

One mark questions

1) In which kingdom holozoic mode of nutrition is seen?

Ans: Animalia

2) Name a fungus from which an antibiotic is extracted.

Ans: Penicillium

3) Name a unicellular fungus

Ans: Yeast

4) What are bacteriophages?

Ans: Viruses that infect the bacteria

5) The plant disease wheat rust is caused by the fungus named_____

Ans: Puccinia

6) Kingdom of unicellular eukaryote: Protista; Kingdom of unicellular prokaryote: _____

Ans: Monera

7) Name a fungus used to make bread and beer

Ans: Yeast

8) Infectious part of virus is _____

Ans: Genetic material.

Two mark questions

9) List some diseases in humans caused by viruses

Ans: Mumps, small pox, herpes, influenza, AIDS

10) Comment on the asexual reproduction in fungi.

Ans: Asexual reproduction is by spores called conidia or sporangiospores or zoospores.

11) The nature of cell wall of some kingdoms are given below. Assign them to their respective kingdoms (Cell wall with chitin, Cell wall with cellulose, Non cellulosic cell wall with polysaccharide and amino acids, Cell wall absent)

Ans:

Kingdom	Nature of cell wall
Monera	Noncellulosic cell wall with Polysaccharide and amino acid
Fungi	Cell wall with chitin
Plantae	Cell wall with cellulose
Animalia	Cell wall absent

12) What are hyphae? Define coenocytic hyphae.

Ans: The body of the fungus consists of long, slender thread-like structures called as hyphae.

Some hyphae are continuous tubes filled with multinucleated cytoplasm. These are called coenocytic hyphae

13) What are Saprophytes?

Ans: Some organisms like fungi get nutrients by absorbing soluble organic matter from dead substrates.

These organisms are called as saprophytes

14) Mention two symbiotic associations of fungus

- Fungus live in association with algae as Lichens
- Fungus live in association with roots of higher plants as Mycorrhiza

15) Point out the merits of five kingdom classification

- All unicellular prokaryotic organisms were grouped together under Kingdom Monera and unicellular eukaryotic organisms were placed in Kingdom Protista.
- Fungi were placed in a separate kingdom

16) Name a plant disease caused by Virus. List some viral disease symptoms seen in plants.

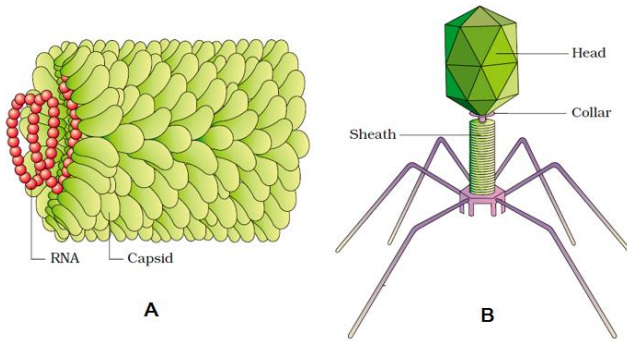
Ans: Mosaic disease of tobacco

-Mosaic formation, leaf rolling and curling, yellowing and vein clearing, dwarfing and stunted growth.

17) Mention two demerits of five kingdom classification

- Unicellular organisms and the multicellular ones are grouped together, for example, *Chlamydomonas* and *Spirogyra* were placed together
- Viruses did not find a place in this classification

18) Identify A & B in the diagram given below



Ans: A- Tobacco mosaic virus B - Bacteriophage

19) What is a capsid? Name its subunits .Mention its function

Ans: The protein coat of the virus is called as capsid. It is made of small subunits called capsomeres. It protects the nucleic acid of the virus.

20) Mention the vegetative reproduction in fungi

Ans: Reproduction in fungi can take place by vegetative means – fragmentation, fission and budding.

21) Assign the name of the scientist given below to their respective works.

(M.W. Beijerinck, Pasteur, Dmitri Ivanowsky, W.M. Stanley)

A	Coined the name virus that means venom - _____
B	Crystallised viruses - _____
C	Named the infectious living fluid from tobacco as <i>Contagium vivum fluidum</i> - _____
D	Recognised certain microbes as causal organism of the mosaic disease of tobacco- _____

Ans: A- Pasteur, B- W.M. Stanley, C- M.W. Beijerinck, D- Dmitri Ivanowsky

Three mark questions

22) All organisms are classified into five kingdoms under five kingdom classification.

a) Who proposed a Five Kingdom Classification?

R.H. Whittaker

b) Mention the five kingdoms

Monera, Protista, Fungi, Plantae and Animalia.

c) What are the main criteria for classification?

Cell structure, Body organisation, Mode of nutrition, Reproduction and Phylogenetic relationships

23) Reproduction in fungi take place by both asexual and sexual methods.

a) Name three sexual spores seen in fungus

Oospores, Ascospores and Basidiospores.

b) Explain the stages of sexual cycle

The sexual cycle involves the following three steps: (i) Fusion of protoplasts between two motile or non-motile gametes called plasmogamy. (ii) Fusion of two nuclei called karyogamy. (iii) Meiosis in zygote resulting in haploid spores.

24) Explain how a dikaryophase is formed within some fungus.

Ans: When a fungus reproduces sexually, two haploid hyphae of compatible mating types come and fuse. In some fungi the fusion of two haploid cells immediately results in diploid cells (2n). But in some fungi the two haploid does not fuse and leading to a condition called a dikaryon and this phase is called dikaryophase.

25) Why viruses did not find a place in classification?

Ans: Since they are not considered truly ‘living’, because

- They possess a non-cellular organization. They are inactive outside the body of a host. They can be crystallized and precipitated. But,
- They possess genetic material. They can grow and multiply when inside the host. They are obligate parasites and attack specific hosts.

Each question from 1 to 7 carries 1 score.

- 1) What are kelps?
- 2) In which class of algae flagella are absent?
- 3) Asexual motile spores of algae are called as _____.
- 4) Point out a notable importance of the unicellular algae Chlorella.
- 5) Name any two filamentous algae.
- 6) Bryophytes are called amphibians of the plant kingdom. Why?
- 7) Laminarin and Mannitol are the stored food found in an algal class known as _____.

Each question from 8 to 19 carries 2 scores.

- 8) Comment on the nature of flagella in chlorophyceae.
- 9) Comment on the vegetative reproduction in Algae.
- 10) What are rhizoids?
- 11) Name two algae from which Agar is commercially produced.
- 12) The plant body of bryophyte is a gametophyte. What does the term “gametophyte” means?
- 13) What is the role of algae in an aquatic environment?
- 14) Point out two economic importance of Mosses.
- 15) Which are the two divisions of Bryophytes.
- 16) Name the two algae which reproduce by oogamous type of sexual reproduction.
- 17) Comment on the nature of flagella in Phaeophyceae.
- 18) Name a unicellular and a colonial form of algae.
- 19) Name two hydrocolloids (water holding substances) produced commercially from algae.

Each question from 20 to 25 carries 3 scores.

- 20) Mention the three types of sexual reproduction seen in algae.
- 21) Name the three main classes of Algae based on the pigments present on it.
- 22) Fill in the blanks in the table with the correct options given below.

(Starch, Rhodophyceae, Phaeophyceae, Green algae, Floridean starch, Mannitol)

Classes	Common name	Stored Food
Chlorophyceae	<u>A</u>	<u>B</u>
<u>C</u>	Brown algae	<u>D</u>
<u>E</u>	Red algae	<u>F</u>

- 23) Bryophytes are of great ecological importance. Give reasons.
- 24) Nature of cell wall of three algal classes are given below. Assign them to their respective classes.
 a) Cellulose, pectin and poly sulphate esters, b) Cellulose, c) Cellulose and algin,

Class	Composition of cell wall
Chlorophyceae	
Pheophyceae	
Rhodophyceae	

- 25) Fill in the blanks with the correct options given below.
 (Gametophyte, Archegonium, Sporophyte, Antherozoids, Antheridium, Egg)

In Bryophytes, the male sex organ is called A. They produce biflagellate B.
 The female sex organ is called C it is flask-shaped and produces a single D.
 An antherozoid fuses with the egg to produce the zygote. It develops into a E which undergo reduction division (meiosis) to produce haploid spores. These spores germinate to produce F.

ANSWERS

Each question from 1 to 7 carries 1 score.

- 1) Kelps are massive marine algal plant bodies.
- 2) Rhodophyceae.
- 3) Zoospores.
- 4) Chlorella is a unicellular alga rich in proteins is used as food supplement even by space travellers.
- 5) Ulothrix , Spirogyra.
- 6) Because Bryophytes can live in soil but are dependent on water for sexual reproduction.
- 7) Phaeophyceae.

Each question from 8 to 19 carries 2 scores.

- 8) Flagella are 2-8, equal and apical.
- 9) Vegetative reproduction is by fragmentation. Each fragment develops into a thallus.
- 10) The plant body of bryophytes is attached to the substratum by unicellular or multicellular root like structures called rhizoids.
- 11) Gelidium and Gracilaria
- 12) The main plant body of bryophyte is haploid and it produces gametes, hence is called as a gametophyte.
- 13) -A half of the total carbon dioxide fixation on earth is carried out by algae through photosynthesis.
-They Increase the level of dissolved oxygen in their immediate environment.
-They are primary producers of aquatic animals.
- 14) -Mosses provide food for herbaceous mammals, birds and other animals.
-*Sphagnum* provide peat which is used as fuel, and also as packing material.
- 15) The bryophytes are divided into two - Liverworts and Mosses.
- 16) Volvox, Fucus.
- 17) Flagella are two, unequal and lateral.
- 18) Unicellular algae - Chlamydomonas, Colonial algae - Volvox
- 19) Algin (from brown algae) , Carrageen (from red algae) ,Agar

Each question from 20 to 25 carries 3 scores

- 20) 1) Isogamous - Fusion of two gametes similar in size.
E.g. These gametes can be flagellated (as in Ulothrix) or non-flagellated (as in Spirogyra).
- 2) Anisogamous - Fusion of two gametes dissimilar in size. E.g. Eudorina.
- 3) Oogamous - Fusion between one large, non-motile female gamete and a smaller, motile male gamete. e.g., Volvox, Fucus.
- 21) Chlorophyceae – Chlorophyll a,b
Phaeophyceae - Chlorophyll a,c , Fucoxanthin
Rhodophyceae - Chlorophyll a,d , Phycoerythrin
- 22) A- Green algae, B- Starch, C-Pheophyceae , D-Mannitol, E-Rhodophyceae, F-Floridean starch
- 23) Bryophytes play an important role in plant succession on bare rocks or soil.
-Mosses along with lichens are the first organisms to colonise rocks and they decompose rocks making the substrate suitable for the growth of higher plants.
-Mosses form dense mats on the soil, they reduce the impact of falling rain and prevent soil erosion.
- 24)

Class	Composition of cell wall
Chlorophyceae	Cellulose
Pheophyceae	Cellulose and Algin
Rhodophyceae	Cellulose, Pectin and Polysulphate esters

- 25) A-Antheridium, B-Antherozoids, C-Archegonium, D-Egg, E-Sporophyte, F-Gametophyte

Each question from 1 to 10 carries 1 score.

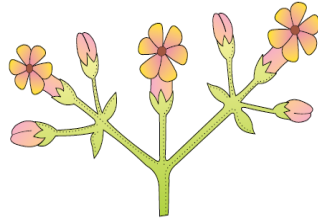
- 1) What are adventitious roots? Give one example.
- 2) Flowers without bracts are called _____.
- 3) Differentiate between the terms gamosepalous and polysepalous.
- 4) The swollen end of the pedicel on which the floral whorls are arranged is termed _____.
- 5) Which part of the stem is modified as tendrils in cucurbits?
- 6) What is pulvinus ? Where is it seen?
- 7) A sterile stamen is termed as _____.
- 8) Define the term aestivation.
- 9) The stem develops from the _____ of the embryo of a germinating seed.
- 10) What type of modification is seen in the stem of *Opuntia*?

Each question from 11 to 20 carries 2 scores.

- 11) Ginger is an example for an underground stem modification. State two functions of this modification.
- 12) Differentiate between tap root system & fibrous root system. In which type of plants they are seen?
- 13) Thorns are found in plants such as *Citrus* & *Bougainvillea*.
 - a) Which part of the stem gets modified as thorn? b) What is its function?
- 14) In some plants roots modified to perform functions other than absorption and conduction of water. Mention any two root modifications meant for support.
- 15) Differentiate between an actinomorphic & zygomorphic flower with example.
- 16) Given below is a type of aestivation seen in pea flowers. a) Identify the aestivation. b) Describe the arrangements of petals seen in this aestivation.



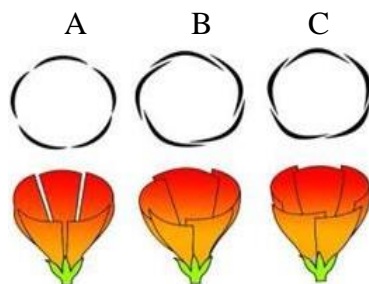
- 17) What are pneumatophore? Mention a plant in which pneumatophore is seen.
- 18) The arrangement of flowers on the floral axis is termed as inflorescence.
 - a) Mention the two types of Inflorescence. b) Identify the type of inflorescence given below.



- 19) Differentiate between apocarpus & syncarpous gynoecium.

Each question from 20 to 25 carries 3 scores.

- 20) Given below diagram A, B, & C shows three types of aestivation seen in flowers. Identify & Comment upon each.



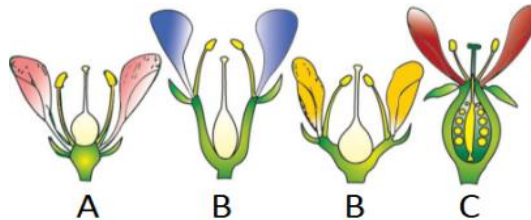
21) Some floral characters are listed below.

Arrange them to their respective families in the table given below

- Flower: bisexual, zygomorphic.
- Perianth: tepals six (3+3).
- Androecium: ten, diadelphous.
- Corolla: petals five, polypetalous, papilionaceous.
- Androecium: stamens six, 3+3, epiphyllous.
- Flower: bisexual; actinomorphic.

Fabaceae	Liliaceae
•	•
•	•
•	•

22) Given below diagrams represents different types of flowers based on the position of calyx, corolla and androecium in respect of the ovary. Identify A, B & C and comment upon each.

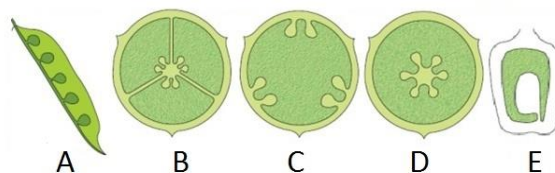


23) Match the following.

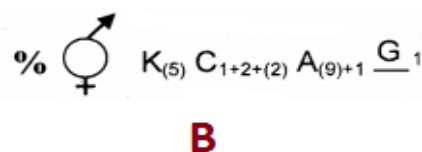
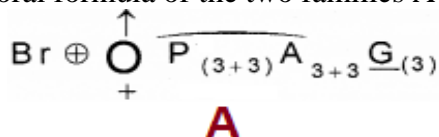
Column A	Column B
1) Epipetalous stamen	a) stamens are free.
2) Monadelphous	b) stamens attached to the perianth. E.g. Liliaceae.
3) Diadelphous	c) stamens united into more than two bundles. E.g. Citrus.
4) Polyandrous	d) stamens are attached to the petals.
5) Polyadelphous	e) stamens united into two bundles. E.g. Pea.
6) Epiphyllous stamen	f) stamens united into one bundle. Eg. Hibiscus.

24) a) Define placentation.

b) Identify the types of placentation in the diagrams A, B, C, D & E given below.



25) Floral formula of the two families A & B are given below.

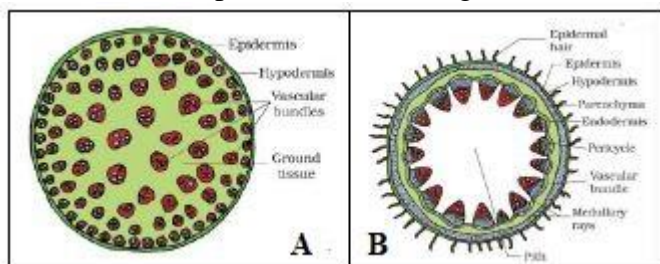


a) Identify the family.

b) Describe the features of androecium and gynoecium of the flowers belonging to above families.

Each question from 1 to 10 carries 1 score.

- 1) What are trichomes?
- 2) Name the xylary element which is absent in Gymnosperms.
- 3) State the functions of stomata.
- 4) Identify the anatomical specimens A and B given below.



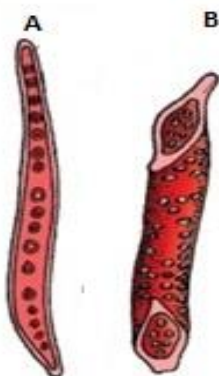
- 5) Which meristem helps in the regeneration of plant parts in grasses?
- 6) Mention the commercial significance of phloem fibres (bast fibres).
- 7) What are root hairs? What is its function?
- 8) What are complex tissues?
- 9) Which cells helps in the radial conduction of water within xylem?

10) Fill in the blank.

Tissue system	A. Epidermal tissue system
	B. Ground tissue system
	C. _____

Each question from 11 to 20 carries 2 scores.

- 11) Inner to the endodermis lies a few layers of thick-walled parenchymatous cells referred to as pericycle.
 - a) How it is arranged in a dicot stem
 - b) What is its function in dicot root?
- 12) Differentiate between endarch and exarch xylem.
- 13) What are casparian strips? Where is it seen?
- 14) Explain the structure and arrangement of mesophyll tissue in a dicot leaf.
- 15) Xylem is considered as a complex tissue. List its components. Write two functions of xylem.
- 16) State the function of lateral meristems. Mention three types of lateral meristems.
- 17) Identify and differentiate the xylem elements A and B given below.



- 18) What are conjunctive tissues?
- 19) T.S of a Dicot stem shows different layers of cells and are listed below. Arrange these layers in a sequential order starting from the outer epidermis to the innermost pith .

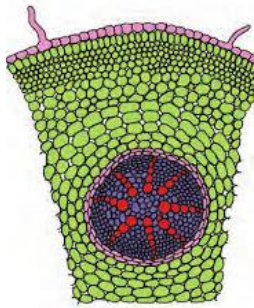
(Pericycle, Cortex, Endodermis, Hypodermis)

1- Epidermis	2- _____	3- _____	4 - _____	5 - _____	6 - Pith
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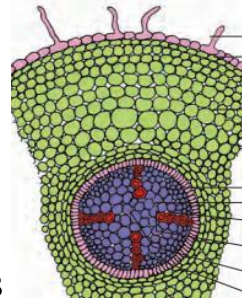
- 20) What are meristems? Mention its types.

Each question from 21 to 25 carries 3 scores.

21) Identify the specimen A and B given below. Differentiate between the vascular bundles in A and B.



A



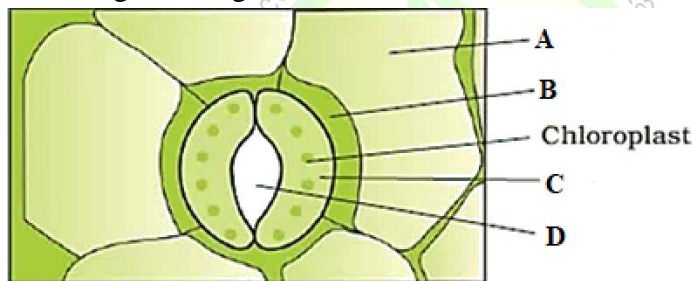
B

22) Some anatomical features of stem is listed below. Assign them in respective columns.

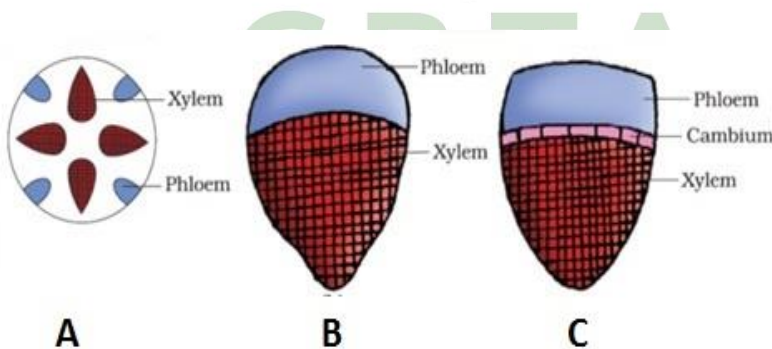
- Vascular bundles are arranged in a ring.
- Sclerenchymatous bundle sheath.
- Vascular bundles are conjoint and closed.
- Semi-lunar patches of sclerenchyma.
- Vascular bundle is conjoint, open,
- Large number of scattered vascular bundles

Dicot stem	Monocot stem

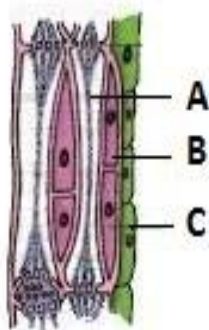
23) Identify A, B, & C in the given diagram. State the function of C.



24) Three different types of vascular bundles A, B, & C are given below. Identify and comment upon each.



25) Diagram of phloem is given below. Label A, B, & C. Comment on the function of B?

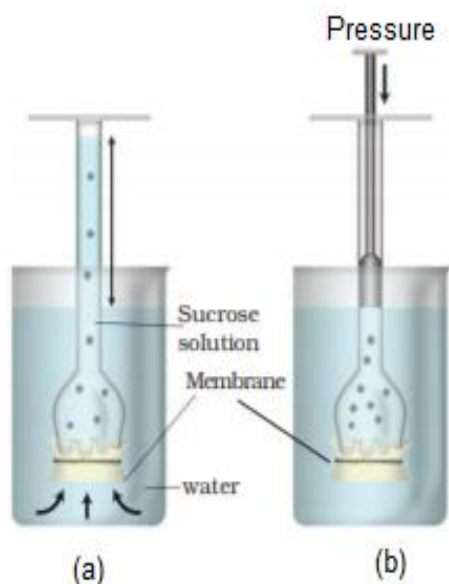


Each question from 1 to 10 carries 1 score.

- 1) Fill in the blanks from the given options (Hypertonic, Hypotonic, Isotonic)
Cells swell when placed in _____ solutions and shrink in _____ solutions.
- 2) The water potential of pure water at standard temperatures and which is not under any pressure, is _____.
- 3) What are Casparian stripes?
- 4) State the equation of water potential. Define pressure potential.
- 5) Mention the process of absorption of water by dry seeds which helps in seed germination.
- 6) Gaseous movement within the plant body takes place by _____.
- 7) What are porins?
- 8) Define transpiration.
- 9) State how the cellulose micro fibrils of guard cells helps to perform the function of stomata.
- 10) Define Imbibition.

Each question from 11 to 20 carries 2 scores.

- 11) Define osmosis
- 12) What is the relationship between osmotic pressure and osmotic potential?
- 13) What is turgor pressure?
- 14) In the picture given below Fig. (a) demonstrates the process of Osmosis . What happens when an external pressure is applied from the upper part of the funnel as in Fig (b). What is that pressure termed as?

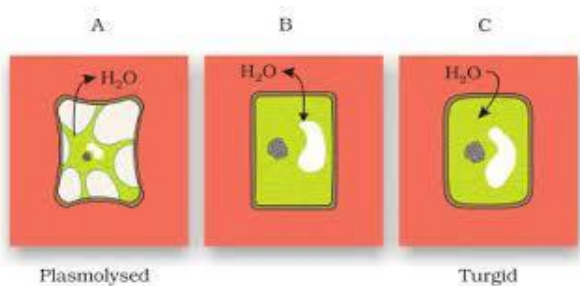


- 15) What is mycorrhiza? How is it helpful to the plants?
- 16) The absorption of water by dry wood is a classical example for Imbibition.
What are the factors essential for Imbibition?
- 17) How is turgor pressure developed within the cell? What is its significance?
- 18) State why solutions have a lower water potential than pure water.
- 19) What causes the opening and closing of guard cells of stomata during transpiration?
- 20) What is role of Casparian stripes in the movement of water through root layers?

Each question from 21 to 25 carries 3 scores.

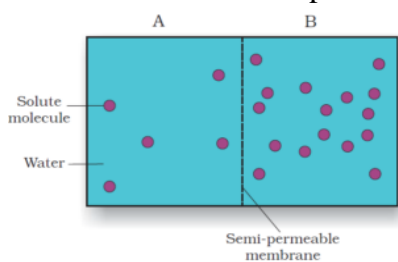
- 21) List the external and plant factors which control the rate of transpiration.
- 22) Briefly describe the cohesion-tension-transpiration pull model of water transport. List the physical properties of water that helps in the ascent of xylem sap.

23) The diagram given below represents a plant cell which is kept in three types of solutions, A, B & C. Identify the types of solutions and explain how these solutions effect the movement of water in and out of the cell.

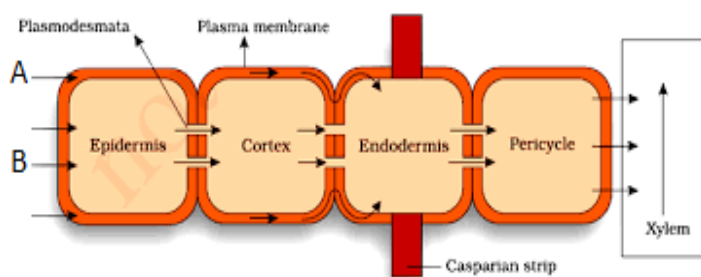
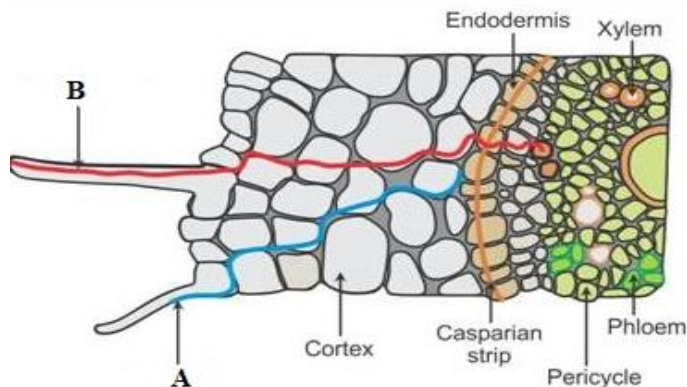


24) Observe the figure given below and answer the following questions.
Two chambers, A and B, containing solutions are separated by a semi-permeable membrane.

- Solution of which chamber has a higher water potential?
- Solution of which chamber has a lower solute potential?
- In which direction will osmosis occur?
- Define the term Solute potential



25) Water absorbed by the root hairs, move deeper into root layers by two distinct pathways which is mentioned the given figure as A & B. Identify and explain the pathways.

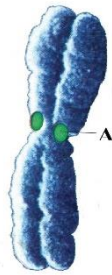


Answers

- 1) Hypotonic, Hypertonic 2) Zero.
- 3) The band of suberin depositions on the walls of endodermis is called as Casparian strip.
- 4) $\Psi_w = \Psi_s + \Psi_p$. The pressure exerted by the protoplasts due to entry of water into the cell against the rigid cell.
- 5) Imbibition. 6) Diffusion.
- 7) The porins are proteins that form huge pores in the outer membranes of the plastids, mitochondria and some bacteria allowing molecules up to the size of small proteins to pass through.
- 8) Transpiration is the evaporative loss of water by plants which occurs mainly through the stomata.
- 9) Cellulose micro fibrils of the guard cells are oriented radially and making it easier for the stoma to open.
- 10) It is a type of diffusion in which water is absorbed by solids –colloids ,results in an increase in volume.
- 11) Movement of water molecules from a region of higher concentration to a region of lower concentration through a semipermeable membrane.
- 12) Numerically osmotic pressure is equal to osmotic potential but sign is opposite.
- 13) It is the pressure build up against the cell wall due to movement of water into the cell.
- 14) When an external pressure is applied from the upper part of the funnel it prevents the entry of water from diffusing into the funnel through the membrane. This pressure is called as osmotic pressure.
- 15) A mycorrhiza is a symbiotic association of a fungus with a root system of some plants. The fungal hyphae have a very large surface area that absorb water and mineral from the soil and it provides it to the roots, in turn the roots provide sugars and N_2 -containing compounds to the fungus
- 16) 1. Water potential gradient between the absorbent and the liquid imbibed.
2. Affinity between the adsorbant and the liquid.
- 17) When water diffuses into the cell a pressure is build up in the cytoplasm against the cell wall, and is called Turgor pressure. This pressure is responsible for enlargement and extension growth of cells.
- 18) When solute is dissolved in pure water, the solution has fewer free water and the concentration of water decreases. As a result water potential of the solution is decreased. Hence, all solutions have lower Ψ_w .
- 19) When turgidity increases within the guard cells, the thin outer walls bulge out and force the inner walls to form a crescent shape. When the guard cells lose its turgidity, due to water loss the elastic inner walls regain their original shape, the guard cells become flaccid and the stoma closes.
- 20) The Casparian stripes present on the walls of the endodermis are suberin depositions which are impermeable to water. It resist the flow of water by apoplastic movement and so the movement of water through endodermis is purely symplastic, which is a slow process.
- 21) External- temperature, light, humidity, wind
Plant factors-number and distribution of stomata, percent of open stomata, water status of plant, canopy structure etc
- 22) The transpiration driven ascent of xylem sap depends mainly on the following physical properties of water:
 - Cohesion – mutual attraction between water molecules.
 - Adhesion – attraction of water molecules
 - Surface Tension – water molecules are attracted to each other inThese properties give water, high tensile strength and high capillarity.
As a result a continuous water column or xylem sap is created within the xylem cells.
During transpiration water evaporates through the stomata. To compensate that loss the mesophyll cells takes more and more water from the xylem which results in the upward movement of water through xylem.
- 23) A - Hypertonic solution. Water moves out of the cell and the cell is plasmolysed.
B- Isotonic solution. There is no net flow of water towards the inside or outside the cell.
C- Hypotonic solution. Water diffuses into the cell, and the cell is said to be turgid
- 24) a- A , b- B , c- from A to B.
d - All solutions have a lower water potential than pure water.
The magnitude of this lowering of water potential due to dissolution of a solute is called solute potential
- 25) A- Apoplast movement .It occurs exclusively through the intercellular spaces and the walls of the cells.
B - Symplast movement. During symplastic, the water travels through the plasmodesmata. Water has to enter the cells through the cell membrane, hence the movement is relatively slower. Symplastic movement may be aided by cytoplasmic streaming.

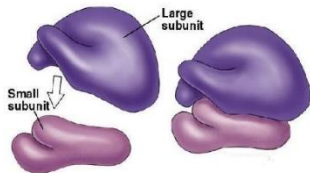
Each question from 1 to 10 carries 1 score.

- 1) Ribosomes are first observed by_____.
- 2) Name a prokaryotic organism without cell wall.
- 3) What are mesosomes?
- 4) Mention the site of rRNA synthesis.
- 5) The eukaryotic ribosomes are 80S. What does S stands for?
- 6) What are histones ?
- 7) Mention two cell organelles having its own ribosomes.
- 8) Name the scientist who coined the term Chromatin.
- 9) ‘Plasma membrane is selectively permeable membrane’-Justify.
- 10) Diagram of a chromosome is given below. What is the structure marked as ‘A’?



Each question from 11 to 20 carries 2 scores

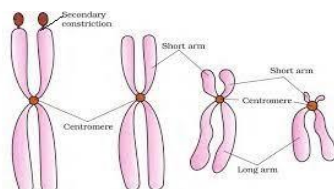
- 11) Identify the cell organelle given below. State its function.



- 12) Which are the different types of plastids based on the presence of pigments. Name the colourless plastid.
- 13) What are plasmids? Point out its significance.
- 14) Transport of the molecules across the plasma membrane takes place both by active and passive method.
What is meant by active transport?
- 15) Bacteria vary greatly in shape and size. Mention the four basic shapes of bacteria.
- 16) Identify and comment the structure marked as A in the diagram given below.



- 17) Name an organelle which is present in both prokaryotic & eukaryotic cell.
State its differences in prokaryotic and eukaryotic cell?
- 18) Observe the diagram given below and describe the different types of chromosomes based on the position of centromere.

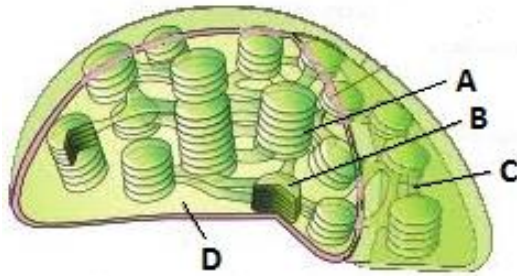


19) Which organelle is called as the ‘Power houses of the cell’? Why?

20) Mitochondria has some bacterial characteristics-Justify.

Each question from 21 to 25 carries 3 scores.

21) Identify the cell organelle. Label A, B, C & D.



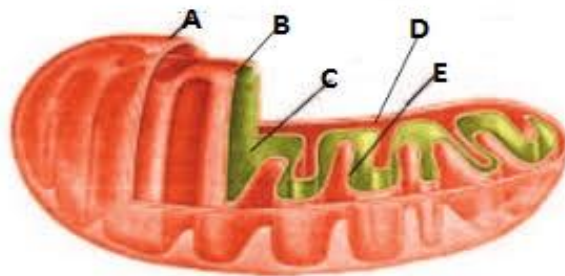
22) The given diagram represents a model of the Plasma membrane.

a) Name the model. b) Who proposed this model? c) Explain how this model helps in its functions.



23) Describe the structure and the different components present on the plasma membrane.

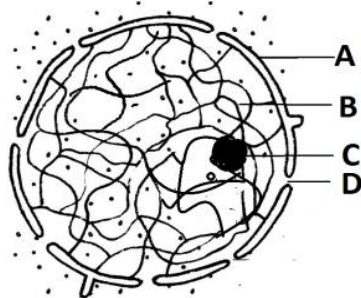
24) Identify the cell organelle given below. Label A, B, C, D and E.



25) Diagram of Nucleus is given below. A] Who first described the Nucleus?

B] Label A, B, C and D.

C] Comment on the function of D?



Each question from 1 to 5 carries 1 score.

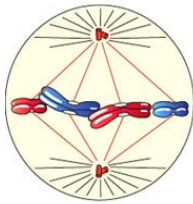
- 1) DNA replication takes place during the _____ stage of Interphase.
- 2) G₀ phase is called as the quiescent stage of the cell cycle. Why?
- 3) Where does the spindle fibres attach on to the chromosome?
- 4) Define the term bivalent.
- 5) The haploid cells that are formed after meiosis are called as _____.

Each question from 6 to 10 carries 2 scores.

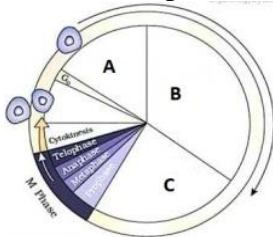
- 6) Define the term synapsis. In which phase a synaptonemal complex is formed during meiosis?
- 7) What is meant by syncytium? Name a tissue in which it is observed.
- 8) Which is the most prolonged stage during meiosis. Mention its sub stages.
- 9) In which stage of meiosis chiasmata is formed. Explain how it is formed.
- 10) Differentiate between the process of cytokinesis that takes in animal cell and plant cell.

Each question from 11 to 15 carries 3 scores.

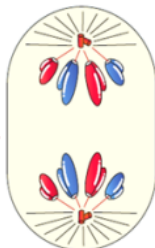
- 11) Identify the phase given below .Mention any two events that takes place during this phase.



- 12) Given below is a diagrammatic view of cell cycle. A, B & C represents the three phases of Interphase. Identify & comment upon what happens during each phase.



- 13) The diagram given below shows a phase during mitotic cell division.
 - a) Identify the phase. b) Points out the events that takes place during this phase.



- 14) Crossing over is a very important process that leads to genetic variability in a population.
 - a) What is crossing over? b) In which stage it occur? c) Name the enzyme that mediates crossing over.
- 15) Few phases of Meiosis are listed below. Assign them to their respective events in the table given below (Prophase-I, Anaphase-II, Anaphase-I, Telophase-I, Metaphase-I, Telophase-II)

Events takes place during Meiosis	Phase
Chromosomes fully condensed. Nucleolus disappears and the nuclear envelope breaks down.	
Nuclear membrane and nucleolus reappear, cytokinesis follows and results in tetrad of cells.	
Homologous chromosomes separate, sister chromatids remain associated at their centromeres.	
Bivalent chromosomes align on the equatorial plate and the spindle fibre attach to the pair of homologous chromosomes.	
Nuclear membrane and nucleolus reappear, cytokinesis follows and results in dyad of cells.	
Centromere of the chromosome splits and the sister chromatids move toward opposite poles.	

ANSWERS

- 1) S Phase.
- 2) In G0 phase the cells do not divide and it enter an inactive stage.
- 3) Spindle fibres attach on to the kinetochores of the centromere.
- 4) The complex formed during zygotene by a pair of synapsed homologous chromosomes is called as bivalent.
- 5) Gametes.
- 6) During Zygotene chromosomes start pairing together and this process of association is called synapsis. Such paired chromosomes later forms a complex structure called synaptonemal complex.
- 7) In some organisms karyokinesis is not followed by cytokinesis as a result of which a multinucleate condition arises which leads to the formation of Syncytium. Liquid endosperm in coconut.
- 8) Prophase 1. The sub stages are Leptotene, Zygotene, Pachytene, Diplotene, and Diakinesis.
- 9) During diplotene the dissolution of the synaptonemal complex takes place and the recombined homologous chromosomes of the bivalents try to separate from each other except at the sites of crossovers. This results in the formation of an X-shaped structures called as Chiasmata.
- 10) In an animal cell, cytokinesis starts by the appearance of a furrow in the plasma membrane. The furrow gradually deepens and ultimately joins in the centre dividing the cell cytoplasm into two. In plant cells, wall formation starts in the centre of the cell and grows outward to meet the existing lateral walls. The formation of the new cell wall begins with the formation of a simple precursor, called the cell-plate that represents the middle lamella between the walls of two adjacent cells.
- 11) Metaphase.
 - Spindle fibres attach to kinetochores of chromosomes.
 - Chromosomes move to the equator and get aligned along metaphase plate.
- 12) A – G1 phase During G1 phase the cell is metabolically active and continuously grows.
 B – S phase DNA synthesis or replication takes place.
 During this phase the amount of DNA per cell doubles.
 C – G2 phase. During this phase, proteins are synthesised in preparation for mitosis and cell growth continues.
- 13) Anaphase.
 - Centromeres split and chromatids separate.
 - Chromatids move to opposite poles.
- 14) a) Crossing over is the exchange of genetic material between the non-sister chromatids of two homologous chromosomes.
 b) Pachytene. c) Recombinase.
- 15)

Events takes place during Meiosis	Phase
The chromosomes are fully condensed, nucleolus disappears and the nuclear envelope also breaks down.	Prophase I
The nuclear membrane and nucleolus reappear, cytokinesis follows and results in the formation of tetrad of cells.	Telophase II
Homologous chromosomes separate, while sister chromatids remain associated at their centromeres.	Anaphase I
The bivalent chromosomes align on the equatorial plate the spindle fibre attach to the pair of homologous chromosomes.	Metaphase I
The nuclear membrane and nucleolus reappear, cytokinesis follows and results in the formation of dyad of cells.	Telophase I
The centromere of the chromosome splits and the sister chromatids move toward opposite poles of the cell.	Anaphase II:

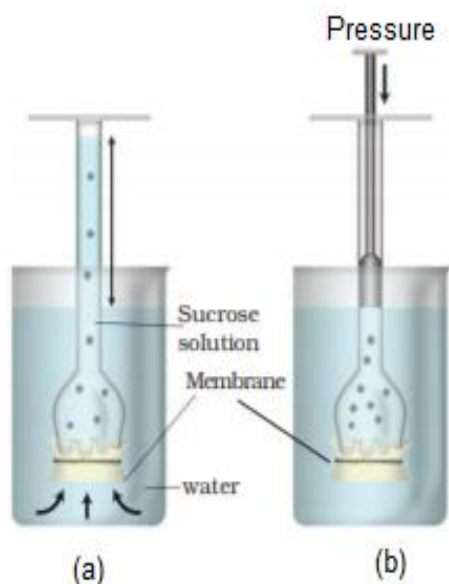
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Each question from 1 to 10 carries 1 score.

- 1) Fill in the blanks from the given options (Hypertonic, Hypotonic, Isotonic)
Cells swell when placed in _____ solutions and shrink in _____ solutions.
- 2) The water potential of pure water at standard temperatures and which is not under any pressure, is _____.
- 3) What are Casparian stripes?
- 4) State the equation of water potential. Define pressure potential.
- 5) Mention the process of absorption of water by dry seeds which helps in seed germination.
- 6) Gaseous movement within the plant body takes place by _____.
- 7) What are porins?
- 8) Define transpiration.
- 9) State how the cellulose micro fibrils of guard cells helps to perform the function of stomata.
- 10) Define Imbibition.

Each question from 11 to 20 carries 2 scores.

- 11) Define osmosis
- 12) What is the relationship between osmotic pressure and osmotic potential?
- 13) What is turgor pressure?
- 14) In the picture given below Fig. (a) demonstrates the process of Osmosis . What happens when an external pressure is applied from the upper part of the funnel as in Fig (b). What is that pressure termed as?

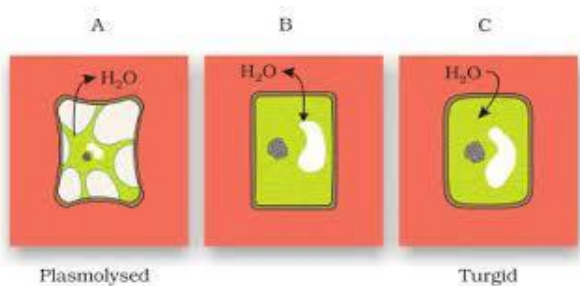


- 15) What is mycorrhiza? How is it helpful to the plants?
- 16) The absorption of water by dry wood is a classical example for Imbibition.
What are the factors essential for Imbibition?
- 17) How is turgor pressure developed within the cell? What is its significance?
- 18) State why solutions have a lower water potential than pure water.
- 19) What causes the opening and closing of guard cells of stomata during transpiration?
- 20) What is role of Casparian stripes in the movement of water through root layers?

Each question from 21 to 25 carries 3 scores.

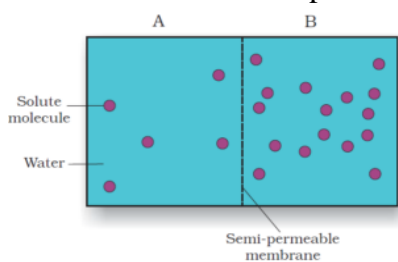
- 21) List the external and plant factors which control the rate of transpiration.
- 22) Briefly describe the cohesion-tension-transpiration pull model of water transport. List the physical properties of water that helps in the ascent of xylem sap.

23) The diagram given below represents a plant cell which is kept in three types of solutions, A, B & C. Identify the types of solutions and explain how these solutions effect the movement of water in and out of the cell.

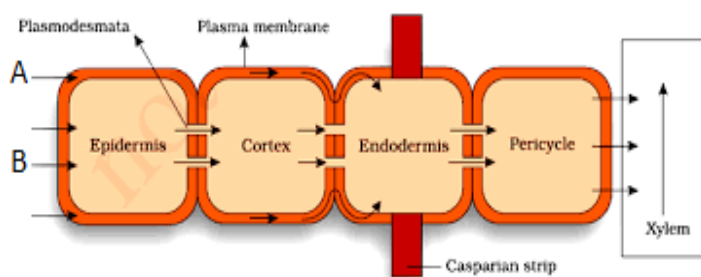
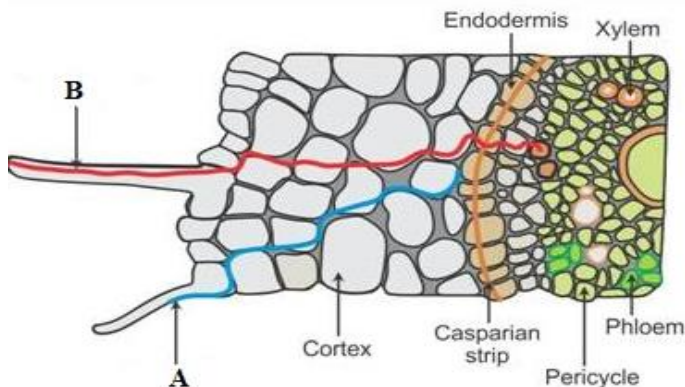


24) Observe the figure given below and answer the following questions.
Two chambers, A and B, containing solutions are separated by a semi-permeable membrane.

- Solution of which chamber has a higher water potential?
- Solution of which chamber has a lower solute potential?
- In which direction will osmosis occur?
- Define the term Solute potential



25) Water absorbed by the root hairs, move deeper into root layers by two distinct pathways which is mentioned the given figure as A & B. Identify and explain the pathways.



Answers

- 1) Hypotonic, Hypertonic 2) Zero.
- 3) The band of suberin depositions on the walls of endodermis is called as Casparian strip.
- 4) $\Psi_w = \Psi_s + \Psi_p$. The pressure exerted by the protoplasts due to entry of water into the cell against the rigid cell.
- 5) Imbibition. 6) Diffusion.
- 7) The porins are proteins that form huge pores in the outer membranes of the plastids, mitochondria and some bacteria allowing molecules up to the size of small proteins to pass through.
- 8) Transpiration is the evaporative loss of water by plants which occurs mainly through the stomata.
- 9) Cellulose micro fibrils of the guard cells are oriented radially and making it easier for the stoma to open.
- 10) It is a type of diffusion in which water is absorbed by solids –colloids ,results in an increase in volume.
- 11) Movement of water molecules from a region of higher concentration to a region of lower concentration through a semipermeable membrane.
- 12) Numerically osmotic pressure is equal to osmotic potential but sign is opposite.
- 13) It is the pressure build up against the cell wall due to movement of water into the cell.
- 14) When an external pressure is applied from the upper part of the funnel it prevents the entry of water from diffusing into the funnel through the membrane. This pressure is called as osmotic pressure.
- 15) A mycorrhiza is a symbiotic association of a fungus with a root system of some plants. The fungal hyphae have a very large surface area that absorb water and mineral from the soil and it provides it to the roots, in turn the roots provide sugars and N_2 -containing compounds to the fungus
- 16) 1. Water potential gradient between the absorbent and the liquid imbibed.
2. Affinity between the adsorbant and the liquid.
- 17) When water diffuses into the cell a pressure is build up in the cytoplasm against the cell wall, and is called Turgor pressure. This pressure is responsible for enlargement and extension growth of cells.
- 18) When solute is dissolved in pure water, the solution has fewer free water and the concentration of water decreases. As a result water potential of the solution is decreased. Hence, all solutions have lower Ψ_w .
- 19) When turgidity increases within the guard cells, the thin outer walls bulge out and force the inner walls to form a crescent shape. When the guard cells lose its turgidity, due to water loss the elastic inner walls regain their original shape, the guard cells become flaccid and the stoma closes.
- 20) The Casparian stripes present on the walls of the endodermis are suberin depositions which are impermeable to water. It resist the flow of water by apoplastic movement and so the movement of water through endodermis is purely symplastic, which is a slow process.
- 21) External- temperature, light, humidity, wind
Plant factors-number and distribution of stomata, percent of open stomata, water status of plant, canopy structure etc
- 22) The transpiration driven ascent of xylem sap depends mainly on the following physical properties of water:
 - Cohesion – mutual attraction between water molecules.
 - Adhesion – attraction of water molecules
 - Surface Tension – water molecules are attracted to each other inThese properties give water, high tensile strength and high capillarity.
As a result a continuous water column or xylem sap is created within the xylem cells.
During transpiration water evaporates through the stomata. To compensate that loss the mesophyll cells takes more and more water from the xylem which results in the upward movement of water through xylem.
- 23) A - Hypertonic solution. Water moves out of the cell and the cell is plasmolysed.
B- Isotonic solution. There is no net flow of water towards the inside or outside the cell.
C- Hypotonic solution. Water diffuses into the cell, and the cell is said to be turgid
- 24) a- A , b- B , c- from A to B.
d - All solutions have a lower water potential than pure water.
The magnitude of this lowering of water potential due to dissolution of a solute is called solute potential
- 25) A- Apoplast movement .It occurs exclusively through the intercellular spaces and the walls of the cells.
B - Symplast movement. During symplastic, the water travels through the plasmodesmata. Water has to enter the cells through the cell membrane, hence the movement is relatively slower. Symplastic movement may be aided by cytoplasmic streaming.

Each question from 1 to 10 carries 1 score.

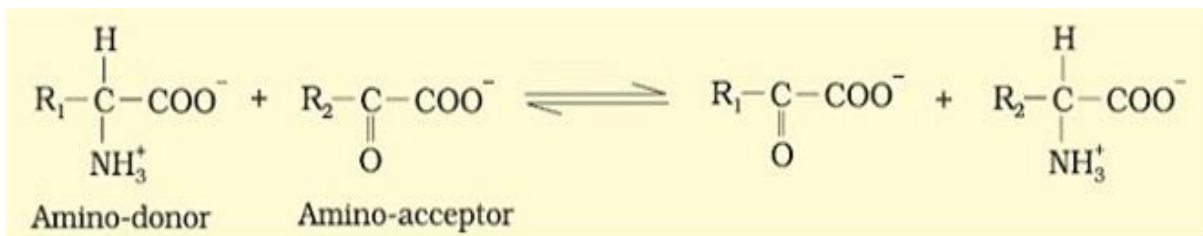
- 1) Name the N_2 -fixing microbe seen in root nodules of non-leguminous plant *Alnus*.
- 2) Name the two trace elements which are present in Nitrogenase enzyme?
- 3) What are N_2 - fixers?
- 4) Name the first amino acid which is synthesised during Reductive amination?
- 5) Name any two *Cyanobacteria* which are N_2 – fixers.
- 6) Raju uprooted a *Pea* plant and observed some nodules on its root. When he cut through it he noticed a pink colour. What makes the nodules pink?
- 7) Give any two examples for free-living nitrogen-fixing aerobic microbes.
- 8) Name an anaerobic free-living N_2 - fixer
- 9) List any two nitrogenous compounds which are having a high nitrogen to carbon ratio.
- 10) Name any two bacteria which are involved in denitrification.

Each question from 11 to 20 carries 2 scores.

- 11) Magnesium is a macronutrient present in plant tissues. Mention two of its important role.
- 12) Elements are divided into two broad categories based on their quantitative requirements. Mention them.
- 13) Match the following

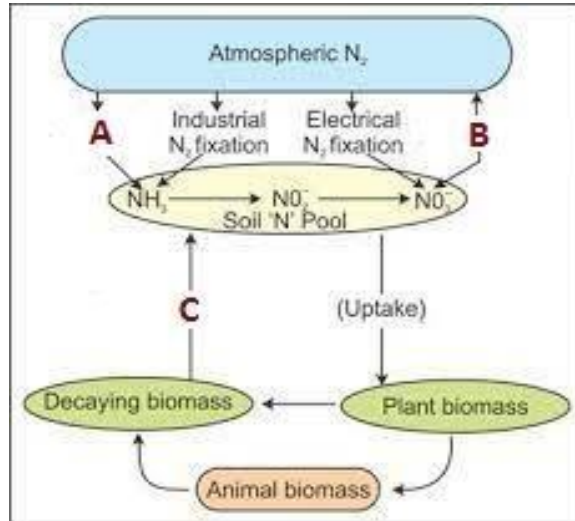
Name of element	Role of element
Magnesium	Activator of alcohol dehydrogenase
Phosphorus	Opening and closing of stomata.
Zinc	Constituent of chlorophyll
Potassium	Present in ATP

- 14) List the four macro elements which are components of biomolecules and structural elements of cells.
- 15) What is Nitrogen Fixation? Mention the three types of Nitrogen Fixation.
- 16) Explain the process of Nitrification. Mention the microorganisms involved in this process.
- 17) What is meant by symbiotic Nitrogen fixation? Point out one example.
- 18) What are Amides? How are they formed in plants?
- 19) Which are the two most important amides found in plants? Name the amino acids from which they are formed.
- 20) Given below the equation represents a reaction involved in Nitrogen metabolism.
 - a) Identify the process.
 - b) Name the enzyme involved in this process.

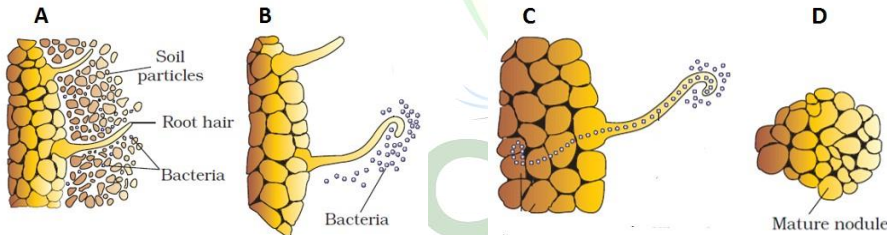


Each question from 21 to 25 carries 3 scores.

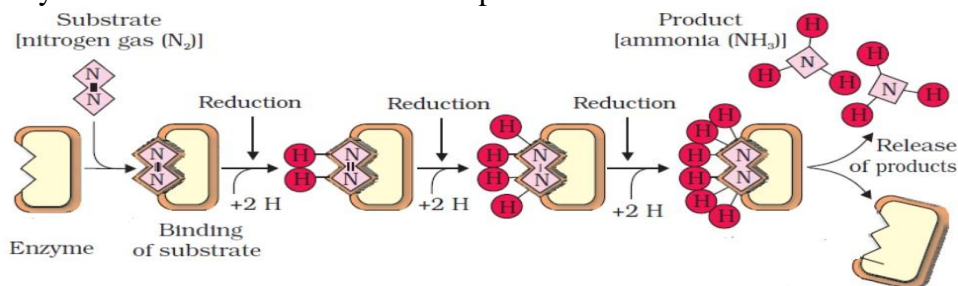
- 21) More than sixty elements of the 105 discovered so far are found in different plants. Some are very essential for the growth and development of plants. What are the criteria for essentiality of an element?
- 22) Given below is a diagrammatic representation of Nitrogen Cycle. Identify & Explain the process A, B, & C



- 23) Ammonia - the product of nitrogen fixation is used to synthesis amino acids in plants.
 a) Explain the two main steps involved in this process.
 b) Mention the enzymes involved in these steps.
- 24) The given below diagram explains the development of root nodules.
 Describe the stages A, B, C & D



- 25) Given below is a schematic representation of the steps of Nitrogen fixation.
 a) Name the enzyme involved in this process.
 b) Explain how the Pea plant ensure the protection of this enzyme.
 c) How many ATP s are needed for each NH₃ produced?



ANSWERS

- 1) *Frankia*.
- 2) Molybdenum & Iron.
- 3) N₂ - fixers are some prokaryotic microbes which is capable reduction of N₂ into NH₃ with the help of nitrogenase enzyme.
- 4) Glutamic acid.
- 5) *Anabaena* and *Nostoc*.
- 6) The pink colour is due to the presence of a pigment leg-haemoglobin.
- 7) *Azotobacter* and *Beijernickia*.
- 8) *Rhodospirillum*.
- 9) Amides & Ureides.
- 10) *Pseudomonas* and *Thiobacillus*.
- 11) Magnesium is an activator for both *ribulose bisphosphate carboxylase oxygenase* [Rubisco] and *phosphoenol pyruvate carboxylase*.
-It is also a constituent of chlorophyll molecule.

12) (i) Macronutrients, and (ii) Micronutrients

-Macronutrients are present in plant tissues in large amounts.

(in excess of 10 m mole Kg⁻¹ of dry matter).

It include carbon, hydrogen, oxygen, nitrogen, phosphorous, sulphur, potassium, calcium and magnesium.

-Micronutrients or trace elements, needed in very small amounts.

(less than 10 m mole Kg⁻¹ of dry matter).

These include iron, manganese, copper, molybdenum, zinc, boron, chlorine and nickel.

13)

Name of element	Role of element
Magnesium	Constituent of chlorophyll
Phosphorus	Present in ATP
Zinc	Activator of alcohol dehydrogenase
Potassium	Opening and closing of stomata

14) Carbon, Hydrogen, Oxygen and Nitrogen

15) The process of conversion of Nitrogen to Ammonia is termed as Nitrogen fixation.
Biological Nitrogen fixation, Electrical Nitrogen fixation & Industrial Nitrogen fixation

16) Ammonia is first oxidised to Nitrite by the bacteria *Nitrosomonas* and/or *Nitrococcus*.
The Nitrite is further oxidised to Nitrate by the bacterium *Nitrobacter*. These steps are called Nitrification

17) Reduction of Nitrogen to Ammonia by living organisms which live symbiotically is called as symbiotic Nitrogen fixation.

-The mutual association between the roots of legume plants and the *Rhizobium* bacteria is an example for it.

-The bacteria lives inside the root nodules of the leguminous plants do the process.

18) Amides are the structural part of proteins found in plants.

-They are formed from amino acids.

-The hydroxyl part of the acid is replaced by another NH₂- radicle.

-So they contain more nitrogen than the amino acids.

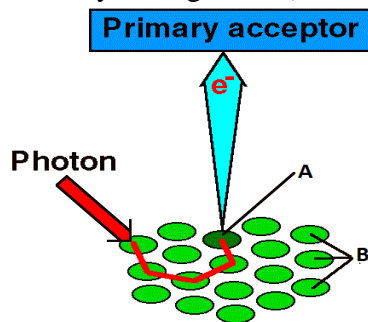
Each question from 1 to 10 carries 1 score.

- 1) The colour of the chlorophyll b in the chromatogram is _____.
- 2) The reaction centre of PS I & PS II is ___ & ___ respectively.
- 3) Mention the technique used for separation of leaf pigments.
- 4) Expand LHC.
- 5) What is the range of wave length of visible spectrum of light, VIBGYOR?
- 6) The reaction centre of PS I is called as P700 .Why?
- 7) Name the primary CO₂ acceptor molecule in C₃ cycle.
- 8) Name the first stable 3 carbon compound formed during C₃ cycle.
- 9) How many molecules of ATP and NADPH are used up to synthesise one glucose molecule?
- 10) Name the enzyme involved in carboxylation in C₃ cycle?

Each question from 11 to 20 carries 2 scores.

- 11) Define photophosphorylation. Name the two types.
- 12) Non-cyclic photo-phosphorylation takes place in grana not in stroma lamellae . Why?
- 13) Expand RuBisCO .Explain why this enzyme is named so?
- 14) Observe the given diagram and answer the following questions.

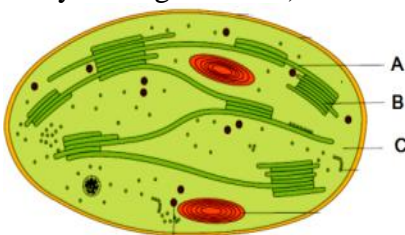
a) Identify the figure. b) Name A and B.



15) Where is NADP reductase enzyme located in the chloroplast? What is its role in Non cyclic photophosphorylation?

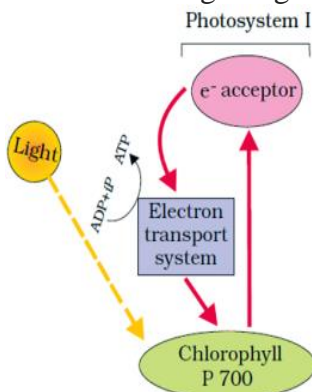
16) Observe the diagram given below and answer the following questions.

a) Identify the organelle. b) Name A , B & C



17) Mention the two components of ATP synthase enzyme. Where is it located in the chloroplast?

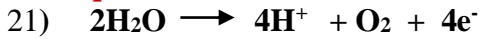
18) Observe the diagram given below. a) Name the process b) Why is it called so?



19) What are accessory pigments? What is their role in photosynthesis?

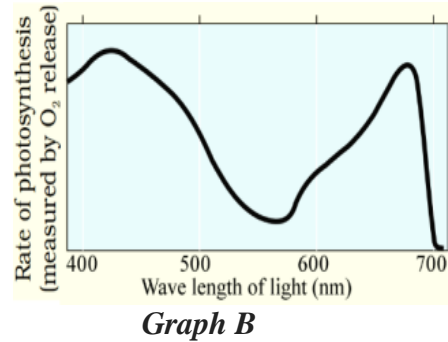
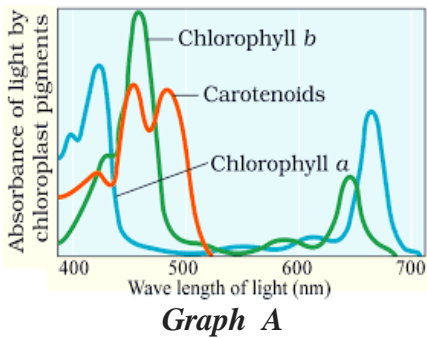
20) What are the requirements for ATP synthesis according to Chemiosmotic Hypothesis?

Each question from 21 to 30 carries 3 scores.

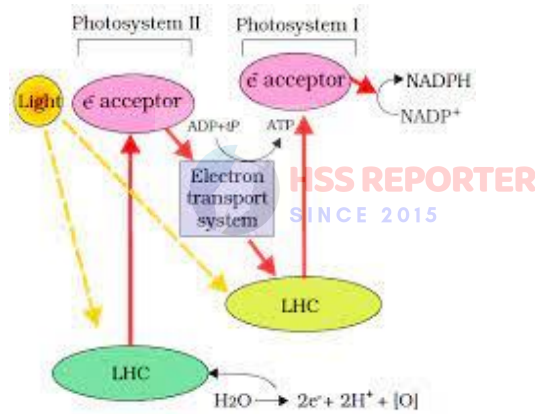


The above equation represents an important reaction that takes place during Non-cyclic photophosphorylation

- a) Name the process. b) Where does this reaction take place in plants?
 c) What is the significance of this reaction?
 22) Observe the graphs given below. What does these graphs indicate?

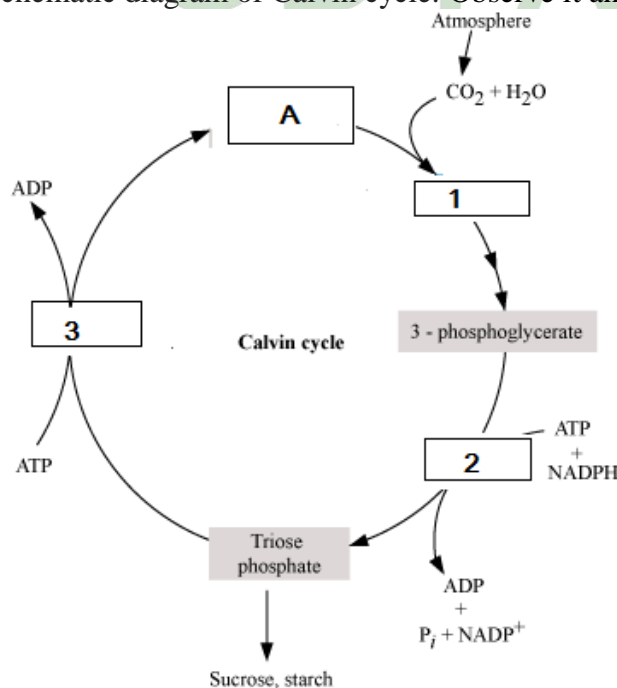


23) Given below diagram represents the process of Non cyclic photophosphorylation.

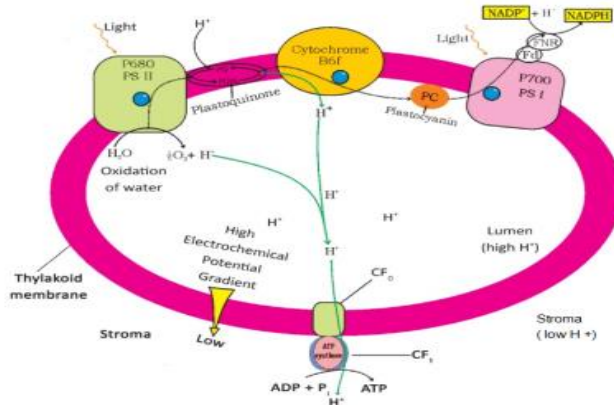


- a) Why is it called as Non cyclic photophosphorylation?
 b) Why it is called as Z scheme.

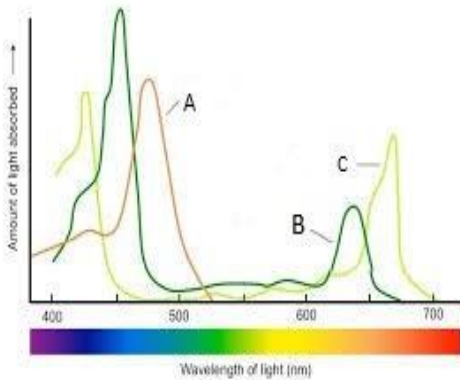
24) Given below is the schematic diagram of Calvin cycle. Observe it and answer the following questions.



- 1) Where does this cycle takes place? 2) Mention the three stages of Calvin cycle.
 3) Name the compound which is regenerated in this cycle.
 25) Observe the diagram given below.



- a) Which process is explained by this diagram?
 b) Name the three electron carrier molecules present on the thylakoid membrane.
 c) Name the enzyme required for ATP synthesis and its components.
 26) ATP synthesis is linked to development of proton gradient across a membrane.
 Explain three ways for developing the proton gradient across the thylakoid membrane.
 27) Observe the graph given below and answer the questions.
 a) Label the pigments A, B, & C b) Which is the chief pigment in photosynthesis? Why?



- 28) You are provided with some characters of photophosphorylation, arrange them in appropriate column [Occurs at stroma lamella, Electron flow is cyclic, Production of ATP and NADPH, Both PS I & PS II are functional, Presence of NADP reductase, Occurs at grana, Only PS I is functional, Absence of NADP reductase, Synthesis of ATP only, Electron flow is not cyclic.]

Cyclic Photophosphorylation	Noncyclic photophosphorylation

- 29) Explain the process of ATP synthesis according to Chemiosmotic hypothesis.
 30) Photolysis – splitting of water is a very important reaction that takes place during Non-cyclic photo-phosphorylation.
 a) Which pigment system is associated with this process?
 b) Mention the site of the water splitting complex.
 c) Which gas is released during this process?

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ANSWERS

- 1) Yellow green.
- 2) P700 & P680.
- 3) Paper chromatography.
- 4) Light Harvesting Complex.
- 5) 400 nm - 700 nm.
- 6) Because the reaction centre of PSI is a Chl-a molecule which is having an absorption peak at 700 nm.
- 7) RUBP - Ribulose biphosphate .
- 8) 3PGA - 3 Phosphoglycerate.
- 9) 18 ATP & 12 NADP.
- 10) RuBisCo.
- 11) Photophosphorylation is the synthesis of ATP from ADP and inorganic phosphate in the presence of light.
Cyclic photophosphorylation & Non cyclic photophosphorylation.
- 12) Stroma lamellae membranes lack PS II as well as NADP reductase enzyme,
Whereas the grana have both PS I and PS II as well as NADP reductase enzyme.
- 13) RuBP carboxylase-oxygenase.
This enzyme is called so because it has both carboxylation and oxygenation activity.
- 14) a) Light harvesting complex b) A) Reaction centre B) Pigment molecules.
- 15) Stroma side of the thylakoid membrane. To convert NADP^+ to NADPH.
- 16) a) Chloroplast b) A – Stroma lamellae B- Grana C- Stroma.
- 17) The ATP synthase enzyme consists of two parts: F₀ & F₁ .
F₀ is embedded in the thylakoid membrane and F₁ protrudes on to the outer surface of the thylakoid membrane into the stroma.
- 18) a) Cyclic photophosphorylation
b) The electrons that escape from PSI are cycled back to the same pigment system.
- 19) All the pigments other than chlorophyll a, like chlorophyll b, xanthophylls and carotenoids, which are present in a pigment system are called accessory pigments.
 - They absorb sunlight and transfer the solar energy to chlorophyll a.
 - They also protect chlorophyll a from photo-oxidation.
- 20) The four requirements for ATP synthesis are
 - 1) A membrane.
 - 2) A proton pump.
 - 3) A proton gradient across the membrane.
 - 4) ATP synthase enzyme.
- 21) a) Photolysis.
b) In the lumen of thylakoid.
c) i) Help to increase H⁺ gradient in lumen for ATP synthesis.
ii) Help to replace electrons in PS II.
- 22) -Graph A represents the Absorption spectrum of the pigments chlorophyll a, b and the carotenoids
-It shows that the rate of absorption of light by the pigments are more in the blue and red regions of the visible spectrum.
-Graph B represents the Action spectrum of photosynthesis.
-It shows that the rate of photosynthesis is maximum in the blue and red regions of the spectrum
- 23) a) The electrons escaped from PSII are not cycled back to same PS, instead they move towards PS I
b) This whole scheme of transfer of electrons, starting from the PS II, uphill to the acceptor, down the electron transport chain to PS I, excitation of electrons, transfer to another acceptor, and finally downhill to NADP^+ reducing it to $\text{NADPH} + \text{H}^+$ is called the **Z scheme**, due to its characteristic shape.
This shape is formed when all the carriers are placed in a sequence on a redox potential scale
- 24) a - Stroma. b- 1- Carboxylation. 2- Reduction. 3- Regeneration. c - Ribulose-1,5- biphosphate.
- 25) a) Chemiosmotic hypothesis which explains the mechanism of ATP synthesis.
b) Plastoquinine, Cytochrome B6-f, Plastocyanine.
c) ATP synthase - F₀ & F₁ complex.

- 26)
- The protons or hydrogen ions are produced by the splitting of water and they accumulate within the lumen of the thylakoids.
 - When electrons moves through the electron acceptor molecules, the protons are released into the lumen of the thylakoids. As a result the concentration of protons are high within the lumen of the thylakoids.
 - The protons present in the stroma are used up for the reduction of NADP^+ to $\text{NADPH} + \text{H}^+$. So the concentration of protons are reduced within the stroma.
- Thus a proton gradient is created across the thylakoid membrane.
- 27) a) A. Carotenoides B. Chlorophyll b. C. Chlorophyll a.
 b) Chlorophyll a.
 Because in Absorption spectrum and Action spectrum Chl-a shows maximum rate of absorption in blue and red region and also shows higher rate of photosynthesis.
- 28)

Cyclic photophosphorylation	Non cyclic photophosphorylation
Occur at stroma lamella	Occur at grana
Only PS I is functional	Both PS I and PS II functional
Absence of NADP reductase	Presence of NADP reductase
Synthesis of ATP only	Production of ATP and NADPH_2
Electron flow is cyclic	Electron flow is not cyclic

- 29)
- A proton gradient is created across the thylakoid membrane.
 - The breakdown of this proton gradient provides enough energy which leads to the synthesis of ATP.
 - The gradient is broken down due to the movement of protons across the membrane to the stroma.
 - ATP synthase enzyme present on the membrane has a channel F_0 that allows diffusion of protons from the lumen into the stroma across the membrane.
 - This releases enough energy to cause a conformational change in the F_1 particle of the ATP synthase thus catalyses the formation of ATP.
- 30) a) PS II.
 b) Inner side of thylakoid membrane.
 c) Oxygen.

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Each question from 1 to 10 carries 1 score.

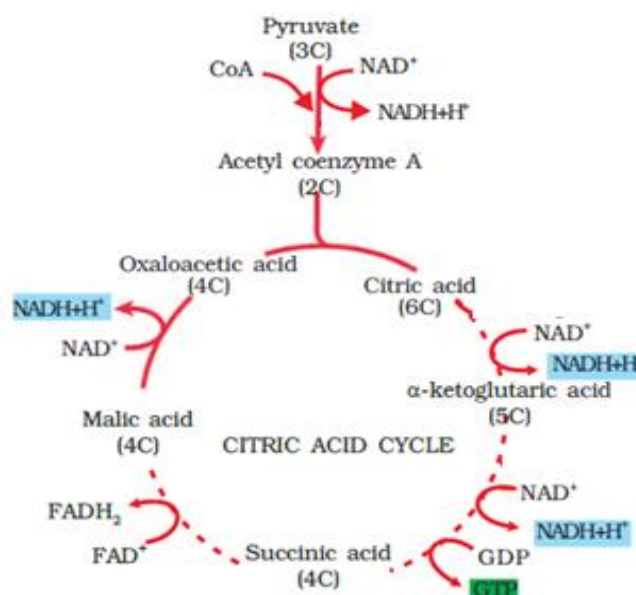
- 1) Tricarboxylic acid cycle was first elucidated by _____
- 2) The final hydrogen acceptor in ETS of aerobic respiration is _____
- 3) Name the enzyme which converts sucrose into glucose.
- 4) How many ATP are produced by the oxidation of one molecule of NADH & one molecule of FADH₂?
- 5) EMP pathway is commonly called as _____
- 6) Name the five carbon compound produced during Krebs cycle.
- 7) Name the compound which receives electrons both from Complex I & Complex II during ETS.
- 8) Where does Glycolysis occur within a cell?
- 9) Name the pathway which is common to both aerobic & anaerobic respiration.
- 10) Name the mobile carrier molecule which transfer of electrons between complex III and IV in ETS.

Each question from 11 to 20 carries 2 scores.

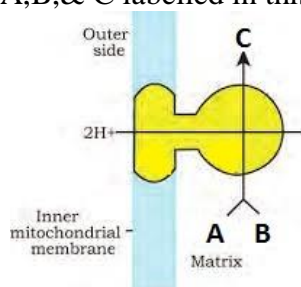
- 11) Differentiate between Photophosphorylation and Oxidative phosphorylation
- 12) Explain the process of alcohol fermentation in Yeast cells? Name the enzyme that catalyses this reaction.
- 13) Point out the step in which a substrate level phosphorylation takes place during Krebs cycle.
- 14) Pyruvic acid produced by glycolysis is handled by different cells in three major ways. Which are they?
- 15) During vigorous exercise, when oxygen is inadequate for cellular respiration the muscle cells respire anaerobically. Explain this process. Name the enzyme that catalyses this reaction.
- 16) What are respiratory substrate? Give examples.
- 17) Differentiate between Aerobic respiration and Anaerobic respiration.
- 18) How many NADH & FADH₂ are produced when one molecule is Pyruvate is oxidised during Krebs cycle.
- 19) Mention the four crucial events of aerobic respiration.
- 20) During Glycolysis, there is one step where NADH + H⁺ is formed from NAD⁺.
Point out the step in which NADH + H⁺ is formed.

Each question from 21 to 25 carries 3 scores.

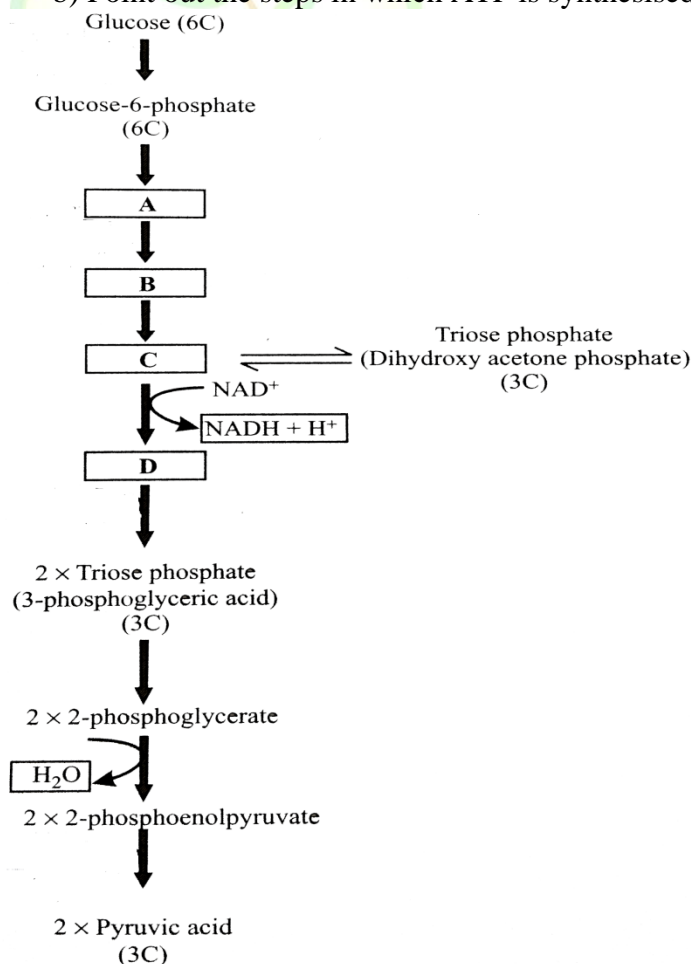
- 21) The diagram given below is a schematic representation of Krebs cycle starting from Pyruvic acid.
 - a) Point out the steps where decarboxylation reactions takes place.
 - b) Name the enzyme which catalyses the condensation of acetyl coenzyme A with oxaloacetic acid.



- 22) The metabolic pathway through which the electron passes from one carrier to another is called as Electron Transport System or ETS.
- Mention the site of ETS in Mitochondria.
 - Name the four different complexes through which electrons are transported.
 - Out of these complexes which complex receives the electrons generated during oxidation of succinate in TCA cycle?
- 23) The end product of Glycolysis, Pyruvic acid undergoes a very important reaction before entering into Krebs cycle.
- Explain the reaction.
 - Name the enzyme which catalyses this reaction.
 - Name the mineral ion which activates this enzyme.
- 24) Given below diagram shows the structure of complex V present on the inner membrane of mitochondria.
- Which are the two major components, of this complex. .b) Explain the function of this complex.
 - Identify A,B,& C labelled in this diagram



- 25) Given below is the schematic diagram of Glycolysis in which some steps are missing.
- Identify the compounds A,B,C & D
 - Point out the steps in which ATP is synthesised & ATP is utilised.



ANSWERS

- 1) Hans Krebs.
- 2) Oxygen.
- 3) Invertase.
- 4) NADH produces 3 molecules of ATP & FADH₂ produces 2 molecules of ATP.
- 5) Glycolysis.
- 6) α -ketoglutaric acid.
- 7) Ubiquinone.
- 8) Cytoplasm.
- 9) Glycolysis.
- 10) Cytochrome-c.
- 11) During photophosphorylation light energy is utilised for the production of proton gradient required for phosphorylation. It takes place within Chloroplast. In oxidative phosphorylation the energy from oxidation-reduction reactions is utilised for the production of proton gradient. It takes place within Mitochondria.
- 12) In yeast cells, glucose undergoes glycolysis to form Pyruvic acid which is then converted into CO₂ and ethanol. The enzymes that catalyse these reactions are Pyruvic acid decarboxylase and Alcohol dehydrogenase.
- 13) A substrate level phosphorylation takes place during the conversion of succinyl-CoA to succinic acid. In this step a molecule of GTP is synthesised.
- 14) Lactic acid fermentation, Alcoholic fermentation and Aerobic respiration.
- 15) When muscle cells respire anaerobically, Pyruvic acid is reduced to Lactic acid. Enzyme is Lactate dehydrogenase
- 16) The compounds that are oxidised during respiration are known as respiratory substrates. Usually carbohydrates are oxidised to release energy, but proteins, fats and even organic acids can be used as respiratory substances in some plants, under certain conditions.
- 17)

Aerobic respiration	Anaerobic respiration
<ul style="list-style-type: none"> • It is the process of complete oxidation of organic substances in the presence of oxygen • It releases CO₂ & water • Large amount of energy is present in the substrate. 	<ul style="list-style-type: none"> • It is the process of incomplete oxidation of organic substances in the absence of oxygen • It releases CO₂, water & Ethanol / Lactic acid • Only less amount of energy is present in the substrate.

- 18) 3 molecules of NADH & 1 molecule of FADH₂.
- 19) Glycolysis, Link reaction, Krebs cycle and Electron transport system.
- 20) When 3-phosphoglyceraldehyde (PGAL) is converted to 1, 3-bisphosphoglycerate (BPGA).
- 21) a - Decarboxylation of Pyruvate to Acetyl-coA, Decarboxylation of citric acid to alpha-ketoglutaric acid, Decarboxylation of alpha-ketoglutaric acid to Succinic acid.
b - Citrate synthase.
- 22) a – Inner mitochondrial membrane.
b - Complex I- NADH dehydrogenase, Complex II – Succinate dehydrogenase, Complex III.- Cytochrome *bc*1 complex, Complex IV Cytochrome *c* oxidase
c- Complex II – Succinate dehydrogenase.
- 23) a) Pyruvate, enters into the mitochondrial matrix and undergoes oxidative decarboxylation to form a 2C compound Acetyl CoA.
b) This reaction is catalysed by the enzyme Pyruvic dehydrogenase. c) Mg²⁺
- 24) a) F₀ & F₁ are the two components of ATP Synthase.
b) The F₁ headpiece is a peripheral membrane protein complex and contains the site for synthesis of ATP from ADP and inorganic phosphate. F₀ is an integral membrane protein complex that forms the channel through which protons cross the inner membrane. The passage of protons through the channel is coupled to the catalytic site of the F₁ component for the production of ATP.
- 25) a) A - fructose-6-phosphate. B - fructose 1, 6-bisphosphate.
C - 3-phosphoglyceraldehyde. D - 1, 3-bisphosphoglycerate.
b) ATP is utilised in the conversion of Glucose into Glucose 6-phosphate and second in the conversion of Fructose 6-phosphate to Fructose 1, 6-bisphosphate.
ATP is produced during the conversion of 1, 3-bisphosphoglycerate to 3-phosphoglyceric acid and during the conversion of PEP to Pyruvic acid.

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Each question from 1 to 10 carries 1 score.

- 1) The most widely used compound as source of ethylene is _____
- 2) A farmer wants to remove the small dicot weeds growing along with his monocot crop. Which plant hormone would you suggest to achieve this?
- 3) Which plant hormone acts as an antagonist to GAs?
- 4) Name a gaseous PGR.
- 5) Mention a natural substance isolated from coconut milk having cytokinin-like activities.
- 6) Point out two Plant growth inhibitors which promote abscission of plant organs.
- 7) Mention a plant hormone which can induce rooting in a twig.
- 8) Name any two growth promoters which delay senescence.
- 9) Name a plant hormone which can induce Parthenocarpy.
- 10) Which plant hormone is seen more in regions where rapid cell division occurs?

Each question from 11 to 20 carries 2 scores.

- 11) Spraying Ethylene on pineapple plantation is quite common. Point out the outcomes of this activity.
- 12) What is meant by Respiratory climactic?
- 13) Suggest a method to increase the yield of sugarcane by the application of plant hormone.
- 14) Define the term apical dominance. Name the PGR which induces it. Name the PGR which can overcome it.
- 15) Name the PGR which is called a Stress hormone. Why is it called so?
- 16) What is meant by Bolting. Name the hormone which promotes Bolting
- 17) Would a defoliated plant respond to photoperiodic cycle? Why?
- 18) Name any two natural auxins & synthetic auxins.
- 19) Give reasons :- a) Auxins are widely applied in tea plantations and hedge-making.
b) A ripened fruit is usually mixed with unripened fruit to speed up ripening.
- 20) How does ethylene helps in absorption of water in plants?

Each question from 21 to 25 carries 3 scores.

- 21) Differentiate between a short day plant and a long day plant.
22. Match the following

Column A	Column B
Weed free lawn.	ABA
Sprouting of potato tubers.	Gibberellins
To produce new leaves and chloroplasts.	Ethylene
Petiole elongation in deep water rice plants.	Cytokinins
Stimulate closure of stomata.	Auxin
Early seed production in conifers.	Ethylene

- 23) Expand PGR. Explain the two groups of PGR based on their functions on living plants.
- 24) Define Photoperiodism. Explain the three types of plants based on Photoperiodism.
- 25) Assign the plant growth regulators [a-f].

Applications	Plant Growth Regulators
To increase the length of grapes stalks.	<u>a</u>
To promote lateral shoot growth	<u>b</u>
To initiate rooting in stem cuttings	<u>c</u>
To speed up the malting process in brewing industry	<u>d</u>
To inhibit seed germination.	<u>e</u>
To promotes female flowers in cucumbers	<u>f</u>

ANSWERS

- 1) Ethephon. 2) 2,4 D. 3) ABA. 4) Ethylene. 5) Zeatin. 6) Ethylene & ABA.
7) Auxin. 8) Cytokinins, Gibberellins. 9) Auxin. 10) Cytokinins.
11) Ethylene helps to initiate flowering in pineapple and for synchronising fruit-set in pineapples.
12) Ethylene is highly effective in fruit ripening. It enhances the respiration rate during ripening of the fruits. This rise in the rate of respiration is called Respiratory climactic.
13) Sugarcane stores carbohydrate as sugar in their stems. Spraying sugarcane crop with gibberellins increases the length of the stem, thus increasing the yield.
14) In higher plants, the growing apical bud inhibits the growth of the lateral buds. This phenomenon is called as Apical dominance. Auxin induces apical dominance. Cytokinins overcomes apical dominance
15) ABA inhibits seed germination. ABA stimulates the closure of stomata and increases the tolerance of plants to various kinds of stresses. Therefore, it is also called the stress hormone.
16) The process of internode elongation just prior to flowering in many plants with rosette habit like beet, cabbages is called as Bolting. Gibberellins promotes bolting.
17) No. Leaves are the site of photoperiodic perception in plants. It has been hypothesised that there is a hormonal substance that is responsible for flowering. This hormonal substance migrates from leaves to shoot apices for inducing flowering .So a defoliated plant won't respond to photoperiodic cycle.
18) Natural Auxin -IAA ,IBA Synthetic Auxin - NAA, 2-4D
19) a- Auxins are responsible for apical dominance and so it inhibits the growth of lateral buds b -Ripe fruits produces a gaseous plant hormone ethylene which can accelerate the ripening of unripe fruits
20) Ethylene promotes root growth. It also helps in root hair formation, thus helping the plants to increase their absorption surface and thereby increase the rate of absorption of water.
21) Long day plants are plants that require the exposure to light for a period more than its critical duration to initiate flowering. Short day plants are plants that require the exposure to light for a period less than this critical duration to initiate flowering.
22)

Column A	Column B
Weed free lawn	Auxin
Sprouting of potato tubers.	Ethylene
To produce new leaves & chloroplasts in leaves	Cytokinins
Petiole elongation in deep water rice plants.	Ethylene
Stimulates the closure of stomata	ABA
Early seed production in conifers	Gibberellins

- 23) The PGRs can be broadly divided into two groups based on their functions in a living plant body.
1) Plant growth promoters - These are involved in growth promoting activities, such as cell division, cell enlargement, pattern formation, tropic growth, flowering, fruiting and seed formation. e.g., auxins, gibberellins and cytokinins.
2) The PGRs of the other group play an important role in plant responses to wounds and stresses of biotic and abiotic origin. They are also involved in various growth inhibiting activities such as dormancy and abscission. The PGR abscisic acid belongs to this group. The gaseous PGR, ethylene, could fit either of the groups, but it is largely an inhibitor of growth activities.
24) Flowering in certain plants depends on a combination of light and dark exposures and also their relative durations. This response of plants to periods of day/night is termed as photoperiodism.
-Some plants require the exposure to light for a period more than a well-defined critical duration to initiate flowering. This group of plants are called Long day plants.
-Some plants require the exposure to light for a period less than this critical duration to initiate flowering. This group of plants are termed Short day plants.
-In some plants , there is no such correlation between exposure to light duration and induction of flowering response. Such plants are called day-neutral plants
25) a- Gibberellins, b-Cytokinins, c-Auxin, d-Gibberellins, e-ABA, f-Ethylene.

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