



FACULTY OF SCIENCE

DEPARTMENT OF BIOTECHNOLOGY AND FOOD TECHNOLOGY BIOTECHNOLOGY

**MODULE BTN7X03
 APPLIED PLANT BIOTECHNOLOGY 4
CAMPUS DFC**

Supplementary Examination January 2021

DATE: 20 January 2021

SESSION: 8:00 –11:00

EXAMINER:

DR S. M. MOYO

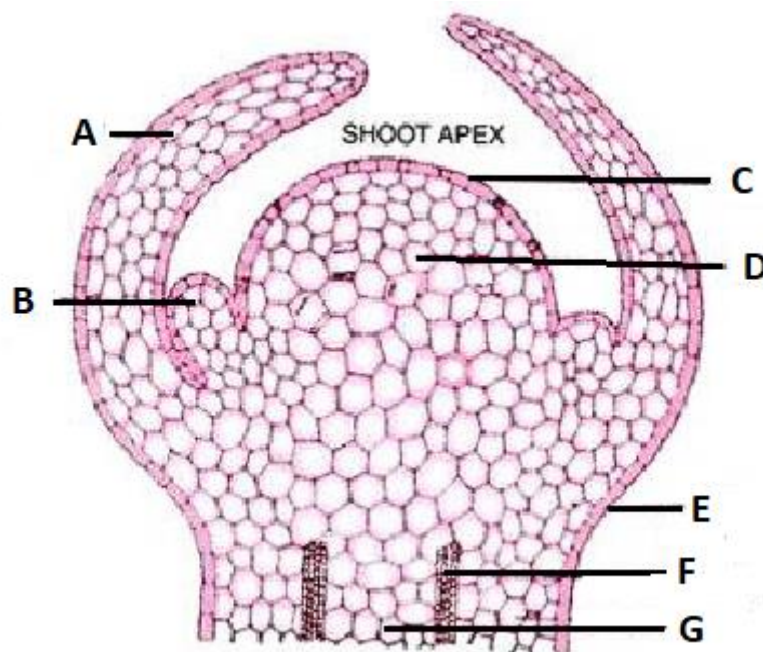
EXTERNAL MODERATOR:

DR J. M BAPELA

DURATION: 3 HOURS

MARKS 106

1. Describe the differences between
 - (i) Epigeous germination and hypogeous germination. (6)
 - (ii) Stratification and scarification (6)
2. The shoot apex is the terminal, dome shaped part of shoot and is formed from a meristem.
 - (i) Label the structure of the shoot apex below (7)



3. Which of the following metabolites are produced as a result of primary metabolism in plants? (2)
 - i. Proteins
 - ii. Lipids
 - iii. Flavonoids
 - iv. Hormones
 - a. i, ii, iv
 - b. i, iii, iv
 - c. ii, iii, iv
 - d. i, ii, iii
4. Which statement is not true about Absciscic acid (ABA)? (2)
 - a. It is a naturally occurring growth inhibitor
 - b. Can promote cell division and shoot growth
 - c. It is involved in pathogen defence and response
 - d. It counteracts the effects of gibberellic acid and promotes seed dormancy
5. True or false? (2)

Phytochrome far red is biologically inactive and absorbs red light during the photoperiodic response of plants.
6. Explain why an individual would select filter sterilization as a method of achieving sterility in plant tissue culture and why do the filters have 0.45 to 0.22 μm pore size. (4)
7. You have prepared a stock solution of 0.03g per 20mL of Kinetin. Calculate the volume (L) of the stock solution that you need to add to 375mL of growth media to have a final concentration of 5mg/L. (4)

- a. 0.001125 L
 - b. 0.00125 L
 - c. 1.25 L
 - d. 3.125 L
8. Which of the following hormones is an example of a synthetic Auxin? (2)
- a. Kinetin
 - b. BAP (benzylaminopurine)
 - c. IAA (indole-3-acetic acid)
 - d. 2,4-Dichlorophenoxyacetic acid (2,4-D)
9. Which of the following occurs during the lag phase of a batch culture growth cycle? (2)
- a. Cell division occurs and cells are metabolically active
 - b. No cell division occurs, and cells are not metabolically active
 - c. Rate of cell division increases and rate of cell expansion increases
 - d. No cell division occurs, and cells are metabolically active
10. The Chemostat culture involves the (2)
- a. Addition of fresh medium that is equal to the outflow of old medium and adding the cells from old medium back into the culture
 - b. Addition of fresh medium that is controlled by an increase in turbidity of the culture
 - c. Control of cell size and growth rate by limiting the supply of nutrients
 - d. Addition of cells and equal removal of cells from culture by maintaining optical density
11. Immobilised cell systems are used to culture?
- a. Individual cells only
 - b. Aggregate cells only
 - c. Individual cells, aggregate cells, and calluses
 - d. Calluses of homogenous nature only
12. Explain how morphological differentiation effects the production of secondary metabolites during *in vitro* tissue culture (3)
13. What is the difference between the Gametophytic phase and Sporophytic phase of the life cycle of Angiosperms? (4)
14. Which of the statements is true? (2)
- a. Pollen mother cells (PMCs) divide by mitosis to form a tetrad
 - b. After meiosis II, a tricellular pollen is formed
 - c. Uni-cellulate microspore nuclear undergo mitosis I to produce vegetative nucleus and generative nucleus
 - d. Both a and c
15. Haploid production cannot be done through
- a. Pollen culture
 - b. Callus culture
 - c. Anther culture
 - d. Hybridisation
16. Diploidization of haploid plants can be achieved by
- a. Colchicine treatment
 - b. Endomitosis
 - c. Pre-treatment of anthers
 - d. Both A and B
17. How does protoplast plating density affect protoplast plating efficiency? (4)
18. Which one of the listed chemicals below is not used in the identification of hybrid plants? (2)

- a. Fluorescein isothiocyanate
 - b. Colchicine
 - c. Carbofuchsin
 - d. Rhodamine isothiocyanate
19. Which method uses X-ray irradiated protoplast during protoplast culture (2)
- a. Co-culture of protoplasts method
 - b. Liquid culture method
 - c. Feeder layer method
 - d. Slow growth method
20. What is the importance of adding cryoprotectants during cryopreservation? (3)
21. Which strategy of conservation of plant genetic materials involves the use of cryopreservation? (2)
- a. *In-situ* conservation
 - b. *Ex-situ* conservation
 - c. *In vitro* conservation
22. What is the importance of the TATA box? (3)
23. Describe the role of a methyl group in controlling gene expression in plants? (3)
24. True or False? Genes within an Operon will always be expressed together or not at all.
25. The plastome genome consists of (2)
- a. Three sets of genes
 - b. Two sets of genes
 - c. One gene
 - d. Four sets of genes
26. Which of the following vector can be used for cloning bigger DNA fragments? (2)
- a. Yeast cloning vector
 - b. Cosmids
 - c. Plasmids
 - d. Shuttle vector
27. Give the correct sequence of the following steps used in Southern hybridization (2)
- i. Blotting membrane
 - ii. Restriction digestion
 - iii. Detection
 - iv. Separation by electrophoresis
- A. iv, i, ii, iii
 - B. ii, iv, i, iii
 - C. iv, ii, i, iii
 - D. ii, i, iv, iii
28. What is the purpose of protease and RNAase enzyme in DNA extraction? (2)
29. True or False? The use of Ti plasmid from *Agrobacterium tumefaciens* as a vector involves the removal of *Vir* genes and T- DNA region. (2)
30. True or False? The Cauliflower mosaic virus (CaMV) gene transfer method involves the synthesis of the virus RNA transcript in the cytoplasm. (2)
31. Which method of gene transfer involves the use of gold or tungsten particles? (2)
32. Liposome mediated transformation makes use ofto increase transformation efficiency. (2)
- a. Calcium chloride
 - b. Polyethylene glycol

- c. Dimethyl sulfoxide
 - d. Calcium nitrate
33. Marker free selection can be done by (2)
- a. Co-transformation
 - b. Deletion
 - c. Inversion
 - d. Deletion
34. True or False? Gene silencing involves the inactivation of transferred genes at transcriptional and post transcriptional level. (2)
35. The Bar gene is used as (2)
- a. Herbicide resistant marker
 - b. Antimetabolite marker
 - c. Antibiotic resistant marker
 - d. Both herbicide and antibiotic resistant marker
36. True or False? The β -glucuronidase gene can be used a positive selectable marker and reporter gene. (2)
37. Which of the following statements are true about glyphosate tolerant transgenic plants? (2)
- I. Transgenic plants detoxify glyphosate to amino ethyl phosphate
 - II. Transgenic plants produce a mutated EPSP that is not affected by glyphosate
 - III. Transgenic plants detoxify products of mutated EPSP
 - IV. Transgenic plants use gus gene to prevent inhibition of amino acids biosynthesis
- a. I and II
 - b. I and III
 - c. II and IV
 - d. III and IV
38. Golden Rice is a transgenic crop with which improved trait? (2)
- a. High insect resistance
 - b. Hight lysine content
 - c. High protein content
 - d. High beta-carotene content
39. Why does the Bt gene expressed in transgenic plants control specific pests and not affect non-target species? (2)
40. How can transgenic plants be used in reducing plastic pollution? (3)
41. True or False? Insulin can be produced from transgenic plants (2)