Nagaland Board
Class XI
Bio-Zoology
Sample Paper 1 – Solution

PART A

1. (iii)
Gymnosperms are known as seeded plants without flowers because their ovules are not covered and lie naked on the surfaces of specialised leaves arranged into cones

2. (ii)
A sucker is the modification of a stem which originates from the basal and underground portion of the main stem. Examples: Banana, Chrysanthemum

3. (iii)
The inside and outside movement of CO_2 and O_2 during respiration and photosynthesis is achieved by independent diffusion.

4. (i)
Jan Ingenhousz modified Joseph Priestley's experiment and demonstrated that sunlight is important for the process of photosynthesis.

5. (ii)
Continuous exposure to red light causes conversion of Pr to Pfr which is rapidly destroyed and the inhibition of synthesis of Pr. Thus, the total amount of phytochrome is decreased.

6. A leaf of silk cotton is palmately compound because the petiole bears leaflets at the tip of the petiole like the fingers of the palm.

7. The tracheids and vessels are collectively referred to as the tracheary elements.

(a) Tracheids: The tracheids are elongated dead cells with hard lignified walls, wide lumen and narrow end walls. The inner walls of tracheids have various types of thickenings for mechanical strength.

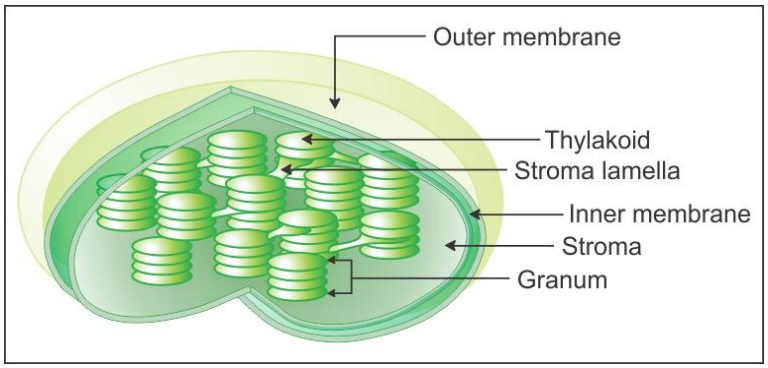
(b) Vessels: They are much elongated tubes which are closed at either end and are formed by the union of several short, wide and thickened cells called vessel elements or members.
Each cell of the vessel elements is lignified with a large cavity and devoid of protoplasm.

The end walls of vessel elements are transverse or oblique. They are often completely dissolved; the condition is called a simple perforation plate. In few cases, there are multiple perforation plates

8. Ferns which produce two kinds of spores—microspores and megaspores—are called heterosporous ferns. Examples: Selaginella, Salvinia

9. Double fertilisation is unique to angiosperms.
In this phenomenon, two male gametes are discharged by a pollen tube into the embryo sac of an ovule. One male gamete fuses with the female gamete to form a zygote. This fusion is called syngamy. A second male gamete fuses with the secondary nucleus to form the primary endosperm nucleus. This is called double fertilisation.

10.



Or

A photosystem is a group of pigments which are involved in photosynthesis. These pigment systems have a reaction centre to which light energy absorbed by the accessory pigments is passed. There are two photosystems—I and II. A chlorophyll a molecule acts as the reaction centre. It is called P700 in PS I and P680 in PS II.

11. The factors affecting the rate of diffusion:

i. Temperature: The rate of diffusion increases with the increase in temperature because the kinetic energy of diffusing particles also increases with increasing temperature.

ii. Density of diffusing substance: The rate of diffusion is inversely proportional to the square root of the density of the diffusing substance.

iii. Medium in which diffusion occurs: The rate of diffusion decreases in a concentrated medium. Example: A gas diffuses more rapidly through vacuum than air.

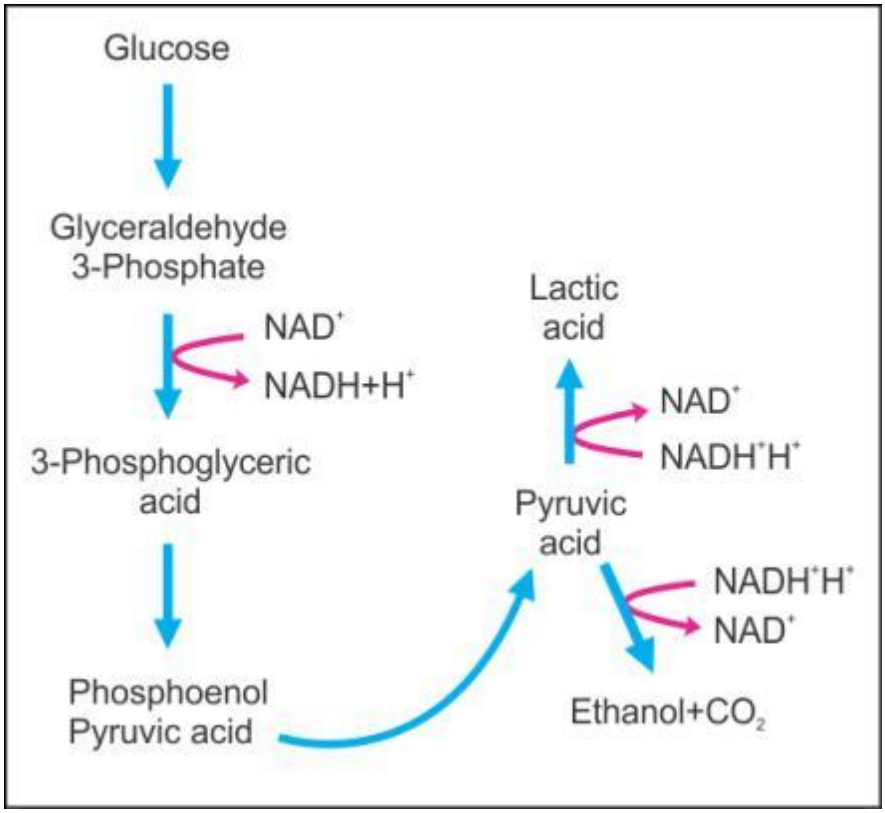
12. To enter the respiratory pathway, fatty acids and proteins are broken down or degraded to acetyl CoA.

During the synthesis of proteins and fats, the substances are withdrawn from the respiratory pathways and used in anabolism.

The breakdown of substances is called catabolism, and the formation of substances is called anabolism. Because the respiratory pathway is responsible for both anabolism and catabolism, it is called an amphibolic pathway.

Or

Pathway of anaerobic respiration:



13.

(a) Auxin fails to cause growth of intact plants because the required amount of auxin is already present in such plants and they do not need an external supply of auxins.

(b) Vitamins have no specific influence on the growth of plants. They are essential dietary factors needed by an organism in small amounts. They influence the growth and metabolism through direct nutritive effects.

(c) Short-day plants need a long and uninterrupted dark period for flowering. Therefore, it is appropriate call a short-day plant a long-night plant.

(d) Plants belonging to halophytes and growing in marshy lands face a great difficulty in seed germination due to the presence of a high concentration of salt in water. These plants solve this problem by vivipary.

Gibberellins require the presence of meristematic cells to cause elongation growth. Therefore, they do not enhance the growth of isolated plant parts if meristematic cells are absent.

Or

i. 1. Mesophyll cells
2. Mesophyll chloroplasts
3. Cells of bundle sheath
4. Bundle sheath chloroplasts

ii. Kranz anatomy is shown in the given diagram. This anatomy occurs in the leaves of C_4 plants in which the bundle sheath cells are arranged in a wreath- like manner.

Structure and function of mesophyll chloroplasts: Mesophyll chloroplasts are granal and contain thylakoids which are stacked to form grana. These chloroplasts are involved in the light reaction with the evolution of molecular 0_2. CO_2 is fixed by phosphoenol pyruvic acid to form 4 carbon oxaloacetic acid. Structure and function of bundle sheath chloroplasts: These chloroplasts are agranal, i.e. grana are absent and the thylakoids are present only as stroma lamellae. The C_3 cycle occurs in bundle sheath chloroplasts in which CO_2 is fixed by RuBP catalysed by the enzyme RuBisCO (RuBisCO is present only in bundle sheath chloroplasts). CO_2 is made available by decarboxylation of 4 carbon organic acid (malic acid).

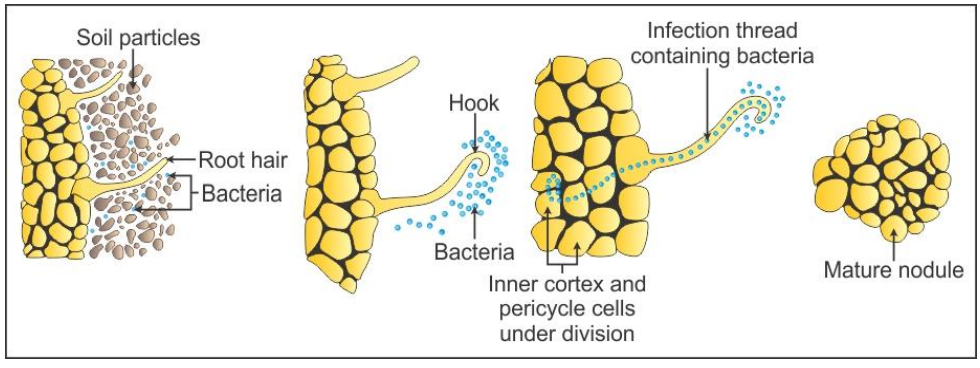
14. Steps in the development of root nodules:

(a) The roots of legumes secrete flavonoids and betaines which attract Rhizobium bacteria.

(b) The bacteria collect over the root hair and release Nod factors which cause curling of root hair.

(c) The enzymes from the bacteria degrade the parts of root hair cell wall which produces a thread-like structure called the infection thread.

(d) The bacteria multiply and invade the infection thread and finally reach up to the inner cortex where they enter the cells and divide to form a knob-like protuberance called root nodule.



Or

i. Root hair, 4. Endodermis

Function of parts 1 and 4:

(a)

1. Root hair: The root hair is unicellular elongations of epidermal cells. Each root hair is about 0.05–15 mm long and 10 μ wide. It has a central vacuole filled with cell sap which determines the osmotic relations of the cell. Root hair are specialised for absorption of water.

4. Endodermis: It is the inner boundary of the cortex and is single layered. It is made of barrel-shaped cells which do not enclose intercellular spaces. Endodermis is called the starch sheath in stems. The major function of endodermis in roots is to prevent the loss of water and minerals.

ii. Pathway 2 – Symplast

In this pathway, water moves from cell to cell through the living cytoplasm and plasmodesmata.

Pathway 3 – Apoplast

In apoplast, movement of water takes place through non-living cell walls and intercellular spaces.

PART B

1. (ii)
The characteristic feature of coelenterates is the presence of nematocysts or stinging cells. Nematocysts help in food capture, defence and attachment.

2. (i)
Histamine is secreted by mast cells which are modified basophils of blood which occur in the loose connective tissue.

3. (iii)
The groups of enzymes which catalyse the hydrolysis of phosphodiester bonds between nucleic acids in a polynucleotide chain are endonucleases.

4. (ii)
In Emphysema, over inflation of the alveoli and rupture of alveolar walls occur. This decreases the surface area and pulmonary ventilation.

5. (iv)
Blood supply to the heart stops due to complete blockage of the coronary arteries which results in coronary heart disease which is also called atherosclerosis.

6. Metaphase is the best stage to study the morphology of chromosomes because the chromosomes are the shortest and thickest at this stage.

7. Haemocoel is a body cavity or pseudocoel filled with blood. It is found in Arthropods and Molluscs.

8. Intestinal lumen and intestinal epithelial cells.
The enzyme which digests fats is lipase.The end-products of fat digestion are fatty acids and glycerol.

9. Significance of meiosis:
i. Formation of gametes: Meiosis produces gametes for sexual reproduction.
ii. Crossing over: It introduces a new combination of traits or variations.
Maintenance of chromosome number: Meiosis reduces the number of chromosomes to half in the gametes so that fertilisation may restore the original diploid number in the zygote

10.

i. Arthritis. It is caused by the inflammation of the joints. It is a common disease in old age which includes pain and stiffness in the joints.

ii. Sprain. It refers to an injury to a joint capsule which involves stretching or tearing of tendons or ligaments. This condition may often remain for a week or may take more time. Thus, it may become chronic.

iii. Osteoporosis. It results from excessive resorption of calcium and phosphorus from the bones and leads to more chances of fractures. The major causes of this disorder are imbalances of hormones (such as calcitonin of thyroid, parathormone of parathyroids and sex hormones) and deficiency of vitamin D.

Or

Cretinism is a disorder caused by the deficiency of thyroid hormone (hypothyroidism) in infants.

Causes:

i. Failure of the thyroid gland to secrete thyroxine

ii. Hyposecretion of thyrotropin-releasing hormone (TRH)

11.

i. Cockroaches cause damage to household materials such as clothes, purses, shoes etc. They also eat and destroy human food such as bread, fruits, cheese etc.

ii. They carry harmful germs of diseases such as diarrhoea, cholera, typhoid, tuberculosis etc.

Many animals such as amphibians (e.g. frogs, toads), lizards and birds eat cockroaches. Thus, they are part of the food chain.

12. For the formation of oxyhaemoglobin, the factors required such as high pO_2, low pCO_2, low concentration of H^+ ions and low temperature are maintained in the alveoli. Hence, the binding of oxygen with haemoglobin at lung surfaces is faster.

Low pO_2, high pCO_2, high H+ ion concentration and high temperature are the factors found in tissues which always favour the dissociation of oxygen.

Or

Characteristic features of phylum Porifera:

a) Poriferans are marine animals.
b) They are asymmetrical.
c) They exhibit cellular level of organisation.
d) Sponges are hermaphrodite, i.e. eggs and sperms are produced by the same individual.

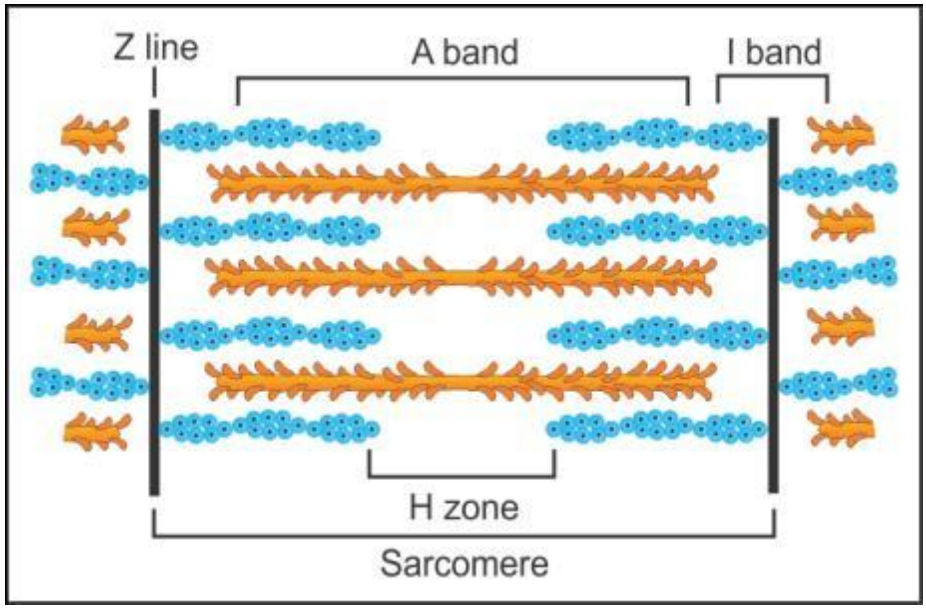
e) Sponges show the presence of a water canal system which helps in reproduction and gathering of food from the surrounding water, gas exchange and excretion.
f) Skeleton is made of spongin fibres or spicules.
g) Fertilisation in sponges is internal.
h) Digestion is intracellular.
i) Special cells called choanocytes are present on the internal lining of the spongocoel.

13.

a. The left and right ventricles are the pumping chambers of the heart.
b. The tricuspid valve is present between the right atrium and the right ventricle, while the mitral valve is present between the left atrium and the left ventricle.
c. When the tricuspid and bicuspid valves are present, the lub sound is produced. When the semilunar valves are closed, the dub sound is produced.
d. We should always approach our parents for advice and proper knowledge when we face problems or questions in life.

Or

Structure of Myofibril:



a. The myofibril is a unit filament of a muscle fibre.
b. It is made of two kinds of bands - dark band and light band.

c. A dark band is also known as an A or anisotropic band (myosin filament) and contains myosin, while the light band is also known as an I or isotropic band (actin filament) and contains actin.
d. Both the bands or filaments are arranged parallel to each other.
e. Actin filaments are thinner than myosin filaments and are hence also called thin and thick filaments, respectively.
f. At the centre of each I band is an elastic fibre called Z-line to which thin filaments are firmly attached.
g. The thick filaments in the A band are held together by an M line.
h. The portion of the myofibril between two successive Z lines is considered functional and is called a sarcomere.
i. In the resting state, the edges of thin filaments partially overlap the free ends of thick filaments on either side leaving the central parts of the thick filament non-overlapped; this is called the H zone.

14.

a. At resting potential, the outer surface of the axon has a positive charge and the axoplasm has a negative charge.
b. When a stimulus is received by the axon at resting potential, say at site A, the axonal membrane becomes freely permeable to Na^+ ions.
c. This causes the rapid influx of Na^+ ions which makes the outer surface of the membrane negatively charged, and the axoplasm is positively charged. Hence, the action potential is achieved.
d. The region ahead of the region, site B, which is the action potential will be still in the resting potential. Due to this, the current from site A flows to site B on the inner surface, and it flows from site B to site A on the outer surface.
e. This results in the reverse of polarity, and hence, the action potential is generated at site B.
f. This sequence is repeated along the length of the axon till the impulse reaches the axon terminal.

Or

In sexually reproducing fungi, hyphae of two compatible mating types fuse.
In some fungi, the fusion of haploid cells immediately forms diploid cells (2n), but in some ascomycetes and basidiomycetes, the fusion results in an n+n stage, i.e. single cell with two nuclei. Such a condition of cell is called the dikaryon condition and the stage is known as dikaryophase.
The polar nuclei of the cells then fuse and the cell becomes diploid.
Reduction division occurs inside the fruiting bodies resulting in the formation of fungi.