MARKING SCHEME

BIOLOGY - 01

F6 2026

(a) Challenges of cell theory

- Cell theory does not explain clearly the origin of pre-existing cell
- Cell theory suggest that all living organism are made up of cell but didn't consider the Viruses which do not have cellular organization that carry out its life processes
- Some cells do not have nuclei eg. red blood cell, Mature sieve tube hence no genetic materials while cell Theory suggest that all cells have similar chemical composition
- Some organelles like Mitochondria contain genetic Material DNA but they are not a cell.
- They do not explain why Viruses reproduce while they are not a cell.

Any five points @01Marks = 05Marks

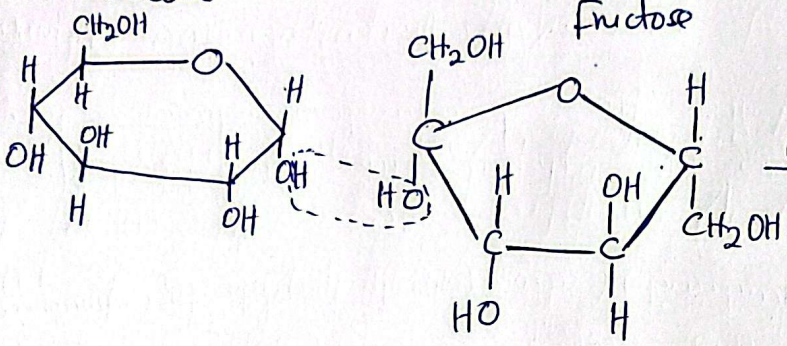
(b) Symbiotic nature of Mitochondria

- Mitochondria has its own DNA for self replication
- Mitochondria has own ribosomes for protein synthesis
- Mitochondria has own enzymes system for carry out metabolic process.
- Mitochondria has own Membrane system that control movement of materials (allow Mitochondria to Communicate with its surroundings).
- Mitochondria has own cytoplasm like Mitochondrial Matrix which is the site for chemical reaction

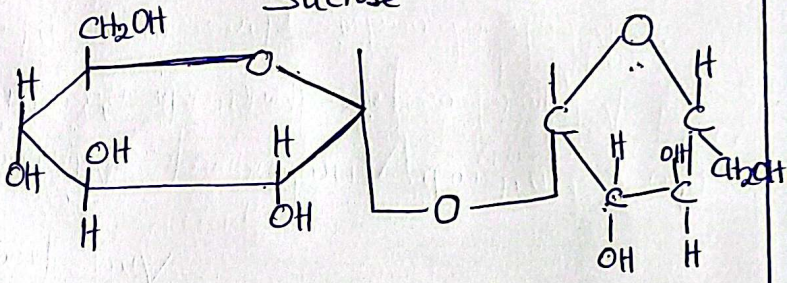
Any five(5) points @ 01Marks = 05 Marks

Q. (a)(i) Equation to show double sugar found in sugar Cane Sucrose.

Glucose.



Sucrose.



1, 2-glycosidic bond

02 Marks

(ii) TEST FOR PROTEIN: BIURET TEST

1. Add 2 cm^3 of protein solution to a test tube
2. Add 2 cm^3 of 5% of NaOH/KOH solution and Mix
3. Add 2 drops of 1% of Copper sulphate solution and Mix, no heat is required

@ 01 Marks = 03 marks

OBSERVATIONS

The expected observation was purple. Colour developed slowly. This indicate that proteins are present @ 02 marks

(b) Classes of lipids based on chemical Composition according to Bloor

(i) Simple lipid (homolipid)

These are ester of fatty acids and various alcohols or are lipid which are made up of fatty acids and alcohol glycerol. example. fat, oils

(ii) Compound lipid (heterolipid)

These are ester of fatty acids with glycerol that possess additional group which may be derived from other acid than fatty acids or are lipid which are made up of fatty acids, alcohol and other Compound e.g. glycolipids, phospholipid and lipoproteins

(iii) Derived lipid

These are lipid derived from simple and Compound lipid by hydrolysis eg. steroids, terpenes and Carotenoids

Any three points 03 @ 00½ = 1½.
Any examples or explanation @ 00½

(a) When many spermatozoan penentrate the egg, the Condition is known as polyspenn. This can be harmful because many centrosome can impair development of the zygote. Therefore, only a single spenn is required to fertilize an egg.

Mammalian eggs have barrier called zonal pellucida that surrounds them. During fertilization, the zonal pellucida becomes impenmiable to prevent more sperm from entering the egg.

The impermiability of the zonal is caused by exocytosis of cortical granules that lead to structural changes in the zonal pellucida soon after fertilization

(b) The chromosome number in radicle of a certain species of flowering plant is 16.

(i) The pollen tube nucleus is haploid

$2n = 16$ chromosome.

$$\frac{2n}{2} = \frac{16}{2}$$

$$n = 8$$

Therefore the pollen tube nucleus has 8-chromosome.

(ii) An antipodal cell is haploid

$2n = 16$ chromosomes

$$\frac{2n}{2} = \frac{16}{2}$$

$$N = 8$$

Therefore, the antipodal cell has 8 chromosomes

(iii) An endosperm is triploid

$2n = 16$ chromosomes

$3n = ?$

$3n \times 16 \ast 2n$

$n = \frac{48}{2}$

$n = 24$

Therefore, endosperm has 24 chromosomes

(iv) pollen mother cell is diploid ($2n$)

$2n = 16$

Therefore, mother cell has 16 chromosomes

(v) Integument is diploid $2n$

$2n = 16$

Therefore, integument have 16 chromosomes.

@ 1 marks = 05 Marks

4. (a) Challenges of assigning scientific name to newly discovered organisms

(i) Lack of information.

Many new organisms are discovered in remote or inaccessible areas make it difficult to collect data or information about them. This lack of information can make it challenging to properly classifying and assigning the organism to a specific group.

(ii) Limited taxonomic experties

Taxonomy, the scence of classifying organisms require specialized knowledge and experts. With increased number of new organisms being discovered, there is a shatage of taxonomic experts who can accurately assign and classify them

(iii) Complex classification system:

The classification of organisms is based on a hierarchy of categories such as Kingdom, phylum Class etc. However with advanced of scentific techniques, the Complexity of classification system has also increased, making it challenging to a new organisms to the appropriate category

(iv) Genetic Vanation

New organisms may have unique genetic characteristics that do not fit into the existing classification system. This can make it difficult to delevmine the evolutionary relationship and assign the organism to a specific group

(v) Lack of standardized guidelines

There are no standardized procedures or guide lines for assigning new organisms to their appro priate taxonomic groups. This can lead to inconsistencies and errors in the classfeation pro cess

(vi) Overlapping characteristics

Some organisms may share similar characteri stics with other species making it challenging to assign its scentific name Any five points @01 = 05 marks

(b) The reasons as to why the name Mangifera indica has biological significance

- The name is universally used for a particular species. This help to avoid the confusion which may arise by use of local (or Vernacular names which differ in different parts of the World.
- The use of this scientific name simplified communication world wide; This is because this is the only one valid name used for the specific living things. This help biologist to avoid errors in communication
- It gives descriptive information about the species; the taxonomists can determine from the description exactly the kind of organism to which the name has been given
- The name is uniformly ~~binn~~ binomial specifying the name of the genus and species of organisms hence the organisms with similar evolutionary history with this species are classified together
- This scientific name allows information about organisms to be organized and found easily.
- The rule followed in the procedures of scientific naming of species favour stability. This help to avoid confusion and ambiguity

Any five reasons @ 01 marks = 05 marks

5 (a) (i) Prevent the action potential from spreading out in both direction until it occupies the whole neurone.

- Separate the second action potential from the first 01½ marks

(ii) Prevent over stimulation which might damage an effector 01½ marks

(b) Differences between Rods and Cones

Rods	Cones
• They are thin and elongated	• They are Concave (thick) in shape
• They are numerous	• They are few
• They are uniform distributed through the retina	• They are highly Concentrated at the fovea.
• They are more sensitive to light	• They are less sensitive to light
• They Contain only one visual pigment hence used for night vision	• They Contain three visual pigments hence used for day vision
• They do not able to discriminate Colour	• They Can be able to discriminate Colour.

@ 01 = 04 Marks

(c) Body temperature

The higher the temperature, the greater the velocity.

Axon diameter

The higher the diameter of the axon, the higher / greater the speed of impulse

- Presence of myelin sheath.

The better the insulation offered by the myelin sheath, the faster the Conduction Velocity.

@ 01 = 03 Marks

6 (a) (i) The name of Condition D is photorespiration 01/2

(ii) The name of enzyme M is RUBP Carboxylase / RUBP Oxygenase. 01 Marks

(iii) The name of Compound K and N

K - Ribulose biphosphate (RUBP). 01 Marks

N - 2-phosphoglycerate (2-PGA). 01 Marks

(iv) Three organelles involved in Conversion of Compound N to PGA

- Chloroplast
- Peroxisomes
- Mitochondria @ 00½ = 01½ Marks

(v) Condition D (photorespiration takes place in C_3 plant this is because in these plants species when Carbondioxide Concentration in the Chloroplast drops below, The enzymes RUBP Carboxylase become higher affinity to oxygen rather Than Carbondioxide 03 marks

(b) In the oxidized state, the chlorophyll is positively charged and very unstable. It is "electron hungry" because when it gains electrons back, it become neutral and stable 02 marks.

7 (a) Mucus

(i) Trap dust and bacteria Trapped in the incoming air via nostrils (01 Marks)

(ii) Surfactant

(i) Lower the surface tension of the fluid inside the alveoli, hence reduce energy required to breath in and out (01 Marks)

(ii) Kills bacteria trapped in the incoming air through nostrils (01 Marks)

(iii) Increase the rate of gaseous exchange in mammals (01 marks)

(b) Conversion of pyruvic acid into ethanol

(i) Decarboxylation

Pyruvate from glycolysis is converted to ethanal (2C) through the removal of Carbondioxide molecules (01 marks)

CH_3CHO → CH_3CH_2OH

Ethanal → Ethanol (01 marks)

$NADH_2$ → NAD^+

(ii) Reduction

Ethanal combine with hydrogen from $NADH_2$ to generate ethanol (01 Marks)

(c) The main reason why the volume of air exchanged in the alveolus is less than that of pulmonary ventilation is due to anatomical dead space. Anatomical dead space refers to the air that stays in the conducting airways such as nose, trachea and bronchi) and does not participate in gas exchange. This is essential wasted and does not reach the alveoli.

Another reasons is that during inhalation, some of air that enters the alveoli is not fully utilized for gas exchange. This is because the alveoli are not fully utilized for gas exchange. This is because the alveoli are not completely filled with air and there is still some residual air left from the previous exhalation. This residual air is not exchanged during each breath and therefore, the volume of air exchanged in the alveoli is less than that of pulmonary ventilation

(03 Marks)

8| Stage of Glycolysis

(i) phosphorylation of glucose.

In this stage glucose is phosphorylated to glucose-6-phosphate under the enzyme hexokinase

Glucose ——→ Glucose-6-phosphate + ~~ADP~~ + H+

Glucose —Hexokinase→ Glucose-6-phosphate + ~~ADP~~ + H+ (01½ marks)

(ii) Isomerism/reamangement of glucose-6-phosphate.

In this stage glucose-6-phosphate is isomerized to fructose-6-phosphate under the influence of enzyme phosphoglucoisomerase

Glucose-6-phosphate —Phosphoglucose isomerase→ Fructose-6-phosphate (01½ marks)

(iii) phosphonylation of gl fructose-6-phosphate

In this stage fructose-6-phosphate is phosphonylated (added phosphate) to fructose-1,6-bisphosphate under the enzyme phosphofructokinase

Fructose-6-phosphate —Phosphofructokinase→ fructose-1,6-bisphosphate (01½ marks)

(iv) Lysis

In this stage phosphonylated-6-Carbon sugar is broken down into 3-Carbon sugar phosphate which are dihydroxyacetone phosphate and glyceraldehyde-3-phosphate under the enzyme aldolase. 03 marks

(V) Oxidation of dehydrogenation
In this stage glyceraldehyde-3-phosphate lose donate hydrogen to NAD to form NADH under the enzyme glyceraldehyde-3-phosphate dehydrogenase.

Glyceraldehyde-3-phosphate → 1,3-biphosphoglycerate
(NADP + Pi ; NADH + H+) 0 1/2 marks

(VI) Conversion of 1,3-biphosphoglycerate to 3-phosphoglycerate.
In this stage 1,3 glyceraldehyde-3-phosphate
In this stage 1,3-biphosphoglycerate is converted into 3-phosphoglycerate by removal of phosphate to ADP which then become ATP. This reaction is catalyzed by an enzyme phosphoglycerate kinase.

1,3-biphosphoglycerate —(phosphoglycerate kinase)→ 3-phosphoglycerate
0 (0 1/2 Marks)

(VII) Conversion of 3-phosphoglycerate to 2-phosphoglycerate, in this stage 3-phosphoglycerate is converted into 2-phosphoglycerate by rearrangement under enzyme phosphoglycerate mutase

3-phosphoglycerate —(Phosphoglycer atemutase)→ 2-phosphoglycerate.

(Viii) Dehydration of 2- phosphoglycerate to phospho enolpyruvate, +H

In this stage water molecules is removed from 2-Phosphoglycerate to form phosphoenolpyruvate under enolase enzyme.

2-phosphoglycerate $\xrightleftharpoons{\text{Enolase}}$ phosphoenolpyruvate + H_2O

(IX) Conversion of phosphoenolpyruvate to pyruvate. 0½ Marks

In this stage phosphoenolpyruvate is converted into pyruvate whereby phosphate from phosphoenolpyruvate is transfered to ADP molecules Combine to form ATP Under the enzyme pyruvate Kinase

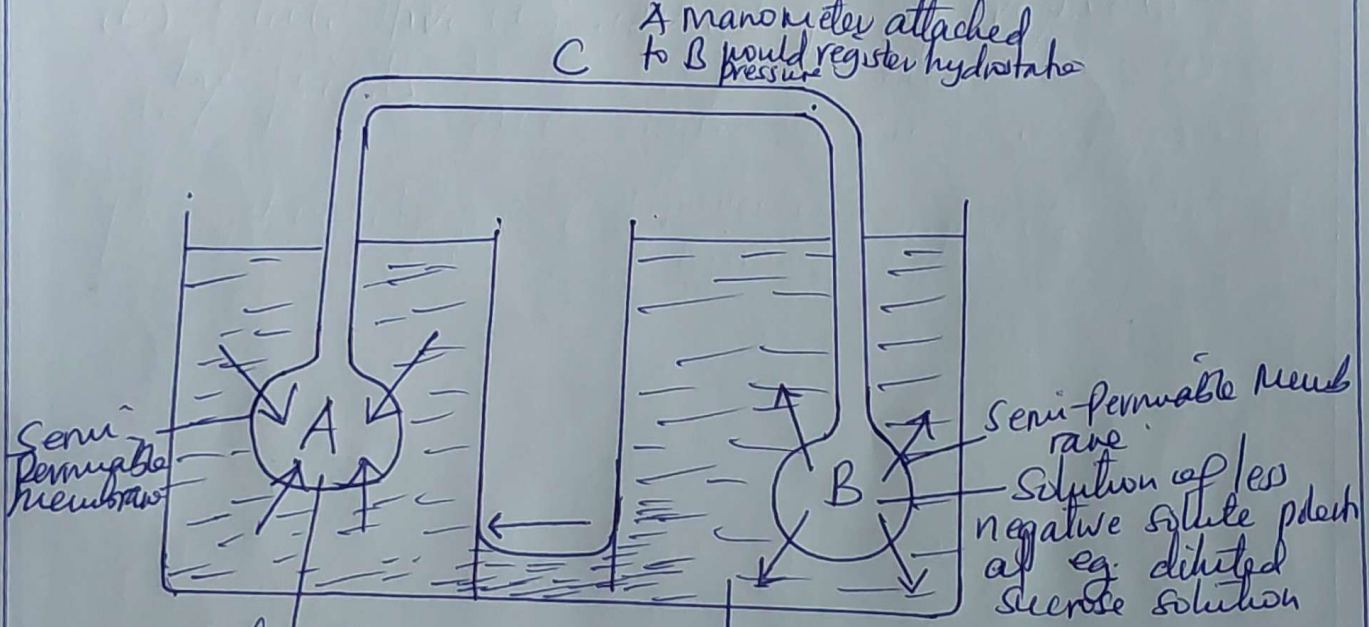
Phosphoenolpyruvate $\xrightarrow[\text{Kinase}]{\text{Pyruvate}}$ pyruvate (0½ Marks)

9. (a) (i) P is Casparian strip (02 marks)

(ii) Role of P (Casparian strip)-

- To stop the apoplast pathway (01½)
- To prevent toxic substances from entering the xylem 01½ Marks
- To regulate movement of solutes into xylem (01½ Marks)
- To prevent pathogens from entering the xylem. Eg. bacteria 01½ Marks

(b) Munch's Mass hypothesis Model.



Net diagram 01 Marks
Caption 1 Marks
Any four labels 02 marks

(i) In the model there is initial tendency of water to pass by osmosis into A and C, but the tendency is greater in A because solution A is more negat Concentrated than that of C (01 Marks)

(ii) As water enter in A, a hydrostatic pressure builds up the in the closed system A-B-C forcing water out of C (01 Marks)

(iii) Mass flow of solution occurs through B along the pressure gradient that is generated, There is also an osmotic gradient from A to C (01 Marks)

(iv) Eventually the system Comes into slight equilibrium as water dilutes Contents A and solutes accumulates at C 01 Marks

10 (a) Changes in the flower after fertilization

(i) Zygote undergo rapidly repeated Mitotic division forming a multicellular embryo

(ii) The embryo then differentiate into young shoot Called plumule, young root called radicle and Simple Seeds leaves called Cotyledons

(iii) The endosperm nucleus undergoes mitotic division to give rise to Mass of endosperm tissues

(iv) Integuments of ovules from tough protective layer Called Seed Coat or testa

(v) The Micropyle remains as a small hole (pore) in the testa through which oxygen and water enter during germination of seeds.

(vi) During embryo development nucellus disintegrate to provide nutrients for supporting initial growth (02 Marks @ Total 10 Marks)

(b) Five advantages of reproduction by seed

- The seed contain food for the developing embryo either in dicot or monocot.
- Seed protect the embryo
- Seed can remain dormant and survive in adverse conditions.
- The seed is physiological sensitive to favourable condition and sometimes must undergo-after ripening so that it will not germinate
- The plant is independent to water for sexual reproduction and therefore better adapted for land environment.

THE END (5 POINTS @ 01 Mark = 05 Marks)