



UNIVERSITY OF ESWATINI

MAIN EXAMINATION PAPER

PROGRAMME: BACHELOR OF SCIENCE IN AGRONOMY YEAR THREE

COURSE CODE: CP305

TITLE OF PAPER: CROP PHYSIOLOGY

TIME ALLOWED: TWO (2) HOURS

INSTRUCTIONS: ANSWER ALL QUESTIONS

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INVIGILATOR

QUESTION 1

Match term in Column 1 with statement that best describe the term in Column 2. In your answer book, for example, just write 17=Q

Column 1	Column 2
1. C4 species	A Heritable modification in plant structure or function that improves the fitness of the organism
2. C3 and C4 plants	B Deficiency symptoms appear in newer tissues
3. Epinasty	C Catalyze movement of one type of ion or molecule against its concentration gradient coupled with the movement of a different ion or molecule in the opposite direction
4. Ethylene	D Caused by diurnal changes in production of ethylene
5. C3 and CAM plants	E Plants that have a higher carbon dioxide compensation point
6. Magnesium	F Responsible for form and shape of plants, plant parts
7. Log phase	G In these plants, photosynthesis shows a temporal separation of metabolic steps
8. ATP pumps	H Plants that have low light compensation points
9. Acclimation	I Refers to the period of seed germination and seedling growth
10. Nyctinasty	J Causes thigmomorphogenesis
11. Adaptation	K Non-heritable adjustment in physiology that occurs over the life of an individual plant
12. Calcium	L Leaf movements that arise from turgor changes
13. Lag phase	M Catalyses movement of materials across a selectively permeable membrane
14. Giberellins	N Deficiency symptoms appear on older tissues because of translocation
15. C3 species	O Associated with tillering, stem elongation and leaf expansion in cereals
16. Antiporters	P In these plants photosynthesis shows a spatial separation of metabolic steps

(20 Marks)

QUESTION 2

In your answer book, simply indicate whether these statements are either TRUE (T) or FALSE (F).

- (a) Plants depend on transpiration and xylem movement for a supply of phosphate
- (b) Transporter proteins are specific proteins in the membrane which can open and close and through which ions or H₂O molecules pass
- (c) High concentrations of auxin can lead to distortion or retardation
- (d) Stem elongation inhibited by light is an example of photomorphogenesis
- (e) The Krebs or Citric Acid Cycle, takes place in the peroxisome
- (f) Responses to cytokinin include adventitious root formation, delay of senescence, and stimulation of germination
- (g) Length of day, not night, is the operative factor in photoperiodism
- (h) Clipping or grazing stimulates branching owing to removal of apical meristem
- (i) Ethylene can assist germination, sprouting, and flowering
- (j) Ectodesmata are microscopic channels through the cell walls and middle lamella between adjacent plant cells
- (k) The process where the enzyme ribulose biphosphate carboxylase fixes O₂ not CO₂ is referred to as phosphorylation.
- (l) Leaf movements (nyctinasty) are governed by oscillating or rhythmic timing mechanisms in plants.
- (m) Many varieties of bamboos may grow or live ≥ 50 yrs. Thus bamboos exhibit an indeterminate growth habit.
- (n) Deficiency symptoms of mobile nutrients appear on new tissues because of translocation
- (o) Aquaporins are water channels that enhance osmosis
- (p) As water potential increases, the stomata close

(20 Marks)

QUESTION 3

- (a) Most plants manage to produce more organic material than they need for respiration and growth. What do they do with the extra carbohydrates?

(5 marks)

- (b) What are growing degree days or heat units? Briefly state two points that account for relevance of growing degree days or heat units? (5 marks)
- (c) Why is it important to examine or understand both nutrient ratios and nutrient concentrations in plants? (5 marks)
- (d) How does air relative humidity affect the transpiration rate of a leaf compared to that of a canopy? (5 marks)

(20 Marks)

QUESTION 4

Describe mechanisms that account for:

- a) xylem transport of water (4 marks)
 - b) facilitated diffusion (4 marks)
 - c) cell elongation (4 marks)
 - d) gravitropism (4 marks)
 - e) cation exchange (4 marks)
- (20 Marks)**

QUESTION 5

Indicate the correct answer for the following statements. As an example, in your Answer Book, write 11 = B.

1. Select the correct events leading to the opening of the stomata

- a. Decline in guard cell solutes
- b. Lowering of osmotic potential of guard cells
- c. Rise in potassium levels in guard cells
- d. Movement of water from neighbouring cells into guard cells
- e. Guard cells becoming flaccid

Answer:

- A a, c and d only
 - B b, c and d only
 - C a and e only
 - D b, d and e only
2. Which one of the following pairs, is not correctly matched?
- A IAA – Cell wall elongation
 - B Absciscic acid – Stomatal closure
 - C Gibberellic acid – Leaf fall
 - D Cytokinin – Cell division
3. The mineral elements involved in water-splitting reaction during photosynthesis are
- A Magnesium and Chlorine
 - B Potassium and Manganese
 - C Manganese and Chlorine
 - D Molybdenum and Manganese
4. In which of the following plants, will there be no transpiration?
- A Plants growing in hilly regions
 - B Aquatic, submerged plants
 - C Plants living in deserts
 - D Aquatic plants with floating leaves
5. Assertion: Deficiency of sulphur causes chlorosis in plants. Reason: Sulphur is a constituent of chlorophyll, proteins and nucleic acids.
- A Both the Assertion and the Reason are true and the Reason is a correct explanation of the Assertion.
 - B Both the Assertion and the Reason are true but the Reason is not a correct explanation of Assertion.
 - C Assertion is true but the Reason is false.
 - D Both the Assertion and the Reason are false.
6. Water will be absorbed by root hair when
- A concentration of salts in the soil is high
 - B concentration of solutes in the cell sap is high
 - C plant is rapidly respiring
 - D they are separated from soil by a permeable membrane

7. Differentiation of shoot is controlled by:
- A High auxin : cytokinin ratio
 - B High cytokinin : auxin ratio
 - C High gibberellin : auxin ratio
 - D High gibberellin : cytokinin ratio
8. Movement of leaves of sensitive plant, *Mimosa pudica* are due to
- A Thermonasty
 - B Seismonasty
 - C Hydrotropism
 - D Chemonasty.
9. Carbohydrates are commonly found as starch in plant storage organs. Which of the following five properties of starch (a - e) make it useful as a storage material?
- a. Easily translocated
 - b. Chemically non-reactive
 - c. Easily digested by animals
 - d. Osmotically inactive
 - e. Synthesized during photosynthesis

The useful properties are:

- A (a) and (e)
 - B (b) and (c)
 - C (b) and (d)
 - D (a), (c) and (e)
10. In sugarcane plant, CO_2 is fixed in malic acid, in which the enzyme that fixes CO_2 is:
- A Ribulose phosphate kinase
 - B Phosphoenolpyruvic acid carboxylase
 - C Ribulose biphosphate carboxylase
 - D Fructose phosphatase

(20 Marks)