

SAMPLE QUESTION PAPER-D

Section-A

1. It means in an artificial environment such as test-tube. 1
2. Salivary glands, liver and gall bladder. (Any two) 1
3. (a) Banyan tree – Prop trees, (b) Mangrove trees – Pneumatophores. 1
4. The protein component of silk fibre derived from silkworms and spiders which form threads to create webs and cocoons. 1
5. (a) No. of chromosomes does not change in any stage of cell cycle during mitosis and in meiosis, it changes to half in anaphase I. $\frac{1}{2}$
 (b) S-phase of interphase – The DNA content doubles after DNA replication. $\frac{1}{2}$

Section-B

6. The movement of water occurs exclusively through the cell wall and intercellular spaces. It does not cross any membrane or living component of the cell. It occurs in cortex as the cortical cells are loosely arranged and offer no resistance. Since endodermis has casparian strips made of suberin, it does not allow movement to pass through and so the water is forced to follow symplast pathway. 2

OR

Fibrous joints do not allow any movement. This type of joint is shown by the flat skull bones which fuse end-to-end with the help of dense fibrous connective tissues in the form of sutures, to form the cranium. In cartilaginous joints, the bones involved are joined together with the help of cartilages. The joint between the adjacent vertebrae in the vertebral column is of this pattern and it permits limited movements. 2

7. (i) By direct transfer of phosphate to ADP.
 (ii) By oxidation of NADH produced in glycolysis to NAD in ETS. 2
8. The malpighian tubules are found at the junction between midgut and hindgut in insects like cockroach, grasshopper etc. it helps in excretion. Gizzard is found in the digestive system of earthworm, cockroach and birds. It helps in grinding the food materials. 2
9. Coleoptile is the leaf like sheath that covers and protects the plumule. Coleorrhiza is the sheath that protects the radicle. 2
10. The four classes of kingdom fungi are : Phycomycetes, Ascomycetes, Basidiomycetes and Deuteromycetes. 2

Section-C

11. Class I – Oxidoreductases, Class II – Transferases, Class III – Hydrolases, Class IV – Lyases, Class V – Isomerases and Class VI – Ligases. 3
12. Xylem and phloem are called complex tissues as they are made up of more than one type of cells and they work as a unit.

Xylem components are :

- (i) Tracheids are elongated or tube like cells with thick and lignified walls and tapering ends. These are dead and are without protoplasm.
- (ii) Vessel is a long cylindrical tube-like structure made up of many cells called vessel members, each with lignified walls and a large central cavity.
- (iii) Xylem fibres have highly thickened walls and obliterated central lumens. These may either be septate or aseptate.

- (iv) Xylem parenchyma cells are living and thin-walled and their cell walls are made up of cellulose.

Phloem components are :

- (i) Sieve tube elements are long, tube-like structures, arranged longitudinally and are associated with the companion cells. Their end walls are perforated in a sieve-like manner to form the sieve plates.
- (ii) Companion cells are specialised parenchymatous cells, which are closely associated with sieve tube elements.
- (iii) Phloem parenchyma is made up of elongated, tapering cylindrical cells which have dense cytoplasm and nucleus.
- (iv) Phloem fibres are made up of sclerenchymatous cells.

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13. **Actinomorphic** : Such flowers show radial symmetry and can be divided into two similar halves in any radial plane passing through the center, *e.g.* Mustard.

Zygomorphic : (Bilateral symmetrical) They can be divided into two similar halves only in one particular plane, *e.g.* Sweet pea, Bean.

Asymmetric : (Irregular) Cannot be divided into two similar halves in any plane, *e.g.* Canna.

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14. Phyllotaxy refers to the mode of arrangement of leaves on stem or branch.

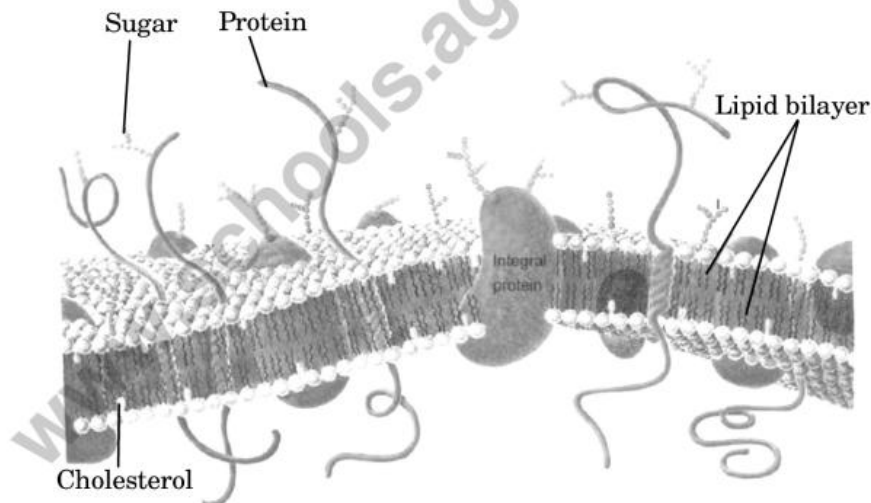
Racemose inflorescence	Cymose inflorescence
(i) Flower opening is centripetal.	Flower opening is centrifugal.
(ii) The terminal bud continues to grow.	The terminal bud forms a flower.
(iii) Flowers are arranged in an acropetal order.	Flowers are arranged in a basipetal order.

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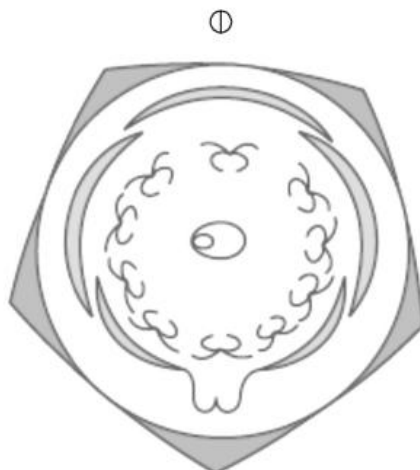
15. Radial symmetry: Echinodermata, Haemocoel : Arthropoda, Water vascular system : Echinodermata, Setae : Annelida, Pneumatic bones : Chordata and Radula : Mollusca.

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OR



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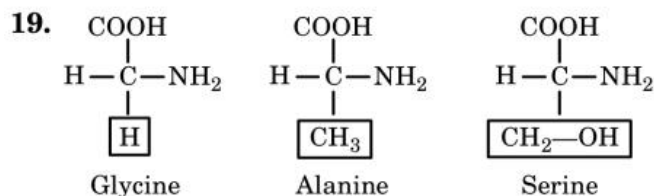
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17. (a) Gibberellins, (b) Cytokinins, (c) Auxin.

18. Plants are grouped into the following three categories :

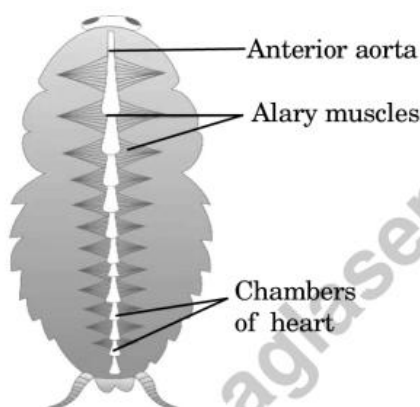
- (a) **Short-day plants** – These plants which need a light shorter than their critical photoperiods for flowering. *e.g.*, – Chrysanthemum, Cosmos.
- (b) **Long-day plants** – These plants which need light period longer than their critical photoperiods for flowering. *e.g.*, – Wheat, barley.
- (c) **Intermediate-day plants** – These plants are not influenced by length of light period for flowering. *e.g.*, – Tomato, cucumber.

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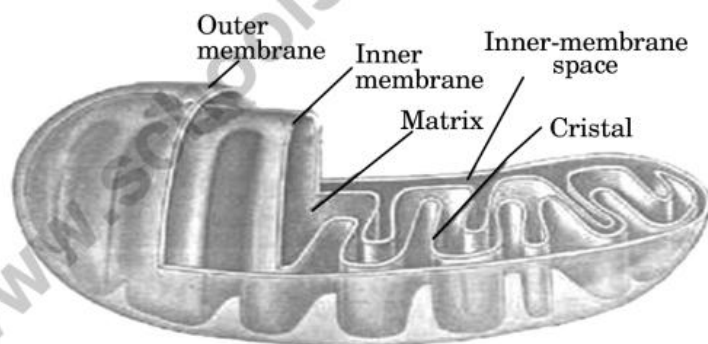
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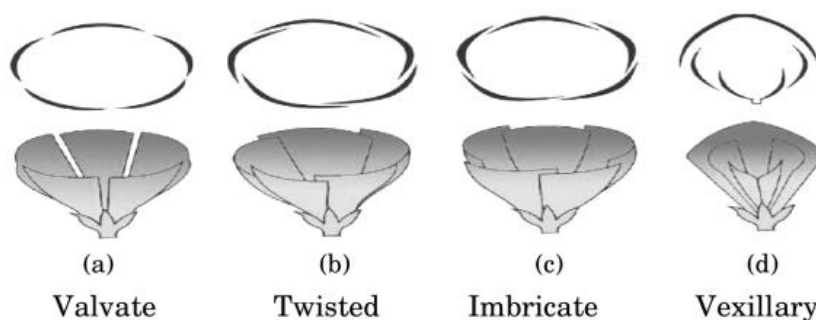
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21.



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22.



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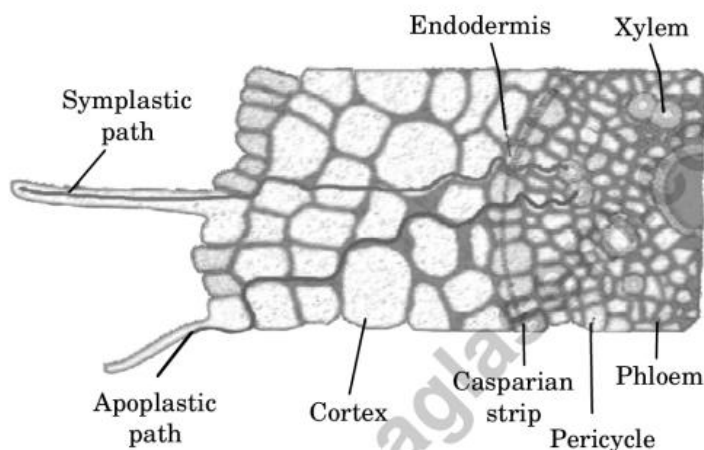
23. Katrina could have brought only one full plant to demonstrate instead of uprooting so many saplings. This practice shows irresponsible and indifferent attitude of Katrina towards environment.

Value – Responsibility, care, concern and respect for nature.

3+1=4

24. (1) Most of the water flow in the roots occurs via the apoplast since the cortical cells are loosely packed, and hence offer no resistance to water movement. However, the inner boundary of the cortex, the endodermis, is impervious to water because of a band of suberized matrix called the casparian strip.
- (2) Water molecules are unable to penetrate the layer, so they are directed to wall regions that are not suberised, into the cells proper through the membranes.
- (3) The water then moves through the symplast and again crosses a membrane to reach the cells of the xylem. The movement of water through the root layers is ultimately symplastic in the endodermis. This is the only way water and other solutes can enter the vascular cylinder. Once inside the xylem, water is again free to move between cells as well as through them.
- (4) In young roots, water enters directly into the xylem vessels and/or tracheids. These are non-living conduits and so are parts of the apoplast.

3



2

OR

- (1) Whenever the supply of an essential element becomes limited, plant growth is retarded.
- (2) The concentration of the essential element below which plant growth is retarded is termed as deficiency. The element is said to be deficient when present below the critical concentration. Since each element has one or more specific structural or functional role in plants, in the absence of any particular element, plants show certain morphological changes.
- (3) These morphological changes are indicative of certain element deficiencies and are called deficiency symptoms. The deficiency symptoms vary from element to element and they disappear when the deficient mineral nutrient is provided to the plant.
- (4) However, if deprivation continues, it may eventually lead to the death of the plant. The parts of the plants that show the deficiency symptoms also depend on the mobility of the element in the plant. For elements that are actively mobilized within the plants and exported to young developing tissues, the deficiency symptoms tend to appear first in the older tissues. For example, the deficiency symptoms of nitrogen, potassium and magnesium are visible first in the senescent leaves.
- (5) In the older leaves, biomolecules containing these elements are broken down, making these elements available for mobilising to younger leaves. The deficiency symptoms tend to appear first in the young tissues whenever the elements are relatively immobile and are not transported out of the mature organs, for example, elements like sulphur and calcium are a part of the structural component of the cell and hence are not easily released.
- (6) The kind of deficiency symptoms shown in plants includes chlorosis, necrosis, and stunted plant growth, premature fall of leaves and buds, and inhibition of cell division. Chlorosis is the loss of chlorophyll leading to yellowing in leaves. This symptom is caused by the deficiency of elements N, K, Mg, S, Fe, Mn, Zn and Mo. Likewise, necrosis, or death of tissue, particularly leaf tissue, is due to the deficiency of Ca, Mg, Cu and K. Lack or low level of N, K, S and Mo causes an inhibition of cell division. Some elements like N, S and Mo delay flowering if their concentration in plants is low.

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25. (1) The most exciting aspect of chemistry deals with isolating thousands of compounds from living organisms, determining their structure and synthesizing them. These organic compounds including amino acids, sugars, etc. are called 'metabolites'. In animal tissues, the presence of all such categories of compounds is called primary metabolites.
- (2) However, when one analyses plant, fungal and microbial cells, one would see thousands of compounds other than these called primary metabolites, *e.g.* alkaloids, flavonoides, rubber, essential oils, antibiotics, coloured pigments, scents, gums and spices. These are called secondary metabolites.
- (3) The primary metabolites have identifiable functions and play known roles in normal physiological processes. It is easy to understand the role or functions of all the 'secondary metabolites' in host organisms. However, many of them are useful to 'human welfare' (*e.g.*, rubber, drugs, spices, scents and pigments). Some secondary metabolites have ecological importance.

Some Secondary Metabolites

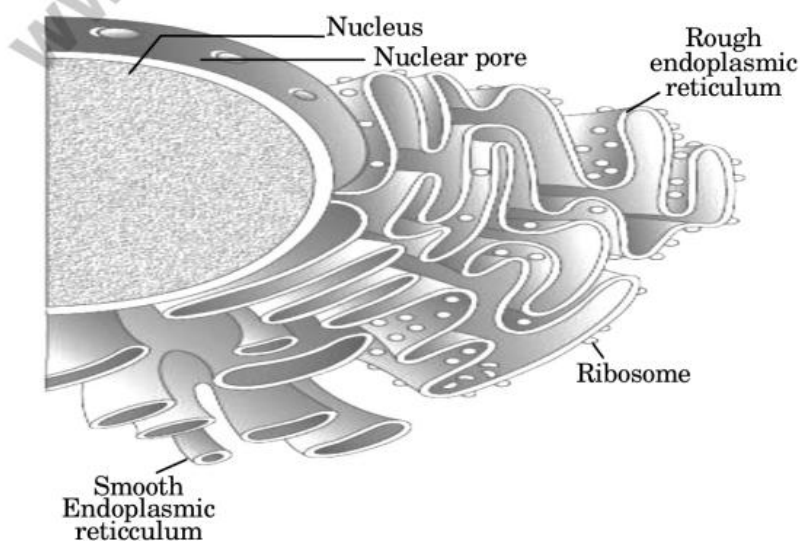
Pigments	Carotenoids, Anthocyanins, etc.
Alkaloids	Morphine, Codeine, etc
Terpenoides	Monoterpenes, Diterpenes etc.
Essential oils	Lemon grass oil, etc.
Toxins	Abrin, Ricin
Lectins	Concanavalin A
Drugs	Vinblastin, curcumin. etc.
Polymeric substances	Rubber. gums, cellulose

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OR

- (1) Electron microscopic studies of eukaryotic cells reveal the presence of a network or reticulum of tiny tubular structures scattered in the cytoplasm that is called the endoplasmic reticulum (ER). Hence, ER divides the intracellular space into two distinct compartments, *i.e.*, luminal (inside ER) and extra luminal (cytoplasm) compartments.
- (2) The ER often shows ribosomes attached to their outer surface. The endoplasmic reticulum bearing ribosomes on their surface is called rough endoplasmic reticulum (RER). In the absence of ribosomes they appear smooth and are called smooth endoplasmic reticulum (SER).
- (3) RER is frequently observed in the cells actively involved in protein synthesis and secretion. They are extensive and continuous with the outer membrane of the nucleus. The smooth endoplasmic reticulum is the major site for synthesis of lipid. In animal cells, lipid like steroidal hormones are synthesized in SER.

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2

26. (1) Androecium is composed of stamens. Each stamen which represents the male reproductive organ consists of a stalk or a filament and an anther. Each anther is usually bilobed and each

lobe has two chambers, the pollen-sacs. The pollen grains are produced in pollen sacs. A sterile stamen is called staminode. Stamens of flower may be united with other members such as petals or among themselves.

- (2) When stamens are attached to the petals, they are epipetalous as in brinjal, or epiphyllous when attached to the perianth as in the flowers of lily. The stamens in a flower may either remain free (polyandrous) or may be united in varying degrees. The stamens may be united into one bunch or one bundle (monadelphous) as in china rose, or two bundles (diadelphous) as in pea, or into more than two bundles (polyadelphous) as in citrus. There may be a variation in the length of filaments within a flower, as in Salvia and mustard.
- (3) Gynoecium is the female reproductive part of the flower and is made up of one or more carpels. A carpel consists of three parts namely stigma, style and ovary. Ovary is the enlarged basal part, on which lies the elongated tube, the style. The style connects the ovary to the stigma. The stigma is usually at the tip of the style and is the receptive surface for pollen grains. Each ovary bears one or more ovules attached to a flattened, cushion-like placenta.
- (4) When more than one carpel is present, they may be free (as in lotus and rose) and are called apocarpous. They are termed syncarpous when carpels are fused, as in mustard and tomato. After fertilisation, the ovules develop into seeds and the ovary matures into a fruit. **5**

OR

- (1) All the four chambers of heart are in a relaxed state, *i.e.*, they are in joint diastole. As the tricuspid and bicuspid valves are open, blood from the pulmonary veins and vena cava flows into the left and the right ventricle respectively through the left and right atria.
- (2) The semilunar valves are closed at this stage. The SAN now generates an action potential which stimulates both the atria to undergo a simultaneous contraction – the atrial systole. This increases the flow of blood into the ventricles by about 30 per cent.
- (3) The action potential is conducted to the ventricular side by the AVN and AV bundle from where the bundle of His transmits it through the entire ventricular musculature. This causes the ventricular muscles to contract, (ventricular systole), the atria undergoes relaxation (diastole), coinciding with the ventricular systole.
- (4) Ventricular systole increases the ventricular pressure causing the closure of tricuspid and bicuspid valves due to attempted backflow of blood into the atria. As the ventricular pressure increases further, the semilunar valves guarding the pulmonary artery (right side) and the aorta (left side) are forced open, allowing the blood in the ventricles to flow through these vessels into the circulatory pathways. The ventricles now relax (ventricular diastole) and the ventricular pressure falls causing the closure of semilunar valves which prevents the backflow of blood into the ventricles. As the ventricular pressure declines further, the tricuspid and bicuspid valves are pushed open by the pressure in the atria exerted by the blood which was being emptied into them by the veins. The blood now once again moves freely to the ventricles.
- (5) The ventricles and atria are now again in a relaxed (joint diastole) state, as earlier. Soon the SAN generates a new action potential and the events described above are repeated in that sequence and the process continues. This sequential event in the heart which is cyclically repeated is called the cardiac cycle and it consists of systole and diastole of both the atria and ventricles. The heart beats 72 times per minute, *i.e.*, that many cardiac cycles are performed per minute.
- (6) The body has the ability to alter the stroke volume as well as the heart rate and thereby the cardiac output. For example, the cardiac output of an athlete will be much higher than that of an ordinary man. During each cardiac cycle two prominent sounds are produced which can be easily heard through a stethoscope. The first heart sound (lub) is associated with the closure of the tricuspid and bicuspid valves whereas the second heart sound (dub) is associated with the closure of the semilunar valves. These sounds are of clinical diagnostic significance. **5**



