart attack**.

❖ **Cause:**

- Blockage of blood vessel by embolus
- Myocardial infarction damage of **heart muscle**.

❖ **Preventive measure:** Avoid eating too much fatty food. (ii) Avoid smoking.
(iii) Control BP. (iv) Maintains normal body weight.

**41. What is thrombus and embolus. How it is formed.** ★★★

➢ **Thrombus:** Blood clot in blood vessels called thrombus.
- **Effect:** It blocks blood vessels.
- **Cause:** Infection in blood vessels. (ii) Reduce rate of blood flow.
(iii) Pneumonia (iv) TB.

➢ **Embolus:** Thrombus may be dislodged and carried to some other location in circulatory system. In this case thrombus called embolus.

**42. What is stroke & haemorrhage.** ★★★

➢ **Stroke:** If flow of blood in blood vessel of brain is blocked by embolus causes death of neural tissue called stroke.
- Symptoms vary, depending on damaged part of brain.
- **Stroke** is also called cerebral infarction.

➢ **Haemorrhage:** Discharge of blood from blood vessels called **haemorrhage.**
- **Example:** Brain haemorrhage, artery of brain burst due to loss of elasticity & hardness. High blood pressure burst such type of artery.

**Preventive measure:** Avoid smoking (ii) Avoid eating too much cholesterol (iii) stress (iv) Over weight & tension. (v) Do exercise (vi) Maintain normal blood pressure.

**43. Define lymph nodes. Write its function.**

➢ **Lymph nodes:** Mass of tissue that contain lymphocytes where lymph is filtered.
- **Location:** Neck, groin and axilla.
- **Function:** It filters the lymph.

**44. Write function of lymphatic system and blood.**

➢ **Lymphatic system:**
- Lymphatic system defends body against pathogens.
- Lymphatic system filters blood ie spleen.

➢ **Blood:**
- Blood transport materials (O2, CO2, nutrients and salts).
- Blood (lymphocyte) provide immunity to body.
- Blood (platelets) involve in blood clotting.

**45. Define immunity.** ★★

➢ **Immunity:** The capacity to recognize any foreign object &mobilize cell & cell products to remove that foreign object with greater speed called immunity.

➢ **Types:** Active immunity & passive immunity.

**46. Difference b/w antigen & antibody.**

| Antigen: | Antibody: |
|---|---|
| Foreign substance made of protein. | Antibodies are specific **Glycoprotein** made by **B-lymphocytes**. |
| **Function:** Antigen stimulates production of **antibodies**. | **Function:** Antibodies destroy the antigens. |
| Antigen has epitope (where antibody attaches). | Antibody has paratope (attach to epitope). |
| Cause disease/allergic reaction. | Protects body agains pathogens. |
| **Example:** Exogenous & endogenous. | **Example:** IG-A, IG-G & IG-D etc. |

**47. What is bursa of fabricius.** ★★

- **Bursa of fabricius:** Bursa of fabricius is lymphoid structure present in cloaca of young birds.
  - **Function:** They form B-lymphocyte that involve in immunity.

**48. Difference b/w cell mediated & humoral immune response.** ★★★★

| Cell mediated response: | Humoral immune response: |
|---|---|
| T cell recognizes antigen, they attack on foreign cell/substance called cell mediated response. | B cells recognize antigen & form antibodies that attack on pathogens & speed up phagocytosis. |
| It also involve in tissue rejection. | It neutralizes the effect of toxins by producing antitoxins. This is called humoral immune response. |
| Acts on intracellular microbes. | Acts on extracellular microbes. |
| Mediated by T-cells. | Mediated by B-cells. |
| T-cells secrete cytokines. | B-cells secrete antibodies. |

**49. Difference b/w active & passive immunity.** ★★★★★

| Active immunity: | Passive immunity: |
|---|---|
| It stimulates production of antibodies & make person immune by using vaccine or antigens called active immunity. | Antibodies are injected in the form of antisera in body to make a person immune against disease called passive immunity. |
| Does not generate rapid response. | It generates rapid response. |
| May last for long time. | May not last for long time. |
| **Example:** Tetanus vaccine. | **Example:** Anti-tetanus serum |

**50. What is antiserum.**

- **Antiserum:** Serum containing **antibodies** called **antiserum.**
  - **Function:** Passive immunity develop by injecting **antiserum.**
  - Antiserum = antibodies + serum

## MULTIPLE CHOICE QUESTIONS
## (SELECTED FROM PAST PAPERS)

**1)** A rye plant less than one meter tall 14 million branch roots of combined length over = **600 km**
**2)** Prosopis tree of leguminous family have max depth of root = **50m**
**3)** Active transport is selective & dependent on = **Respiration**
**4)** Casparian strip present in root part = **Endodermis**
**5)** Water potential of pure water is = **Zero**
**6)** Attraction of water molecule called = **Cohesion**
**7)** Opening & closing of stomata is regulated by = **Potassium ion**
**8)** Rate of transpiration double after every rise in temperature = **$10^0$C**
**9)** At high temperature, mesophyll cells release which hormone = **Abscisic acid**
**10)** Velocity of sugar movement in phloem is = **1 meter/sec**
**11)** In hydra, Indigestible & partly digest food is removed through = **Exocytosis**
**12)** In hydra, ectodermal cell get food from endodermal cells by = **Diffusion**
**13)** In earthworm, how many pair of lateral heart = **4 or 5**
**14)** In earth worm, how many chamber of heart is = **13**
**15)** In cockroach, each heart chamber has pair of lateral openings = **Ostia**

**16)** In which animal, blood is not involved in transport of gases = **Cock roach**
**17)** Heart of amphibians how many chamber = **Three**
**18)** In birds, how many chamber of heart is = **4**
**19)** Weight of blood in our body is about = **1/12 of body weight**
**20)** Volume of plasma in blood is = **55%**
**21)** Most abundant salt in blood is = **NaCl**
**22)** Most abundant compound in blood is = **Water**
**23)** Normal PH of human blood is = **7.4**
**24)** %age of protein in blood plasma = **7-9%**
**25)** In embryonic life, RBCs formed in = **Liver & spleen**
**26)** 60% of WBCs is = **Neutrophils**
**27)** Provides immunity to blood = **Leukocytes**
**28)** Cardiac muscle differ from other muscle due to presence of = **Intercalated disc**
**29)** Heart is enclosed in a double membrane = **Pericardium**
**30)** Which is not a layer of heart wall = **Pericardium**
**31)** Which vessel supply blood to heart = **Coronary artery**
**32)** Which vessel receive blood from each kidney = **Renal vein**
**33)** Which vessel receive blood from liver = **Hepatic portal vein**
**34)** Duration of complete heart beat is = **0.8 seconds**
**35)** Valves present in veins = **Semilunar**
**36)** Interstitial fluid contain = **WBCs**
**37)** Which is not a lymphoid mass = **Liver**
**38)** Blood pressure is highest in = **Aorta**
**39)** Plasma cells are produced by = **Lymphocytes**
**40)** $CO_2$ enters in leaf through = **Stomata**

**41)** Closed blood circulatory system 1st formed in = **Annelida**
**42)** ___ example of agranulocyte = **Monocyte/Lymphocytes**
**43)** Open circulatory system present in = **Periplaneta**
**44)** Left systemic arch disappear in = **Birds**
**45)** Root hairs are extension of = **Epidermis**
**46)** Temperate that close stomata = **40-45$^0$C**
**47)** Mammalian red blood cells are = **Biconcave**
**48)** Apoplast pathway become discontinuous in endodermis due to = **Casparian strip**
**49)** Lenticels are aerating pores formed in = **Bark**
**50)** RBCs has ___%age of hemoglobin in cytoplasm = **95**
**51)** ___ 3rd mechanism to defend body against pathogens = **Immune system**
**52)** Pathway involving system of adjacent cell wall throughout plant root called = **Apoplas**t
**53)** Plasmodesmata found in = **Symplast**
**54)** ____ constitute 90% of plasma = **Water**
**55)** ____ is function of immunoglobins = **Kill pathogens**
**56)** Starch sugar hypothesis proposed by = **Munch**
**57)** ___ has oxygenated blood in fishes = **Dorsal aorta**
**58)** Wall of left ventricle is ___ time thicker than right ventricle = **3**
**59)** Lymphocyte formed in lymph node is part of = **Immune**

**60)** Weight of blood in 60kg person = **5 kg**
**61)** Right atrium receive delxygentaed blood from body except = **Lungs**
**62)** ___ transport sugar in plant = **Sieve elements**
**63)** During day, solute concentration increase in guard cell and water potential ____ = **Decrease**
**64)** What happens when guard cell turgid = **Stoma open**
**65)** Renal vein brings impure blood from = **Kidney**
**66)** ____ conversion starts blood clotting process = **Fibrinogen to fibrin**
**67)** ____ not a part of immune system = **Antigen**
**68)** Honey dew has ____%age of nitrogenous compound = **1**
**69)** Which light enhance the uptake of potassium in guard cells = **Blue**
**70)** Immunoglobulins present in plasma play role in = **Defend against disease**
**71)** The lymph vessels empty in = **Veins**
**72)** Only photosynthesizing cells in epidermis of leaf are = **Guard cells**
**73)** Passive immunity is developed by injecting = **Anti serum**
**74)** Which is absent in heart of a amphibians = **Bulbous arteriousis**
**75)** Lymph closely resemble with = **Plasma**
**76)** A plant requires nitrogen and sulphur for its = **Enzyme**
**77)** A rye plant less than 1m tall has branch roots about = **14 million**
**78)** Water reach the xylem tissue through the pathway = **All (apoplast, symplast & vacuolar**)
**79)** When a cell is placed in hypertonic solution it loses water due to = **Osmosis**
**80)** Upward movement of water and mineral through xylem is = **A cent of SAP**
**81)** Which one contains companion cells of = **Phloem**
**82)** In earthworm the lateral hearts are present between the segments = **7 to 13**
**83)** In Cockroach the blood flows in all these except = **Capillaries**
**84)** Only left aortic Arch is present in = **Mammals**
**85)** Mature mammalian red blood cells don't have = **Nucleus**
**86)** Haem portion of hemoglobin contains an atom = **Iron**
**87)** Which Chemicals are secreted by T helper cells to stimulate be plasma cells to divide = **Interferon**
**88)** B-lymphocyte and T Lymphocytes are formed in = **Before birth in thymus gland**
**89)** T-lymphocyte become mature and complete under the influence of = **Thymus gland**
**90)** Skin and mucus membrane are part of body defence system and the form = **Physical barriers**
**91)** Antibodies provide to infant through mother's milk is an example of = **Artificial passive Immunity**
**92)** which of the following is described as vaccination = **Artificial active immunity**
**93)** Snake bite is treated with which type of immunization = **Passive**

## EXERCISE MCQs

1. Which of the following is not true of Guard cells = **They are connected with plasmodesmatawith other cells**
2. The casparian strips are present in= **Endodermis cells of roots**
3. Lymph most closely resemble with = plasma hydatgode associated with= **Guttation**
4. According to pressure flow theory which of the following serve as sink = **Roots**
5. Which of the following is true about mammals= **They have left aortic Arc only**
6. The process that most likely enables a root hair cell to absorb minerals active transport and enables are muscle cell to contract is= **Respiration**

7. Which of the following process cause substance to move across membrane without expenditure of cellular energy = **Diffusion**
8. Cardiac muscles can be distinguish from other muscles fibre because cardik muscles = **Has intercalated disc**

## LONG QUESTIONS
## (SELECTED FROM PAST PAPERS)

1. **Explain pathway taken by water to reach xylem tissue.**
2. **Explain cohesion tension theory & root pressure.** ★★★
3. **Discuss different types of transpiration.** ★★★★★
4. **Discuss opening & closing of stomata by both hypothesis.** ★★★★★
5. **Discuss factors that effects transpiration.** ★★★★
6. **Transpiration is necessary evil, Explain.** ★★★★
7. **Explain pressure flow theory.** ★★★
8. **Explain transportation in hydra.** ★★
9. **Compare closed & open circulatory system.**
10. **Write a note on blood.** ★★★★★
11. **Write function of blood.** ★★★★★★★
12. **Write a note on leukemia, thalassaemia & oedema.**
13. **Explain structure & function of heart. Also sketch heart.** ★★★★★
14. **Explain cardiac cycle.** ★★
15. **How artery differs from veins, explain it.** ★★
16. **Write a note on blood pressure & rate of flow of blood.**
17. **Explain lymphatic system & also writes its function.** ★★★
18. **Discuss types of immunity.** ★★★★

# 11th Class Biology pairing scheme (2024)

## Objective part

## Q1. MCQs

| | |
|---|---|
| 2 MCQs from each Chapter | Chapters # 10, 11 & 14 |
| 1 MCQs from each Chapter | Chapters # 1, 2, 3, 4, 5, 6, 7, 8, 9, 12 & 13 |

## Subjective part

## Q2. Short Questions

| Chapters | Questions | Chapters | Questions | Chapters | Questions |
|---|---|---|---|---|---|
| 2 | 1 | 8 | 2 | 11 | 2 |
| 3 | 3 | 10 | 4 | | |

## Q3. Short Questions

| Chapters | Questions | Chapters | Questions | Chapters | Questions |
|---|---|---|---|---|---|
| 1 | 2 | 7 | 4 | 14 | 2 |
| 4 | 2 | 13 | 2 | | |

## Q4. Short Questions

| Chapters | Questions | Chapters | Questions |
|---|---|---|---|
| 5 | 1 | 12 | 3 |
| 6 | 1 | 9 | 4 |

## Long Questions

**Q5# Chapters 1 & 13**

**Q6# Chapters 2 & 8**

**Q7# Chapters 4 & 12**

**Q8# Chapters 5 & 14**

**Q9# Chapters 6 & 11**

# Student study plan for FSc Biology I (2024)

## ➢ For 31 marks.

MCQs (All Chapters) = **17 Marks**

Chapter 1 (2 Short Q + 1 long Q) = **8 marks**

Chapter 3 (3 short Q) = **6 marks**

## ➢ For 39 marks.

MCQs (All Chapters) = **17 Marks**

Chapter 1 (8 marks) + 3 (6 marks) = **14 marks**

Chapter 7 (4 short Q) = **8 marks**.

## ➢ For 47 marks.

MCQs (All Chapters) = **17 Marks**

Ch 1 (8) + 3 (6) + 7 (8) = **22 marks**

Chapter 8 (2 short Q + 1 long Q) = **8 marks**.

## ➢ For 55 marks.

MCQs (All Chapters) = **17 Marks**

Ch 1 (8) + 3 (6) + 7 (8) + 8 (8) = **30 marks**

Chapter 13 (2 short Q + 1 L.Q) = **8 marks**.

## ➢ For 61 marks.

MCQs (All Chapters) = **17 Marks**

Ch 1 (8) + 3 (6) + 7 (8) + 8 (8) + 13 (8) = **38 marks**

Chapter 2 (1 short Q + 1 Long Q) = **6 marks**.

## ➢ For 67 marks.

MCQs (All Chapters) = **17 Marks**

Ch 1 (8) + 3 (6) + 7 (8) + 8 (8) + 13 (8) + 2 (6) = **44 marks**

Chapter 6 (1 short Q + 1 Long Q) = **6 marks**.

## ➢ For 75 marks.

MCQs (All Chapters) = **17 Marks**

Ch 1 (8) + 3 (6) + 7 (8) + 8 (8) + 13 (8) + 2 (6) + 6 (6) = **50 marks**

Chapter 9 (4 short Q) = **8 marks**.

## ➢ For 83 marks.

- MCQs (All Chapters) = **17 Marks**
- Ch 1 (8) + 3 (6) + 7 (8) + 8 (8) + 13 (8) + 2 (6) + 6 (6) + 9 (8) = **58 marks**
- Chapter 11 (2 short Q + 1 Long Q) = **8 marks**.

## ➢ For 85 marks.

- MCQs (All Chapters) = **17 Marks**
- Ch 1 (8) + 3 (6) + 7 (8) + 8 (8) + 13 (8) + 2 (6) + 6 (6) + 9 (8) = **58 marks**
- Chapter 5 (1 short Q) = **2 marks**.

# Student study plan for FSc Biology I (2024)

## ➢ For 31 marks.

MCQs (All Chapters) = **17 Marks**

Chapter 1 (2 Short Q + 1 long Q) = **8 marks**

Chapter 3 (3 short Q) = **6 marks**

## ➢ For 39 marks.

MCQs (All Chapters) = **17 Marks**

Chapter 1 (8 marks) + 3 (6 marks) = **14 marks**

Chapter 7 (4 short Q) = **8 marks**.

## ➢ For 47 marks.

MCQs (All Chapters) = **17 Marks**

Ch 1 (8) + 3 (6) + 7 (8) = **22 marks**

Chapter 8 (2 short Q + 1 long Q) = **8 marks**.

## ➢ For 55 marks.

MCQs (All Chapters) = **17 Marks**

Ch 1 (8) + 3 (6) + 7 (8) + 8 (8) = **30 marks**

Chapter 13 (2 short Q + 1 L.Q) = **8 marks**.

## ➢ For 61 marks.

MCQs (All Chapters) = **17 Marks**

Ch 1 (8) + 3 (6) + 7 (8) + 8 (8) + 13 (8) = **38 marks**

Chapter 2 (1 short Q + 1 Long Q) = **6 marks**.

## ➢ For 71 marks.

MCQs (All Chapters) = **17 Marks**

Ch 1 (8) + 3 (6) + 7 (8) + 8 (8) + 13 (8) + 2 (6) = **44 marks**

Chapter 12 (3 short Q + 1 Long Q) = **10 marks**.

## ➢ For 77 marks.

MCQs (All Chapters) = **17 Marks**

Ch 1 (8) + 3 (6) + 7 (8) + 8 (8) + 13 (8) + 2 (6) + 12 (10) = **54 marks**

Chapter 9 (4 short Q) = **6 marks**.

## ➢ For 81 marks.

- MCQs (All Chapters) = **17 Marks**
- Ch 1 (8) + 3 (6) + 7 (8) + 8 (8) + 13 (8) + 2 (6) + 12 (10) + 9 (6) = **60 marks**
- Chapter 4 (1 Long Q) = **4 marks**.

## ➢ For 85 marks.

- MCQs (All Chapters) = **17 Marks**
- Ch 1 (8) + 3 (6) + 7 (8) + 8 (8) + 13 (8) + 2 (6) + 12 (10) + 9 (8) + 4 (4) = **64 marks**

- Chapter 11 (2 short Q) = **4 marks**.