

MID-TERM EXAMINATION 2017
MOTITHANG HIGHER SECONDARY SCHOOL.

XII BIOLOGY
Paper – 1
(THEORY)

Time-3.15 hrs
Maximum marks-100

*(The first 15 minutes of the examination are for reading the paper only.
Candidates must NOT start writing during this time).*

Answer ALL questions in Part I and SIX questions from Part II. All workings, including rough work, should be done on the same sheet as, and adjacent to; the rest of the answer.

The intended marks for questions are given in brackets [].

PART I (40 marks)

Answer all questions.

Question 1.

(a) Read the following questions carefully. For each question there are four alternatives A, B, C and D. CIRCLE the correct alternative in the question paper. [15]

1. Which of the following is not true of a plasmolyzed plant cell when placed into distilled water?
 - A. The cell is hypertonic to the water
 - B. The water is hypotonic to the cell
 - C. The cell will gain water
 - D. The cell will lose water

2. What is the main advantage of the C4 and CAM photosynthesis strategies over the C3 strategy?
 - A. They allow the plant to avoid photorespiration by avoiding the production of lactic acid.
 - B. They make it possible for the plant to use the Calvin cycle at night and during the day.
 - C. They allow the plant to produce ATP more efficiently in hot and dry conditions.
 - D. They help the plant conserve water and synthesize glucose efficiently under hot, dry conditions.

3. In photosynthesis, the chemiosmotic production of ATP
 - A. requires oxygen.
 - B. is analogous to the production of ATP in mitochondria.
 - C. requires the input of NADPH.
 - D. is done by the Calvin cycle.

4. At the end of the citric acid cycle, most of the energy remaining from the original glucose is stored in molecules of
 - A. FADH₂
 - B. CO₂.
 - C. pyruvic acid.
 - D. ATP.

5. A drug is tested in the laboratory and is found to create holes in both mitochondrial membranes. Scientists suspect that the drug will be harmful to human cells because it will inhibit
 - A. glycolysis.
 - B. the citric acid cycle.
 - C. oxidative phosphorylation.
 - D. the formation of alcohol.

6. The specific function of light energy in the process of photosynthesis is to:
 - A. Reduce carbon dioxide
 - B. Synthesise glucose

- C. Activate chlorophyll
D. Split water
7. Okazaki fragments are synthesized on
A. Leading strands of DNA only
B. Lagging strands of DNA only
C. Both leading and lagging strands of DNA
D. Complementary DNA
8. RNA polymerase is only capable of catalyzing the process of _____.
A. Termination
B. Elongation
C. Initiation
D. All of the above
9. A DNA segment which serves as a kind of “on-off switch” for transcription is a/an _____.
A. Regulator gene
B. Operator
C. Promoter
D. Structural gene
10. Under normal conditions which one is completely reabsorbed in the renal tubule?
A. urea
B. uric acid
C. salts
D. glucose
11. If excess water passes out from the tissue without being restored by the kidneys, the cells would
A. burst open and die
B. take water from the plasma
C. not be affected at all
D. shrivel and die
12. You are required to draw blood from a patient and to keep it in a test tube for analysis of blood corpuscles and plasma. You are also provided with the following four types of test tubes. Which of these will you not use for the purpose?
A. test tube containing calcium bicarbonate
B. chilled test tube
C. test tube containing heparin
D. test tube containing sodium oxalate.
13. An action potential in the nerve fibre is produced when positive and negative charges on outside and the inside of the axon membrane are reversed because
A. all potassium ions leave the axon
B. more potassium ions enter the axon as compared to sodium ions leaving it
C. more sodium ions enter the axon as compared to potassium ions leaving it
D. all sodium ions enter the axon
14. A primary objective of cell fractionation is to
A. view the structure of cell membranes.
B. sort cells based on their size and weight.
C. determine the size of various organelles.
D. separate the major organelles so that their particular functions can be determined.
15. Why isn't the mitochondrion classified as part of the endomembrane system?
A. It is a static structure.
B. Its structure is not derived from the ER or Golgi.
C. It has too many vesicles.
D. It is not involved in protein synthesis.

(b) Fill in the blanks

[10 MARKS]

1. In the _____ phase of gastric control, even the taste and sight of food can stimulate gastric secretion and contraction.
2. The hormone _____ inhibits gastric secretion, suppresses the appetite, and stimulates contraction of the gallbladder.
3. When a muscle contracts, one end of it called the _____ remains relatively stationary, whereas the other end, the _____, usually moves a bone.
4. Various protein filaments and tubules make up a supportive framework in a cell called the _____.
5. The transport of solute molecules through a cell membrane by a carrier protein, going down the concentration gradient, is called _____.
6. Cells release secretions by the process called _____ in which a secretory vesicle from the Golgi complex fuses with the plasma membrane and empties its contents from the cell.
7. The thin walled cells of endodermis which permit free passage of water are called _____.
8. The _____ sphincter is under involuntary control and relaxes during the micturition reflex.
9. _____ are substances that may be released along with a neurotransmitter and modify the effects of the neurotransmitter on a postsynaptic cell.
10. The earliest haploid stage of spermatogenesis is the _____.

c) State True/ False and correct the false statements.

[5 marks]

- i. Gap junctions prevent substances from leaking through cell layers.
- ii. A mitochondrion has three separate phospholipid bilayers.
- iii. Living cells cannot be studied under light microscope.
- iv. Primary cell wall is elastic and capable of expansion.
- v. The bulk transport of materials from the cells through plasma membrane is called endocytosis.

d) Match the columns (Rewrite the correct pairs in the answer sheet)

[5 MARKS]

- | Column A | Column B |
|-----------------------------|--------------------------------------|
| i. stratified epithelium | a. nerve impulse |
| ii. cuticle | b. skin |
| iii. keratinized epithelium | c. transistional epithelium |
| iv. nodes of ranvier | d. megakaryocyte |
| v. dendrite | e. leaves |
| vi. sieve tubes | f. collagen fibres |
| vii. blood platelet | g. spindle-shaped |
| viii. smooth muscles | h. skin |
| ix. urinary bladder | i. myelinated nerve fibre |
| x. white fibrous tissue | j. conduction of food |
| | k. conduction of water and minerals. |

e) Short answer type-

[5 marks]

- i. Why specifically do you breathe faster when you are exercising?
- ii. What triggers an action potential? What happens to the membrane to trigger an action potential?.
- iii. Why do cells use active transport? What do cells need in order to perform active transport?
- iv. A cell's plasma membrane acts as both a boundary and barrier for the cell. Briefly explain how the walls and roof of a home are a good analogy for the plasma membrane.

PART II (60 marks)

Answer any SIX questions

Question 2

- (a) Sieve tubes in angiosperms are associated with specialized parenchyma cells. Name those cells. How do they help sieve tube members? [2]
- (b) Describe the mechanism involved in the opening and closing of stomata. [3]
- (c) You decide to go on an extremely strict diet and cut out fat and oil entirely. Sometime later, you notice that your night vision isn't what it used to be. How might this symptom be related to your new diet? [2]
- (d) Process of DNA replication occurs in small replication forks, not in its entire length. Give reason. State the importance of origin of replication in a fork. [3]

Question 3

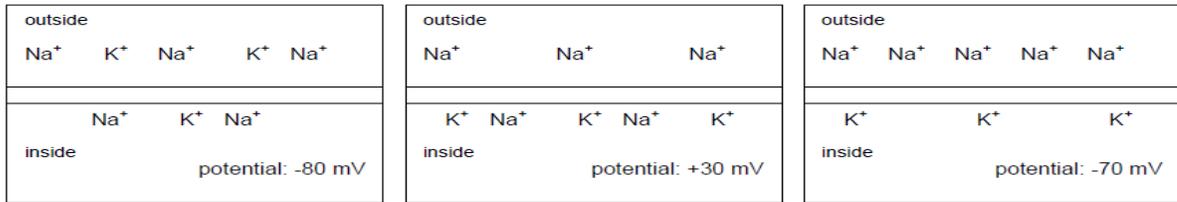
- (a) Name the enzymes of protein digestion in the gastric, pancreatic and intestinal juices; the substrate they digest and the products of their action. [3]
- (b) Your aerobics instructor tells you that exercise helps to prevent constipation. Is the instructor correct? Can you think of any plausible explanation? [1]
- (c) Explain the process of transport and the release of a neurotransmitter with the help of a labeled diagram showing the axon terminal and synapse. [3]
- (d) When and where are the primary oocytes formed in a human female? Trace the development of these oocytes. [3]

Question 4

- (a) Discuss the roles that the synaptonemal complex and the chiasma play during meiosis. [4]
- (b) Explain when meiosis I starts and ends and when meiosis II starts and ends in females. [3]
- (c) A physician plans to attend a cocktail party, but he is also on call that night and must avoid intoxication. Therefore he drinks a glass of cream just before leaving for the party. Explain. [3]

Question 5

- (a) i. Consider the following three diagrams of a nerve cell membrane. They show resting potential, depolarization, and repolarization. Figure out which one is which, label them, and number the diagrams in the order they occur in a cell that undergoes an action potential. [3]



- a.
 i.
- b.
 ii.
- c.
 Iii.

ii. What is the role of the voltage-gated potassium channels? [2]

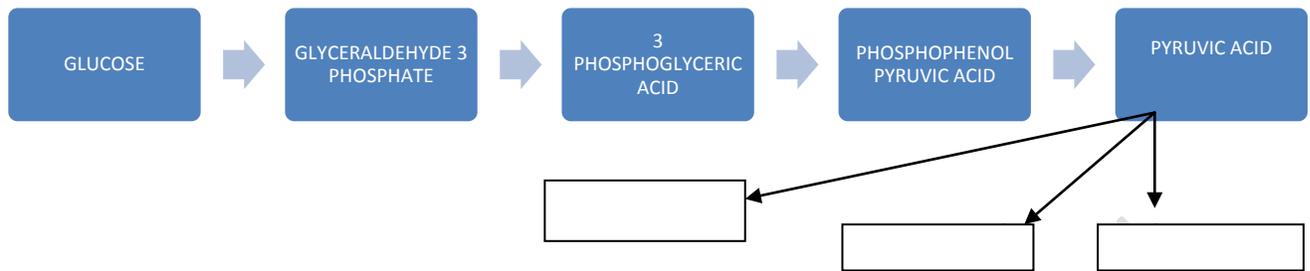
- (b) Briefly describe the relationship between the nucleus and ribosomes. Your answer should include the following key terms: mRNA, rRNA, and protein synthesis. [3]
- (c) Which of these do you think would have the most severe effect on digestion: surgical removal of the stomach, gallbladder, or pancreas? Why? [2]

Question 6

- (a) i. Explain the role of meiosis in sexual reproduction and genetic variation. [2]
 ii. List 3 ways meiosis is different from mitosis. [1.5]
 iii. What occurs during prophase I of meiosis and why is it important? [0.5]
- (b) Analyze overall reactions including reactants and products for photosynthesis and cellular respiration and factors which affect their rates.
- i. Write the equation for photosynthesis. [0.5]
 - ii. Write the equation for cellular respiration. [0.5]
 - iii. How would low levels of carbon dioxide or water affect the rate of photosynthesis? [1]
 - iv. How would high levels of oxygen and glucose affect the rate of cellular respiration? [1]
 - v. How would temperature affect photosynthesis and cellular respiration? [1]
 - vi. How would pH affect photosynthesis and cellular respiration? [1]
 - vii. How does the amount of light affect photosynthesis? [1]

Question 7

- (a) Describe the different regions of a root? [3]
- (b) How does muscle shorten during its contraction and return to its original form during relaxation? [2]
- (c) Pyruvic acid is the end product of glycolysis. What are the three metabolic fates of pyruvic acid under aerobic and anaerobic conditions? Write in the space provided in the diagram. [1.5]

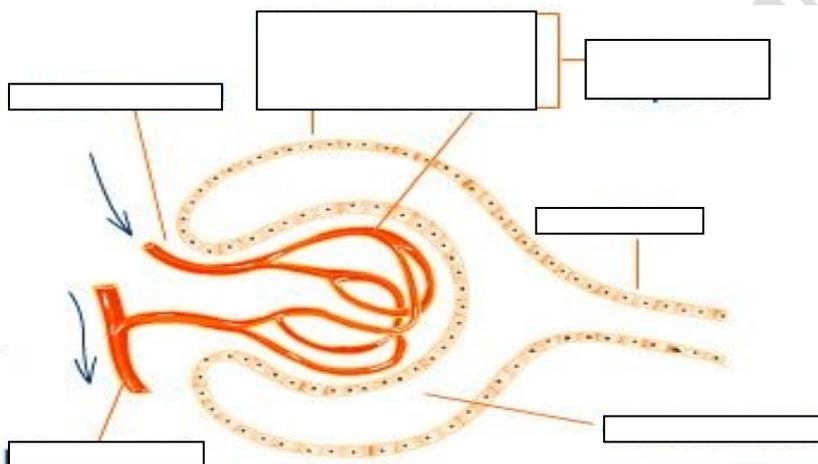


(d) DNA, a nucleic acid found in human beings and many other organisms is considered to be more stable genetic material than RNA found mainly in viruses etc. Justify. [1.5]

(e) The overall rate of photosynthesis is higher per unit energy received in flashes than continuously. Justify the statement. [2]

Question 8

a. i. Name the parts labeled 1, 2, 3 and 4 in the diagram. [2]



ii. In which portion of the nephron, most of NaCl and water is reabsorbed from the filtrate? How does the osmolality of the filtrate remaining in this part differ from the blood plasma. [2]

iii. A friend complains that he is always thirsty, and is producing large quantities of very dilute urine. How would you explain these symptoms? [2]

b. You may have heard that competitive runners often "carbo-load" (eat extraordinary amounts of carbohydrates) before a race. How do the liver and skeletal muscles handle this carbohydrate load? Do all of these carbohydrate calories end up in the liver and muscles? What other fate might the excess glucose molecules have? [2]

c. It is often said that mitochondria make energy for a cell. Why is this statement false? [2]