



FACULTY OF SCIENCE

DEPARTMENT OF BIOTECHNOLOGY AND FOOD TECHNOLOGY BIOTECHNOLOGY

**MODULE BTN7X03
 APPLIED PLANT BIOTECHNOLOGY
CAMPUS DFC**

FINAL ASSESSMENT 2021

DATE: 25 October 2021

SESSION: 12:30 –15:30

EXAMINER:

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EXTERNAL MODERATOR:

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DURATION: 3 HOURS

MARKS 118

1. The apical meristems and intercalary meristems can be characterised as secondary meristems. True or false. Explain your answer. (4)
2. Explain the meaning of
 - (i) Totipotency (3)
 - (ii) Dedifferentiation (3)
 - (iii) Cytodifferentiation (2)
3. Given below are two statements. One labelled as an Assertion (A) and the other labelled as Reason (R).
 Assertion (A): Several factors are responsible for seed dormancy. One of the factors is immature embryo.
 Reason (R): Seed dormancy caused by immature embryo can be overcome by scarification.

 In context of the above statements, which one is correct? (2)
 - a. (A) is correct, (R) is also correct
 - b. (A) is wrong, (R) is correct
 - c. (A) is correct, (R) is wrong
 - d. (A) is wrong, (R) is also wrong
4. True or false? In Dicotyledonous seeds the endosperm is the nourishing tissue which provides food for the growing embryo. (2)
5. 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
6. Which statement is not true about Absciscic acid (ABA)? (2)
 - a. It is a naturally occurring growth inhibitor
 - b. It is required in most cases to break seed dormancy.
 - c. It is involved in pathogen defence and response
 - d. It can stimulate the production of another plant hormone ethylene.
7. True or false? (2)
 Phytochrome far red is biologically inactive and absorbs red light during the photoperiodic response of plants.
8. 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
9. A chemical has a formula weight of 180 g/mole and you need 25 ml of 0.15 M solution. How many milligrams of the chemical must be dissolved in 25 ml water to make this solution? (4)
 - a. 0.675 mg

- b. 675 mg
 - c. 6.75 mg
 - d. 6750 mg
10. 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)
11. 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
12. 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
13. During synchronisation of cells in suspension culture, at what stage of mitosis does the colchicine chemical stop the cell cycle? (2)
- a. Anaphase
 - b. Metaphase
 - c. Prophase
 - d. Telophase
14. Explain how morphological differentiation effects the production of secondary metabolites during *in vitro* tissue culture (3)
15. What is the difference between the Gametophytic phase and Sporophytic phase of the life cycle of Angiosperms? (4)
16. 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
17. Cybrids are produced (2)
- a. By in vitro fusion of gametes
 - b. By fusion of two cells and contain full nuclear genomes of the two parents
 - c. By fusion of two cells and contain full nuclear genome of the other parent and cytoplasm of both parents
 - d. By fusion of two cells and contain nuclear genome of one parent and cytoplasmic genome of the other parent
18. Describe two approaches used for the enzymatic isolation of protoplasts (6)
19. How does protoplast plating density affect protoplast plating efficiency? (4)
20. 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
21. Which method uses X-ray irradiated protoplast during protoplast culture (2)
- Co-culture of protoplasts method
 - Liquid culture method
 - Feeder layer method
 - Slow growth method
22. What is the importance of adding cryoprotectants during cryopreservation? (3)
23. Which strategy of conservation of plant genetic materials involves the use of cryopreservation? (2)
- In-situ* conservation
 - Ex-situ* conservation
 - In vitro* conservation
24. How will histone acetylation or deacetylation affect the synthesis of auxin when needed by a plant that receives a signal to produce the hormone? (3)
25. What is the importance of enhancer regions in plant gene structure? (3)
26. The addition of two protective “caps” (5’ cap and poly-A-tail) on the mRNA occurs (2)
- In the cytoplasm
 - During translation
 - In the nucleus
 - During post-translational modifications
27. The plastome genome consists of (2)
- Three sets of genes
 - Two sets of genes
 - One gene
 - Four sets of genes
28. Which organelle fits this description? Consist of circular and linear DNA, semi autonomous and has to import some tRNA’s from cytosol.
- Mitochondria
 - Chloroplast
 - Nucleus
29. Which of the following vector can be used for cloning bigger DNA fragments? (2)
- Yeast cloning vector
 - Cosmids
 - Plasmids
 - Shuttle vector
30. Give the correct sequence of the following steps used in Southern hybridization (2)
- Blotting membrane
 - Restriction digestion
 - Detection
 - Separation by electrophoresis
- iv, i, ii, iii
 - ii, iv, i, iii
 - iv, ii, i, iii
 - ii, i, iv, iii
31. What is the purpose of protease and RNAase enzyme in DNA extraction? (2)
32. 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)

33. True or False? The Cauliflower mosaic virus (CaMV) gene transfer method involves the synthesis of the virus RNA transcript in the cytoplasm. (2)
34. A plant receives signal to stop the synthesis of Auxin. What would be the role of a methyl group in controlling the gene expression of auxin in plants? (3)
35. Liposome mediated transformation makes use ofto increase transformation efficiency. (2)
- Calcium chloride
 - Polyethylene glycol
 - Dimethyl sulfoxide
 - Calcium nitrate
36. In land plants, chloroplasts and mitochondria are almost always inherited via the female gametophyte, meaning they are.....
- Maternal
 - Paternal
 - Heteroplasmic
37. Marker free selection can be done by (2)
- Co-transformation
 - Deletion
 - Inversion
 - Deletion
38. True or False? Gene silencing involves the inactivation of transferred genes at transcriptional and post transcriptional level. (2)
39. The Bar gene is used as (2)
- Herbicide resistant marker
 - Antimetabolite marker
 - Antibiotic resistant marker
 - Both herbicide and antibiotic resistant marker
40. True or False? The β -glucuronidase gene can be used a positive selectable marker and reporter gene. (2)
41. Which of the following statements are true about glyphosate tolerant transgenic plants? (2)
- Transgenic plants detoxify glyphosate to amino ethyl phosphate
 - Transgenic plants produce a mutated EPSP that is not affected by glyphosate
 - Transgenic plants detoxify products of mutated EPSP
 - Transgenic plants use gus gene to prevent inhibition of amino acids biosynthesis
- I and II
 - I and III
 - II and IV
 - III and IV
42. Cry3A Bt toxin affects? (2)
- Coleoptera species
 - Lepidoptera species
 - Heteroptera species
43. What is the importance of glycine betaine from transgenic plants? (6)
44. How can transgenic plants be used in reducing plastic pollution? (3)
45. How does a transgenic plant use coat protein mediated cross protection in virus resistance? (4)

The end