Reg. No._____

UNIVERSITY OF EMBU

2017/2018 ACADEMIC YEAR

SECOND SEMESTER EXAMINATIONS

THIRD YEAR EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE, BACHELOR OF SCIENCE (BIOLOGY) AND BACHELOR OF SCIENCE (ENVIRONMENTAL CONSERVATION AND NATURAL RESOURCES MANAGEMENT)

SBT 302: PLANT PHYSIOLOGY

DATE: APRIL 10, 2018 **TIME: 8:30-10:30 AM**

INSTRUCTIONS: Answer **ALL** Questions from **SECTIONS A** and **B**, and **ONE** Question selected from **Section C**.

SECTION A: Multiple Choice Questions (1 Mark each)
Please tick in the box opposite the correct answer.

1. Which of the following statements is **FALSE** about the significance of Turgor pressure in plants?

   ☐It keeps the cells and their organelles stretched which is essential for proper functioning of a cell.

   ☐It provides support to woody tissues like parenchyma.

   ☐Turgor pressure is essential for cell enlargement during growth.

   ☐It keeps the leaves fully expanded and properly oriented to light.

2. _____is the terminal electron acceptor in the electron transport Chain.

   ☐ FADH

   ☐ NAD

   ☐ Oxygen

   ☐ ATP

3. _____enzyme is involved in the non-oxidative steps of the pentose phosphate pathway.

- ☐ Glucose-6-phosphate dehydrogenase
- ☐ 6-phosphogluconate dehydrogenase
- ☐ Transketolase
- ☐ Malate synthase

4. Which of the following statements is NOT true about C4 plants?

- ☐ The efficiency of CO_2 absorption at low concentration is quite high and hence, they are more efficient plants
- ☐ Oxaloacetate (OAA) is the first stable product.
- ☐ Plants show dimorphic type of chloroplast.
- ☐ The Calvin cycle enzymes are present in mesophyll chloroplast.

5. During _____Pyruvic acid is converted to carbon dioxide and water.

- ☐ Glycolysis
- ☐ Aerobic respiration
- ☐ TCA cycle
- ☐ Glyoxylate cycle

6. _____enzyme converts Pyruvic acid to acetaldehyde and CO_2.

- ☐ Pyruvic decarboxylase
- ☐ Transketolase
- ☐ Hexo kinase
- ☐ Pyruvic dehydrogenase

7. One of the following statements is not true about respiration

- ☐ It releases energy which is used in various metabolic processes that are essential for plant life and activates cell division.
- ☐ Insoluble food is converted to soluble form.
- ☐ Oxygen is liberated during the respiratory processes
- ☐ Stored energy (potential energy) is converted to usable form (kinetic energy).

8. Which of the following statements best describes the first law of thermodynamics

- ☐ The isothermally unavailable energy of any system increases with temperature, since the energy of molecular and atomic motions increases with temperature
- ☐ It describes the direction of spontaneous processes which result to increase in total entropy.
- ☐ Some energy is stored in the thermal motions of the molecules and in the vibrations and oscillations of their constituent atoms
- ☐ Energy can be converted from one form to another, but the total energy of the universe remains the same.

9. _____is the driving force behind water transport in the xylem according to the cohesion-tension theory.

- ☐ Evaporation of water from the leaf
- ☐ The cohesive and adhesive forces of water molecules
- ☐ Surface tension of the water
- ☐ Capillary action

10. _____is the water that remains in capillary pores of soil after free (gravity) drainage is completed.

- ☐ Available water
- ☐ Field capacity
- ☐ Permanent wilting percentage
- ☐ Water capacity

11. Because of its space-filling and hydrophobic nature the_____ provides an effective barrier to the movement of water through the apoplastic space of the endodermis.

- ☐ Stele
- ☐ Endodermis
- ☐ Casparian band
- ☐ Tracheid

12. Photorespiration in plants is favored by_____.

- ☐ High carbon dioxide concentration in the leaf air space
- ☐ High oxygen concentration in the leaf air space
- ☐ Higher concentration of oxygen as compared to carbon dioxide in the leaf air space
- ☐ Rubisco

13. Which of the following statements best explains what happens during carboxylation in the C4 cycle?

- ☐ The pyruvate molecule is phosphorylated to regenerate phosphoenol pyruvate in the presence of ATP
- ☐ Phosphoenolpyruvate picks up CO_2 and changes into 4 carbon oxaloacetate in the presence of water
- ☐ Oxaloacetate breaks down readily into 4 carbon malate and aspartate in the presence of the enzyme transaminase and malate dehydrogenase
- ☐ Malate and aspartate split enzymatically to yield free CO_2 and 3 carbon pyruvate

14. One of the following statements about Osmosis is FALSE. Which one?

- ☐ Osmosis is the diffusion of water from its pure state or dilute solution into a solution or stronger solution when the two are separated by a semipermeable membrane.
- ☐ The movement of water from its higher chemical potential to its lower chemical potential without allowing the diffusion of solute by means of a semipermeable membrane.
- ☐ Movement of water from a region of high concentration to a region of low concentration
- ☐ Osmosis is movement of solvent or water molecules from the region of their higher diffusion pressure or free energy to the region of their lower diffusion pressure or free energy across a semipermeable membrane.

15. Pentose phosphate pathway contributes to the following except?

- ☐ Formation of ribose-5-phosphate
- ☐ Glucose-6- phosphate formation
- ☐ DNA and RNA formation
- ☐ Coenzymes formation (ATP, NADH, FADH2 and coenzyme A)

SECTION B: SHORT ANSWER QUESTIONS (5 Marks Each)

Your answers should be brief and to the point (Use the examination answer book provided)

16. Explain why photorespiration is important in C_3 plants.
17. Discuss the characteristics of C_4 plants that enable them adapt to areas of high light intensities and temperature range of 30°C to 35°C.
18. Explain how plants overcome osmotic stress.
19. Give an account of the significance of Pentose Phosphate Pathway in actively developing cells.
20. Describe the most common photosynthetic pigments in plants.
21. Explain the relationship between field capacity, permanent wilting percentage and available water in plants.

SECTION C: ESSAY QUESTIONS (25 Marks Each)

Write an essay on any ONE of the following topics (Use the examination answer book provided)

22. Discuss the factors that influence transpiration in plants.
23. Give an account of crassulacean acid metabolism (CAM).
24. Explain why the Calvin-Benson cycle is central to carbon dioxide fixation and reduction in all higher plants.

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