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07 Royal College

First Term Test - May 2024

Grade 12

Biology I

09 E I

One hour

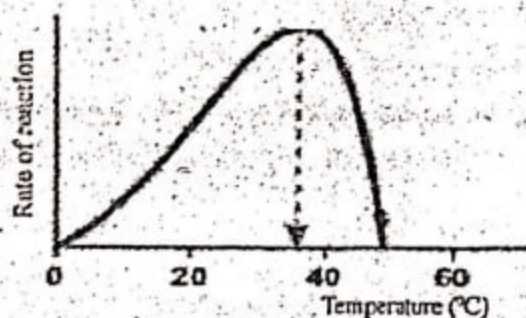
• Answer all questions.

- Select the correct statement.
 - (1) The first formed organisms on earth are believed to be heterotrophic, aerobic prokaryotes.
 - (2) The increase of growth rate of human population causes threat of depletion of natural resources.
 - (3) Sustainable food production is the production of sufficient amount of food for the human population.
 - (4) Cancers, heart diseases and dengue are some dangerous non-communicable diseases.
 - (5) Production of high yielding plant and animals are important to maintain sustainable food production.
- The element that is found in minute amounts in living matter is,
 - 1) Ca
 - 2) P
 - 3) K
 - 4) Mg
 - 5) N
- Which one of the major properties of water allows it to act as a transport medium?
 - (1) Cohesion
 - (2) Adhesion
 - (3) Both cohesion and adhesion
 - (4) Surface tension
 - (5) Cohesive behavior
- Which of the following contains pentoses?
 - a. Inulin
 - b. DNA
 - c. Hemicellulose
 - d. RNA
 - (1) a, b, and c only
 - (2) a, b, and d only
 - (3) b, c and d only
 - (4) a and c only
 - (5) b and d only
- A structural branched polysaccharide is,
 - (1) Cellulose
 - (2) Pectin
 - (3) Hemicellulose
 - (4) Glycogen
 - (5) Amylopectin
- Which of the following is correct regarding the given molecule?
 - (1) Separate chains act as functional proteins.
 - (2) Each subunit of it is held together by intra molecular interactions.
 - (3) It is a tertiary structure.
 - (4) It consists of four types of subunits.
 - (5) It consists of four haem groups and four polypeptide chains
- Which of the following is correct regarding microscopes?
 - (1) Magnification is ratio of an object's size to its image size.
 - (2) Resolution power of electron microscope is 0.2 nm.
 - (3) Magnification of microscopes is a measure of the clarity of the image.
 - (4) In transmission electron microscopes, more electrons may get displayed in regions where structures were densely stained.

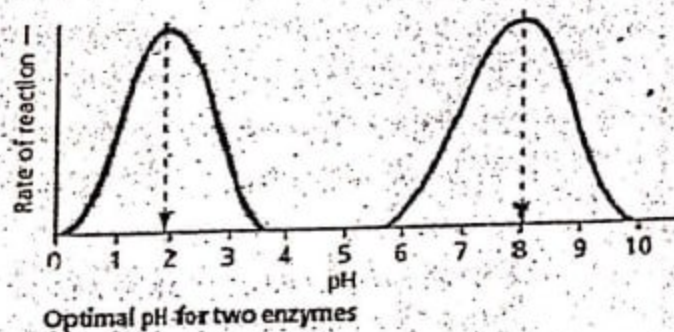
8. Select the correct pair from following.
- (1) Robert Hooke
 - (2) Matthias Schleiden
 - (3) Theodore Schwann
 - (4) Anton Van Leeuwenhook
 - (5) Rudolf Virchow
- The basic unit which can be called living is the cell.
 - Any stage below level of a cell cannot be considered living whether it is a plant or an animal.
 - Discovery of *Chlamydomonas*
 - The first record about bacteria.
 - The basic structural and functional unit of organisms is the cell.
9. Which of the following features can be seen only in eukaryotic organization ?
- (1) Selectively permeable plasma membrane.
 - (2) 80S ribosomes
 - (3) DNA as genetic materials
 - (4) Semifluid cytosol
 - (5) Subcellular components suspended within the cytosol
10. Select the feature of the prokaryotic flagellum that can be used to distinguish it from eukaryotic flagellum.
- (1) 200 nm diameter
 - (2) 9+2 arrangement of microtubules
 - (3) Extracellular
 - (4) Complex
 - (5) Surrounded by cell surface membrane
11. Select the correct statement regarding sub-cellular components.
- (1) Ribosomes are sub-cellular organelles composed of rRNA and protein.
 - (2) SER is called the membrane factory of the cell.
 - (3) The inner membrane of the chloroplast produces flattened and interconnected sacs called thylakoids.
 - (4) The nuclear matrix is extended through out the interior of the nucleus.
 - (5) The mitochondrial matrix consists of 70S ribosomes, circular DNA, many enzymes and lipid droplets.
12. Select the correct statement regarding cell junctions.
- (1) Plasmodesmata are membrane lined channels filled with cytoplasm.
 - (2) Anchor junctions prevent leakage of extracellular fluids through intercellular spaces.
 - (3) Tight junctions allow signal and material exchange between adjacent cells.
 - (4) Gap junctions mechanically attaches the cytoskeleton of adjoin cells by intermediate filaments.
 - (5) Plasmodesmata, Anchor junctions, Tight junctions and Gap junctions are different types cell junctions found in animal cells.
13. Which of the following processes of meiosis always causes the genetic variation?
- (1) Crossing over
 - (2) Independent assortment
 - (3) Recombination
 - (4) Cytokinesis
 - (5) Formation of synaptonemal complex
14. Which of the following statements regarding cofactors are correct ?
- A. Non proteinous components, which are essential for the catalytic activities of all enzymes are called cofactors.
 - B. Cofactors bound loosely to the enzyme are reversible.
 - C. Organic cofactors are called co-enzymes.
 - D. Cu^{2+} is an example of an inorganic cofactor.
- (1) A, C and D only
 - (2) B, C and D only
 - (3) A, B and C only
 - (4) B and D only
 - (5) C and D only

- The graphs below illustrate two factors that affect the rate of an enzymatic reaction. Question numbers 15 and 16 are based on it.

A



B



15. Select the correct statement regarding graph A.
- (1) The rate of an enzymatic reaction increases with temperature.
 - (2) The temperature at which the maximal rate of reaction is achieved is the optimal temperature.
 - (3) When the temperature increases beyond the optimum temperature, it accelerates the formation of enzyme-substrate complexes.
 - (4) For every enzyme, the optimum temperature is 37°C .
 - (5) When the temperature increases beyond the optimum temperature, the reaction stops.

16. Given below is a statement regarding graph B and the reason for the statement.
Statement : There is a narrow range of pH in which a particular enzyme catalyzed reaction takes place. This range contains the pH at which the highest rate of reaction occurs.

Reason: Due to the alteration of chemical bonds involved in the formation of enzyme-substrate complex, most enzymes are sensitive to pH.

Which of the following is correct regarding the above statement and the reason?

- | Statement | Reason |
|---------------|--|
| (1) Correct | Correct |
| (2) Correct | Correct. The reason clarifies the statement. |
| (3) Incorrect | Correct |
| (4) Incorrect | Incorrect |
| (5) Correct | Corrects. The reason does not clarify the statement. |
17. Which of the following colours in the visible spectrum are more efficient in photosynthesis?
- (1) Red and Violet
 - (2) Green and violet
 - (3) Red and green
 - (4) Red and blue
 - (5) Red and yellow

18. Given below are three statements regarding RuBP carboxylase- oxygenase.
- A - It is located in the stroma of chloroplasts and catalyzes the production of 3-PGA.
 - B- CO_2 acts as it's substrate and it is absent in C_4 plants.
 - C- It participates in photosynthesis.

From the above mentioned statements,

- (1) A and B are correct.
- (2) B and C are correct. A is incorrect.
- (3) A is correct. B and C are incorrect.
- (4) A, B and C are incorrect.

19. The first stable products produced in the C_3 pathway and the C_4 pathway of photosynthesis are respectively,
 (1) 3-PGA, OAA — (2) RuBP, OAA — (3) G3P, Pyruvate — (4) 3-PGA, Malate — (5) G3P, Malate

20. Which of the following is correct regarding aerobic respiration ?
 (1) Decarboxylation of respiratory substrate completes in the mitochondrial matrix.
 (2) The total number of ATP produced in liver cells by substrate level phosphorylation is 2.
 (3) The electron transport chain located in the inner membrane of mitochondria is composed of a series of proteins.
 (4) Citric acid contains two carboxylic acid groups.
 (5) In citric acid cycle, two $FADH_2$ and six NADH are generated per single acetyl group.

- For each of the questions 21-25, one or more of the responses is/are correct. Decide which response/responses is/are correct and then select the correct number.

Summary of above instructions				
1	2	3	4	5
Only (A) (B) and (D) correct	Only (A) (C) and (D) correct	Only (A) and (B) correct	Only (C) and (D) correct	Any other response or combination of responses correct

21. Select the correct statement/statements regarding given below nucleotides.
 i) NAD^+ ii) $NADP^+$ iii) FAD
 A. Cannot be found in nucleic acids.
 B. $NADP^+$ act as a reducing agent in photosynthesis.
 C. FAD acts as an oxidizing agent.
 D. NAD^+ act as an oxidizing agent in cellular respiration.
 E. NADP act as an electron carriers.
22. Which of the following events can be found in anaphase of mitosis ?
 A. Separation of sister chromatids
 B. Accumulation of complete sets of chromosomes at each pole of the cell.
 C. Interaction of non-kinetochore microtubules of opposite poles.
 D. Lengthening of non kinetochore microtubules.
 E. Movement of centrosomes towards opposite poles.
23. Select the correct statement/statements regarding ATP.
 A. The net yield of ATP per glucose molecule in fermentation is four.
 B. There is no production of ATP during anaerobic respiration in muscle cells.
 C. ATP is a ribonucleotide that contains adenine.
 D. ATP is used in aerobic respiration.
 E. All enzymatic activities require ATP.
24. The product/products formed in light dependent reaction of photosynthesis is/are
 A. ATP B. CO_2 C. O_2 D. NADPH E. NADP
25. Which of the following is/are common to both processes ; aerobic respiration and photorespiration ?
 A. Release CO_2 B. Use O_2
 C. Involve enzymes in mitochondria D. Take place in C_3 plants.
 E. OAA is formed as an intermediate

Part A – Structured Essay

Answer all the questions on this paper itself.

1. A. i) State three environmental problems caused by the overexploitation of natural resources.

1.....

2.....

3.....

ii) What is meant by adaptation?

.....
.....
.....

iii) What are the four major properties of water to maintain life on earth?

.....
.....
.....
.....

B. i) State two characteristics of polysaccharides.

.....
.....

ii) a. Name a storage polysaccharide found in plants other than starch.

.....

b. State the monomer of the above mentioned polysaccharide.

.....

iii) State two structural differences between triacylglycerol and phospholipid.

Triacylglycerol molecule

Phospholipid molecule

1

.....

2

.....

iv) State a function of each.

a. Triacylglycerols :.....

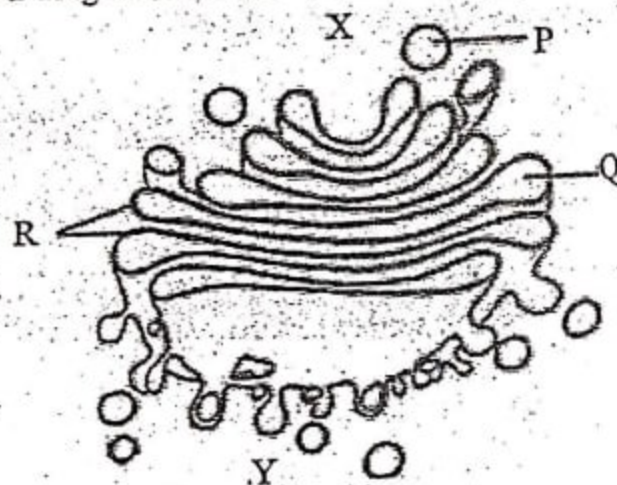
b. Phospholipids :.....

v) Draw the structure of the glycine molecule and label the parts.

vi) State two agents affecting denaturation of proteins.

vii) Write in five steps : the test to identify sucrose chemically in the laboratory.

C) i) Given below is a diagram of a sub-cellular component.



a. Identify and name this sub-cellular component.

b. Name the structures labeled as P, Q and R.

P: Q: R:

c. Name the faces labeled as X and Y.

X: Y:

c. Which face is located near the Endoplasmic reticulum ?

ii) a. How do cilia and flagella of eukaryotes differ from each other?

1.....

2.....

b. State two functions of cilia and flagella.

iii) What will happen to a cell, if it receives a go ahead signal at the G₁ Check point?

iv) State two significances of meiosis.

2. A. i) What is known as anabolism?

ii) a. Name the two types of phosphorylation that take place during cellular respiration. State the specific site/sites of occurrence of each.

Type of phosphorylation

Specific site/sites of occurrence

b. Briefly define each of the above mentioned phosphorylation types.

iii) What substance can bind to the active site of an enzyme other than the substrate molecules?

iv) What is the importance of feedback mechanisms in metabolism?

B. i) State two global importance of photosynthesis.

ii) What are the two types of carotenoids?

iii) State the main differences between linear electron flow and cyclic electron flow of light-dependent reaction of photosynthesis.

Linear electron flow

Cyclic electron flow

- | | |
|--------|-------|
| 1..... | |
| 2..... | |
| 3..... | |

iv) What are the environmental conditions that favour photorespiration in plant leaves?

- | | | |
|--------|--------|--------|
| 1..... | 2..... | 3..... |
|--------|--------|--------|

v) a. How do the mesophyll chloroplasts and bundle sheath chloroplasts of C4 plants differ structurally from each other?

Mesophyll chloroplasts

Bundle sheath chloroplasts

- | | |
|--------|-------|
| 1..... | |
| 2..... | |
| 3..... | |

vi) Which type of electron flow occurs during the light dependent reaction of C4 photosynthesis in bundle sheath cells?

vii) a. Why does the rate of photosynthesis decrease at very high light intensities?

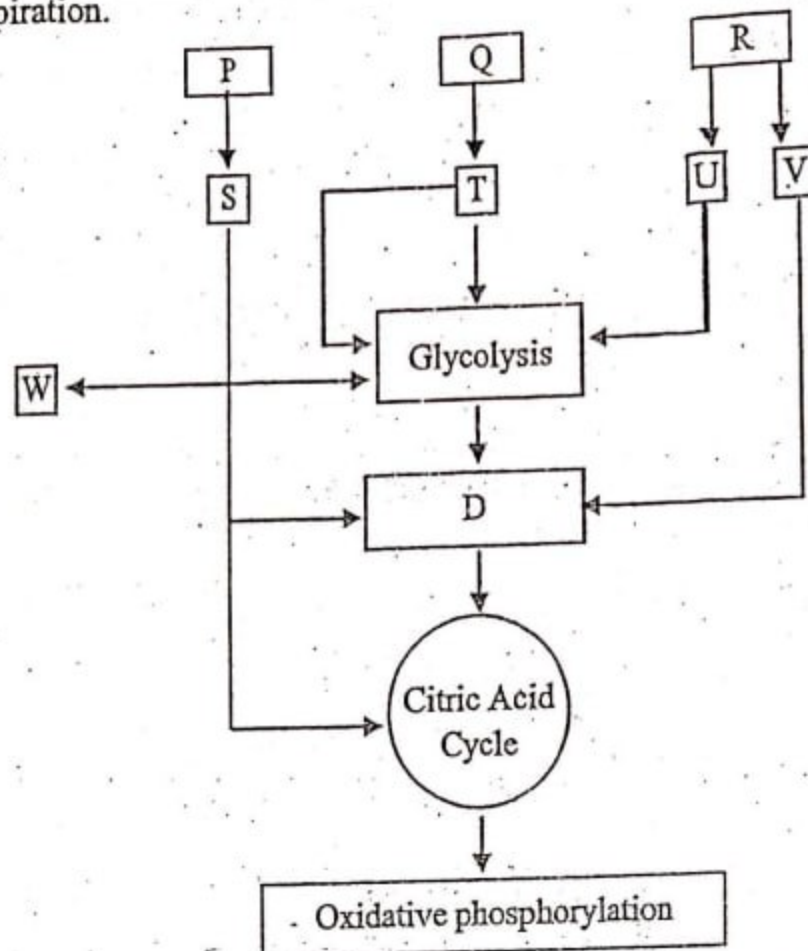
b. Name two devices that may be present in plant leaves to protect themselves from exposure to high light intensities?

C. i) What is known as aerobic respiration?

ii) State the balanced chemical equation for the aerobic respiration of glucose molecules.

iii) Where does the pyruvate oxidation take place in aerobic respiration? State the specific site.

iv) The given below diagram represents the use of three major respiratory substrates in respiration.



a. Name the respiratory substrates represented as P, Q and R and state the RQ of each.

Respiratory substrate	RQ
P	
Q	
R	

b. Name the components represented as D, T, U, V and W

D: T:
 U: V:
 W:



Part B – Essay

- *Answer all the questions.*
 - *Give clear labelled diagrams where necessary*
(Each question carries 150 marks)
3. a) Explain the levels of protein structures.
b) Briefly describe the functions of the proteins with suitable examples.
4. Write short notes on followings.
- a) Structure of DNA molecule
 - b) Extracellular matrix of animal cells
 - c) Fermentation