



College of Agriculture, Fisheries and Forestry (CAFF)

BACHELOR OF SCIENCE IN AGRICULTURE
ACP 532 PLANT PHYSIOLOGY, BIOCHEMISTRY AND
BIOTECHNOLOGY

Date: 16/01/12

Time: 1.00 p.m. to 4.10 p.m.

TRIMESTER III FINAL EXAM – 2012

DURATION 3 HOURS and 10 MINUTES

INSTRUCTIONS TO STUDENTS

1. You are allowed 10 minutes extra reading time in which you are NOT to write.
2. **Answer ALL questions in the answer booklet.** Attach all sheets used as your answer paper in their correct sequence and secure with a string.
3. Write your student ID number on all pages that you use including any additional sheet paper.
4. Calculators are permitted.
5. **Try to allocate your time according to the marks for each question!**
6. **Sections A and B are compulsory and Section c has liberty of choices.**

SECTION	TYPE	TOTAL MARKS
A	MULTIPLE CHOICE	10
	MATCHING	10
	TRUE AND FALSE	10
B	SHORT ANSWER	40
C	LONG ANSWER	30
TOTAL MARKS		100

GOOD LUCK

SECTION A

MULTIPLE CHOICES

(10 Marks)

Select the BEST option to each question. In your answer booklet write the question number followed by the letter which has the best option. **Each question is worth 1 mark.**

1. The production of plantlets through somatic embryogenesis is called;
 - A. Callus and Cell Culture.
 - B. Protoplast Culture.
 - C. Haploid Culture.
 - D. Micro propagation.

2. Plant cell organelle found in eukaryotic cells responsible for cellular respiration is called;
 - A. Ribosome.
 - B. Cytoplasm.
 - C. Cytosol.
 - D. Mitochondria.

3. A large cell vacuole is essential in plant cells for;
 - A. Water Storage.
 - B. PH regulation.
 - C. Storage of essential ions
 - D. All of the above.

4. What is the main target goal of a plant breeder;
 - A. Field Observation.
 - B. Irrigation.
 - C. Increased yield and Quality.
 - D. None of the above.

5. What is a good characteristic of a plant tissue culture?
 - A. Axenic conditions.
 - B. Un-optimized environmental condition.
 - C. Genetic transformation not carried out.
 - D. All of the above.

6. Water in plants travel in vessels. What are two major cells types that transport water in plants?

- A. Phloem and Xylem.
 - B. Sieve tube and elements.
 - C. Root hairs and Phloem.
 - D. Xylem and Tracheids.
7. Guard cells in plants open when the;
- A. CO_2 concentration is high at night.
 - B. CO_2 concentration is low at night.
 - C. CO_2 concentration is low during the day.
 - D. CO_2 concentration is high during the day.
8. Which is not a major plant growth regulator (PGR) used for plant growth regulation?
- A. Auxins.
 - B. Ethylene.
 - C. Cytokinins.
 - D. Gibberellins.
9. The creation of pattern and shape resulting in anatomical development in plants is called;
- A. Plant Growth.
 - B. Morphogenesis.
 - C. Gametogenesis.
 - D. Differentiation.
10. What was the first plant hormone to be discovered?
- A. Cytokinins.
 - B. Auxins.
 - C. Ethylene.
 - D. Gibberellins.

MATCHING**(10 Marks)**

Select the **MATCH** to each question. In your answer booklet write the **BEST MATCH** from Column "B" to Column "A". **Each question is worth 1 mark.**

COLUMN A**COLUMN B**

1. Male Gametophyte
2. Female Gametophyte
3. Energy for germination
4. Buds dominates Stem growth
5. Primary Root
6. Rapid Cell Division
7. 2N
8. N
9. Pairing of Homologous Chromosomes
10. Exchange of Homologous Chromosomes

- A. Embryo Sac
- B. Anther
- C. Diploid
- D. Meristematic zone
- E. Synapse
- F. Apical Dominance
- G. Haploid
- H. Elongation Zone
- I. Ovary
- J. Endosperm
- K. Maturation Zone
- L. Polyploidy
- M. Recombination
- N. Chiasma

MATCHING**(10 Marks)**

Select the **MATCH** to each question. In your answer booklet write "TRUE" OR "FALSE" for each statement provided. **Each question is worth 1 mark.**

1. Mendel's Second Law – gamete formation of each member of the allelic pair separates from other members to form the genetic constituent.
2. DNA building blocks are held together by a sugar phosphate backbone.
3. A monohybrid cross of gametes **YY** and **yy** will yield 75% F1 hybrid plants all yellow in color.
4. A monohybrid cross during self-fertilization of gametes **Yy** and **Yy** will yield 75% green and 25% yellow F2 generation plants.
5. Agro bacterium is a natural plant transformer.
6. Elements such as Fe, B, Mn are macronutrients needed during plant growth.

7. Ethylene is a gaseous plant growth regulator.
8. Ovule culture is a in=⁻vitro fertilization technique
9. Light exerts strong control on the closure and opening of guard cells of the stomata.
10. Genetic engineering of agricultural -plants has its pros and cons.

SECTION B

SHORT ANSWERS

(40 Marks)

Question 1 (8 marks)

- (a) Define the term plant biotechnology? (2 marks)
- (b) How has the adoption of plant biotechnology impacted the environment? (2 marks)
- (c) (i) Define term EIQ? (2 marks)
- (ii) Briefly explain its importance in agriculture? (2 marks)

Question 2 (8 marks)

- (a) Define the following terms;

Choose the best four out of the eight choices provided;

- Pure Line.
- Phenotype.
- Out crossing.
- Self Incompatibility.
- Double Fertilization.
- Recessive trait.
- Plant Development.
- Allele

Question 3 (8 marks)

(a) Set up a punnet square using the following information:

(4 marks)

- Dominant allele for tall plants = D
- Recessive allele for dwarf plants = d
- Dominant allele for purple flowers = W
- Recessive allele for purple flowers = w

(b) Using the punnet square in Question 3a;

- What is the probability of producing tall plants with purple flowers? Give possible genotypes (s)?
- What is the probability of producing dwarf with white flowers? Give possible genotypes (s)?
- What is the probability of producing tall plants with white flowers? Give possible genotypes (s)?
- What is the probability of producing dwarf plants with purple flowers? Give possible genotypes (s)?

Each sub question in 3b I worth 1 mark.

Question 4 (8 marks)

(a) List three methods of delivering DNA into plant using;

- Biological means
- Physical Means

(5 marks)

(b) Define the following Tissue Culture terms; **each is worth 1 mark.**

- Plant Tissue Culture
- Totipotency
- Organogenesis

(3 marks)

Question 5 (8 marks)

(a) Calculate the pressure required to move water to the top of a tall tree which is 150 meters tall? Use Poiseuille's equation for the calculation. (4 marks)

$$J_v = ((\pi) (r^4) (\Delta P)) / 8(n)$$

Assume;

N = viscosity of water; 10^3 Pas)

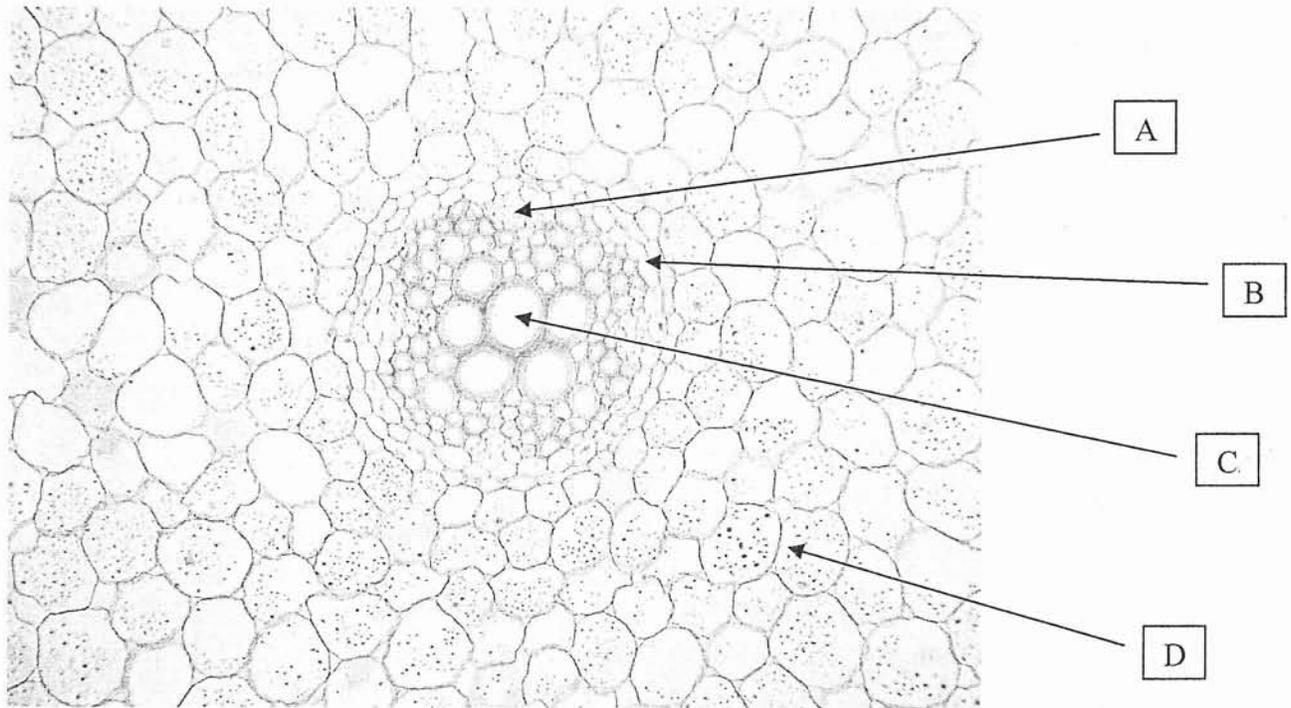
J_v = 4×10^{-3} m/sec

r = 40 μ m.

Effect of gravity = 0.01MPam^{-1}

(b) Name the following structures represented in the diagram;

(2 marks)



(c) Explain the term plant physiology?

(2 marks)

SECTION C**LONG ANSWERS****(30 MARKS)**

Answer **ONLY ONE** out of the 2 choices for each question provided. **For example answer either 1a or 1b; 2a or 2b.**

Each question is worth **6 marks**.

Question 1

(a) The soil-water-air continuums are important stages in the water movement pathway.

Explain in detail the following stages;

- Plant-Air Continuum
- Soil-Root Continuum
- Root-Leave Continuum

OR

(b) Plastids are membrane – bound organelles in plants. They contain DNA and ribosome.

Describe in detail the following types of plastids;

- Chloroplasts
- Chromoplasts
- Pro-plastids

Question 2

(a) Simple Plant growth is accompanied by the process of mitosis. Explain the five basic steps involved in mitosis?

OR

(b) Meiosis is a cell division that makes sex gametes. Meiosis is a two step process. Explain in detail the second stage of division and the processes involved?

Question 3

(a) Plant Transformation involves the physical means of introducing DNA into plant cells. Explain in detail the introduction of gene using agrobacterium;

OR;

(b) by using a Gene Gun

Question 4

(a) Explain each stage involved during the tissue culture development.

OR

(b) Plant Growth Regulators (PGR) are chemical compounds that regulate the growth of plants or plant cells. Describe the functions of the following growth regulators;

- Auxins
- Cytokinins
- Gibberellins
- Abscisic Acid

Question 5

(c) Explain the mechanisms involved in the guard cell action (opening and closure) and discuss the influence of water on stomata by hydropassive control and hydroactive control?

OR

(d) Phloem vessels are made up of sieve tube elements, companion cells, parenchyma cells and fiber tissues. Explain in detail;

- the different types of companion cells.
- the function of parenchyma cells and sieve cells.

THE END