

SET-A

MARKING SCHEME

SECTION-A

1. Pick out the plant that shows whorled phyllotaxy.
China rose, Alstonia, Opuntia, Calotropis
A. Alstonia 1
2. What is TCT? State its function. ½ + ½
A. Thyrocalcitonin-regulates the blood calcium levels.
3. Both Starch and Cellulose are homopolymers of Glucose. Only starch give blue colour with Iodine and not the Cellulose. Why?
A. Starch forms helical secondary structures and can hold I₂ molecules to give blue colour. 1
4. Give the scientific name of a common Indian Earthworm.
A. Pheretima posthuma ½ + ½
5. What is plasmolysis?
A. When a plant cell is placed in a hypertonic solution water diffuses out from its cytoplasm and from vacuole causes the protoplast to shrink away from the walls. This is reversible process. 1
6. In what way the cartilaginous fish different from the bony fish with respect to the location of mouth?
A. In cartilaginous fish mouth is ventral and in bony fish it is mostly terminal. ½ + ½
7. Name the protein that masks the active binding sites for myosin on the actin filaments.
A. Troponin – its sub-unit masks the active binding sites for myosin. 1
8. Define the phenomenon which form the basis of growing some varieties of wheat in spring season or autumn season.
A. Vernalisation – in certain plants like wheat flowering is either quantitatively or qualitatively dependent on exposure to low temperature. 1

M

SECTION-B

9. Mention any four characteristics of birds that help them to fly.

A. Flight adaptations:

- i. Fore limbs modified into wings
- ii. Pneumatic bones-hollow with air cavities
- iii. Air sacs are connected to lungs supplement respiration
- iv. Presence of feathers ?
- v. Warm blooded –homiothermous, maintain constant body temperature
- vi. Digestive tract having crop and gizzard ½ x4=2

10. What is the difference between heart wood and sap wood?

A. Heart wood is centrally located highly lignified secondary xylem in stem of old trees dark brown, hard, durable and resistant to pests and microbes due to deposition of tannins, resins, gums etc. , does not conduct water but gives mechanical support.

Sap wood is peripheral to the heart wood, lighter in colour lack ergastic substances and involved in the conduction of water and minerals. 1+1=2

OR

What is the difference between spring wood and autumn wood?

A. In the spring season, cambium is very active and produces a large number of xylary elements having vessels with wider cavities. The wood formed during this season is lighter in colour and has a lower density and is called spring wood or early wood. In winter, the cambium is less active and forms fewer xylary elements with narrow vessels and the wood formed is darker and has a higher density called autumn wood or late wood. 1+1=2

11. Give the name of the excretory organs A, B, C and D found in the following animals choosing from those given in column three .

Organism	Excretory Organ	Choose from
Planaria	A	Flame cells/Nephridia
Amphioxus	B	Flame cells/Kidneys
Earth worm	C	Gills/Nephridia
Prawn	D	Antennal gland/Malpighian tubules

A.

Organism	Excretory Organ
Planaria	A- Flame cells
Amphioxus	B- Flame cells
Earth worm	C- Nephridia
Prawn	D- Antennal gland

2

12. What are mesosomes? State any two of its functions.

A. Mesosomes in prokaryotic cells are special structures formed by the extensions of plasma membrane into the cell as vesicles, tubules and lamellae.

Functions:

- i. Help in cell wall formation
- ii. Help in DNA replication and distribution to daughter cells
- iii. Help in respiration, secretion processes
- iv. Increases the surface area of the plasma membrane and enzymatic content.

1 + ½ x 2 = 2

13. What is hydroponic? Mention its two uses.

A. The technique of growing plants in a soil free nutrient medium.

Uses:

- i. Essential elements for the plants were identified and their deficiency symptoms discovered.
- ii. Commercial production of certain vegetables such as tomato, seedless cucumber and lettuce.

1 + ½ x 2 = 2

14. Describe the naming system given by C. Linnaeus which is being practiced by

biologists all over the world.

A. Binomial nomenclature, this naming system provides scientific names to known organisms. Each scientific name has two components-the generic name and the specific epithet.

The scientific names are in Latin and written in italics.

The first name is generic name starts with capital letter while the second name is specific name starts with a small letter, and when hand written separately underlined.

1 + ½ x 4 = 2

15. What are Ribosomes? Where they are found in a plant cell? State their function.

A. Ribosomes are non-membrane bound organelles found in both prokaryotic and eukaryotic cells. Within the cells they are found in the cytoplasm, chloroplasts in

plant cells and in mitochondria and on rough ER. Ribosomes are the site of protein synthesis.

$\frac{1}{2} + 1 + \frac{1}{2} = 2$

16. How will you distinguish a male frog from the female frog?

A. Male frog has sound producing vocal sacs and also a copulatory pad on the first digit of the fore limbs.

$1 + 1 = 2$

17. What are nucleosides and nucleotides? Give one example of each.

A. Nucleosides: nitrogen bases A, G, T, C, U when found attached to a sugar. $\frac{1}{2}$

E.g. Adenosine, Guanosine $\frac{1}{2}$

Nucleotides: a nucleoside where a phosphate group is found esterified. $\frac{1}{2}$

E.g. Adenylic acid, Cytidylic acid $\frac{1}{2}$

18. Mention the major pigments, stored food, and composition of cell wall and nature of asexual spores in Red Algae.

A. Major pigments-chlorophyll a, d and phycoerythrin

Stored food- Floridean starch

Cell wall- Cellulose

Asexual spores- non-motile

$\frac{1}{2} \times 4 = 2$

SECTION-C

19. What is Transpiration? How it is useful to plants?

A. Transpiration is the evaporative loss of water by plants mainly through stomata in the leaves.

Significance of transpiration:

a. Creates transpiration pull for absorption and transport of materials

b. Supplies water for photosynthesis

c. Transport minerals from the soil to all parts of the plant

d. Cools leaf surfaces (10-15°C) by evaporative cooling

e. Maintain the shape and structure of the plants by keeping cells turgid $\frac{1}{2} \times 6 = 3$

20. Distinguish Anaphase of Mitosis from Anaphase I of Meiosis. Show it with the help of diagrams.

A. Anaphase of mitosis:

Each chromosome arranged at the metaphase plate split simultaneously and the two daughter chromatids begin to move in equal numbers towards the opposite poles. Refer text book fig-10.2 b and c pg #165-166 2

Anaphase I of meiosis:

Homologous chromosomes move to the opposite poles with both their chromatids remains associated at their centromeres. Refer text book fig-10.3 pg #169 1

21. Describe the role of pancreatic juice in the digestion of food in small intestine.
- A. Proteins + Peptones + Proteoses are converted into Dipeptides by the action of
✓ Trypsin/Chymotrypsin and Carboxypeptidase.
✓ Polysaccharides are converted into Disaccharides by Amylase.
✓ Fats with the help of Bile are converted into Di/Monoglycerides by Lipases.
✓ Nucleases convert Nucleic acids into nucleotides and nucleosides. 3

22. What is inflorescence? Describe racemose and cymose type of inflorescence.

A. The arrangement of flowers on the floral axis is inflorescence.

✓ Racemose – main axis continues to grow

Flowers are borne laterally in an acropetal succession

✓ Cymose- main axis terminates in a flower, growth is limited

Flowers are borne in basipetal succession 3

OR

What are compound leaves? Describe the pinnately and palmately compound leaves.

A. ✓ A leaf with entire lamina or incised but the incisions do not touch the midrib is said to be simple leaf. When the incisions reach up to the midrib to form a number of leaflets, the leaf is called compound leaf.

In pinnately compound leaf a number of leaflets are on a common axis or rachis which represents the midrib of the leaf as in neem.

In palmately compound leaf, the leaflets are attached at the tip of petiole as in silk cotton. 3

23. Name the different groups of hormones based on their chemical nature.

Describe the mechanism of action of any one type of hormone.

A. Groups of hormones:

i. Peptide, polypeptide, protein hormones-insulin

ii. Amino acid derivatives-Adrenalin

iii. Iodothyronines-thyroxine

iv. Steroids-testosterone, esterone $\frac{1}{4} \times 4 = 1$

Hormones produce their effects on target tissues by binding to specific proteins called hormone receptors present on the cell membrane or in the cytoplasm or even in the nucleus/DNA of the target cell. 1

The binding of the hormone with its receptor results in the formation of a hormone-receptor complex that triggers certain biochemical changes to regulate metabolism. Hormones which interact with membrane-bound receptors do not

enter the target cell, but generate a second messenger cAMP, Inositol tri phosphate IP3, Ca⁺⁺ etc which inturn regulate cellular metabolism. E.g. FSH 1
or

Thyroxine and Steroid hormones enter the nucleus and bind with DNA either to initiate or inhibit gene expression to trigger certain physiological responses. E.g. Estrogen 1

24. What is arithmetic and geometric growth? Draw the graph showing an ideal geometric growth curve.

- A. The increased growth per unit time is growth rate. In arithmetic growth, following mitotic cell division, only one daughter cell continues to divide while the other differentiates and matures. E.g. root elongation at constant rate 1
In geometric growth both the daughter cells following mitotic division retain the ability to divide and continue to do so. 1
Refer text book pg # 243 fig: 15.6 for graph 1

25. Describe the arrangement of floral parts in relation to their position or insertion on thalamus.

- A. ~~Hypogynous flower~~: Gynoecium occupies the highest position on thalamus while the other parts are situated below it, and the ovary is said to be superior. E.g. china rose, mustard 1
~~Perigynous flower~~: Gynoecium is situated in the centre and other parts are located on the rim of the thalamus almost at the same level. The ovary is said to be half inferior. E.g. rose, plum 1
~~Epigynous flower~~: the margin of thalamus grows upward enclosing the ovary completely and getting fused with it, the other parts of flower arise above the ovary, which is said to be inferior. E.g. cucumber, ray florets of sun flower 1

26. What are joints? Locate the four types of movable joints in our fore limb.

- A. Joints are points of contact between bones, or between bones and cartilages that are essential for movements. 1

The types of joints in the fore limb:

1. Ball and socket joint between humerus and glenoid cavity of pectoral girdle.
2. Hinge joint or elbow joint
3. Gliding joints between the carpals
4. Saddle joint between carpal and metacarpal of thumb. $\frac{1}{2} \times 4 = 2$

27. Few gaps A, B, C, D, E and F have been left in the following table. Fill up the gaps.

A.

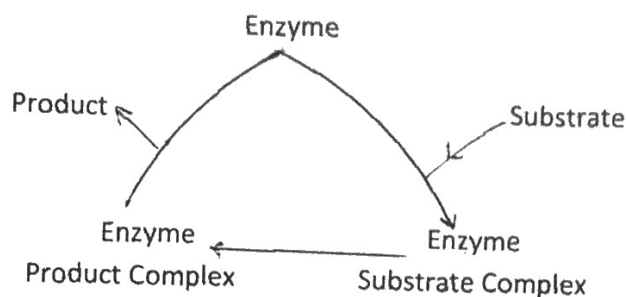
Characteristics	C ₃ Plants	C ₄ Plants
Cell type in which Calvin cycle take place.	Mesophyll Cell	A- <u>Bundle sheath cell</u>
Cell type in which initial carboxylation occur.	<u>B-Mesophyll Cell</u>	Mesophyll Cell
Cell type in which Rubisco present.	Mesophyll Cell	<u>C-Bundle sheath cell</u>
Primary CO ₂ acceptor	<u>D- RuBP</u> <u>Ribulose-1,5-</u> <u>bisphosphate</u>	PEP-Phosphoenol pyruvate
No. of Carbon in Primary CO ₂ acceptor	5 (Five)	3 (Three)
Primary CO ₂ fixation product	<u>E-PGA</u> <u>Phosphoglyceric</u> <u>acid</u>	<u>F- OAA</u> <u>Oxalo acetic acid</u>

SECTION-D

28. (a) What are enzymes? Describe the catalytic cycle of enzyme action.

A. Enzymes are biological catalysts that accelerates or decelerates the rate of any metabolic reaction by lowering the activation energy, and do not undergo any physical and chemical change during the reaction. All enzymes are 3D proteins except Ribozyme, with at least one, active sites for their action. Their activity is affected by temperature, pH, substrate concentration and co-factors. They have been classified into six categories and their names have a suffix, -ase to the type of reaction and its specific substrate.

1½



This concept map shows the steps in the catalytic cycle of an enzyme action:

- i. The substrate binds to the active site of the enzyme fitting into it.
- ii. The 3D enzyme undergoes conformational change fitting more tightly around the substrate to form a highly reactive short lived enzyme-substrate complex.
- iii. Active site of the enzyme breaks the chemical bonds of the substrate to form a new enzyme-product complex.
- iv. Lastly the enzyme releases the product and becomes free again to bind with another molecule of the substrate.

2

(b) Explain competitive inhibition of an enzyme with an example.

A. when the inhibitor closely resembles the substrate in its molecular structure and inhibits the enzyme activity, it is known as competitive inhibitor, as the inhibitor competes with the substrate for the substrate binding site of the enzyme.

Consequently, the substrate cannot bind and the product not formed. Malonate closely resembles the Succinate hence competitively bind with the Succinic dehydrogenase.

1½

OR

What are proteins? Describe the primary, secondary, tertiary and quaternary

structure of a protein.

A. Proteins are polypeptides, linear chain of amino acids linked by peptide bonds. They are heteropolymers. 1

The sequence of amino acids i.e. the positional information in a protein is called the primary structure of a protein. The left end represent the first amino acid is called N-terminal amino acid, and the right represent the last amino acid is called C-terminal amino acid, depending upon the amino group and carboxyl group. 1

The polypeptide chain is folded to form right handed helices at some portions and other regions are folded into other forms to give protein its secondary structure. 1

Due to H-bonding or Disulphide bonding the long protein chain is also folded upon itself to give a 3D structure called tertiary structure necessary for its functions. 1

Some proteins are an assembly of more than one polypeptide or subunits that are arranged with respect to each other forming linear strings of spheres, or cubes or plates, to give the quaternary structure. E.g. Human Haemoglobin has 4 subunits, two of these are identical to each other named as α and β type. 1

29. (a) Draw the diagrammatic view of human respiratory system.

A. Refer Text Book Pg#269 Fig: 17.1 3

(b) Define Tidal Volume and Residual Volume.

A. Tidal volume- Volume of air approx. 500 mL inspired or expired during a normal respiration. 1

Residual volume- Volume of air approx. 1100-1200 mL remaining in the lungs even after a forcible expiration. 1

OR

(a) Draw the diagram showing section of a human heart.

A. Refer Text Book Pg #283 Fig: 18.2 3

(b) Name the different types of WBC's in our blood and write the major function of each one.

A. Neutrophils – phagocytosis

Eosinophils – resist infections and associated with allergic reactions.

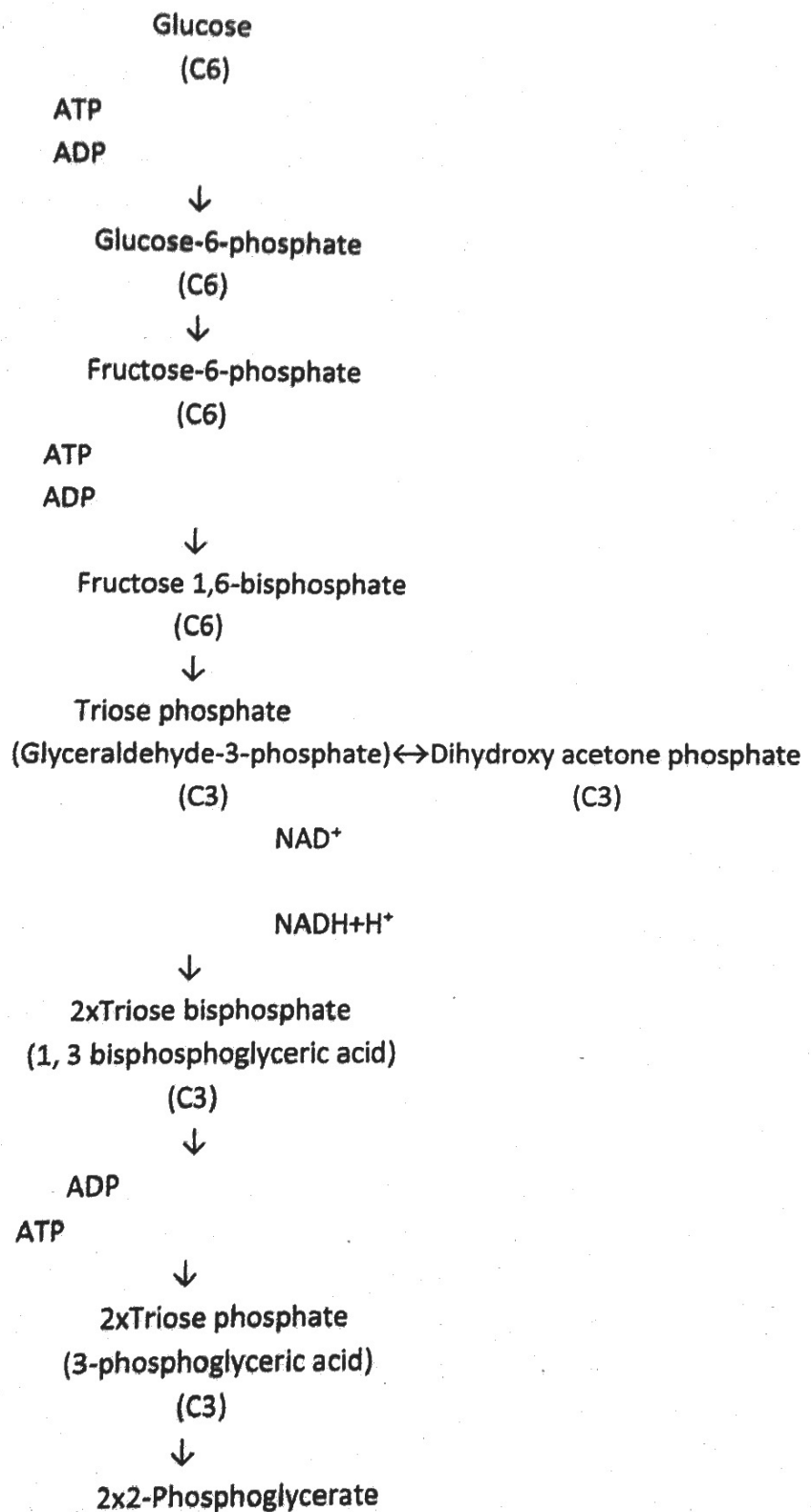
Basophils – secretes histamine, serotonin, heparin and are involved in inflammatory reactions.

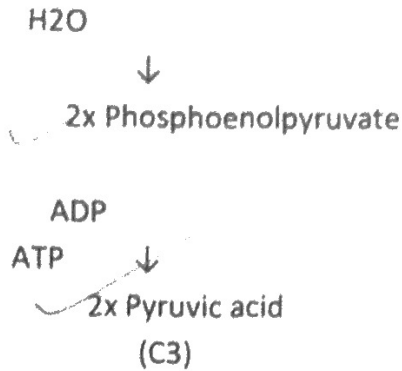
Monocytes – phagocytosis

Lymphocytes-B and T lymphocytes are responsible for immune responses of the body and produce antibodies. 2

30. Give the schematic representation of Glycolysis or EMP pathway highlighting the

steps at which utilization or synthesis of ATP or NADH+H⁺ take place.
A. Ref: Pg 229 Fig 14.1



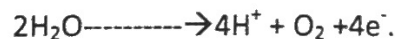


OR

(a) Give the schematic representation of non-cyclic photophosphorylation.

A. Photophosphorylation is the synthesis of ATP from ADP and inorganic phosphate in the presence of light. It is of two types: non-cyclic and cyclic.

In Non-Cyclic Photophosphorylation the two Photosystems work in series, first PS II and then PS I, connected through an electron transport chain in the Z scheme. During Non-Cyclic Photophosphorylation, in the Photosystem II the reaction centre Chlorophyll *a* absorbs 680nm wavelength of red light causing electrons to become excited and jump out to be picked up by an electron acceptor which passes them to an electron transport system consisting of cytochromes, downhill in terms of redox-potential scale, during which the energy of the electrons is harnessed to synthesize ATP from ADP and Pi, and the electrons are passed on to the PS I. Simultaneously the electrons in the reaction centre of PS I are also excited when they receive red light of 700nm and are accepted by another electron acceptor with a greater redox potential, and are moved downhill again to a molecule NADP⁺ that gets reduced to NADPH+H⁺. The PS II receives its electrons back from the photolysis of water into e⁻, H⁺ and [O] or



Refer Text Book Pg# 212 Fig: 13.5 for Z scheme representation.

3

(b) In what ways the cyclic photophosphorylation different from non-cyclic one?

A. Cyclic photophosphorylation occurs in stroma when only light of wave length beyond 680 nm are available for excitation. It involve only PS I. the excited electron does not pass on to NADP⁺ but is cycled back to PS I through ETS resulting in the synthesis of ATP, but not of NADPH+H⁺. The photolysis of water is associated with the PS II but not with PS I so O₂ is not given out.

2