



UNIVERSITY
OF
JOHANNESBURG

FACULTY OF SCIENCE

DEPARTMENT OF BIOTECHNOLOGY AND FOOD TECHNOLOGY
BIOTECHNOLOGY

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

FINAL ASSESSMENT 2021 MEMO

DATE: 25 October 2021

SESSION: 12:30 –15:30

EXAMINER:

DR S. M. MOYO

EXTERNAL MODERATOR:

DR J. M BAPELA

DURATION: 3 HOURS

MARKS 106

Multiple choice and True or False answers

1. b (2)

2. (i) Totipotency (3)

the capacity of a cell to regenerate the entire plant. Cells lines differentiate to form specialized tissues and organs. Cells undergo structural changes during differentiation. Changes take place both in their cell walls and protoplasm.

(ii) Dedifferentiation (3)

is an important biological phenomenon whereby mature cells revert from a specialized function to a simpler meristematic state and forming undifferentiated callus tissue. An undifferentiated cell sometimes regains the power of division. A dedifferentiated cell can divide and produce new cells.

(iii) Cytodifferentiation (2)

Specialization of cells

2. c (2)

4. a (2)

5. b (2)

6. False (2)

8. b (4)

9.d (2)

10.a (2)

11.c (2)

12.b (2)

15.c (2)

16.c (2)

19. b (2)

20. c (2)

22. c (2)

25. c (2)

26.b (2)

27.b (2)

28.b (2)

30.False (2)

31.False (2)

33.b (2)

34.a (2)

35.True (2)

36.a (2)

37.True (2)

38.a (2)

39.d (2)

Structured questions answers

3. A-Region of maturation
B-Region of elongation
C-Region of cell division
D-Root cap region
E-Apical meristem (5)
7. A-Short-day (Long night) plants, B-Long-day (Short night) plants.
Plants that flower only when day length drops below a certain threshold are called short-day plants.
Plants that flower only when day length rises above a certain threshold are called long-day plants. Spinach and sugar beets are long-day plants. (8)
13. Morphological differentiation influences the accumulation of secondary metabolites only in specific plant structures. Lack of tissue differentiation in callus/ liquid culture causes low yield. Start cultures from already differentiated tissues to improve yield (3)
14. **Gametophytic phase**
The stage when plants produce haploid (n) gametes
The diploid cells undergo meiosis (reduction division) to form gametes (n).
It is a short-lived phase as fertilization of the egg in ovary by sperm from pollen again results into the diploid sporophytic phase. (2)
- Sporophytic phase**
The stage when plants produce diploid (2n) spores
Chromosome number (2n) is the product of fertilization of male and female gametes, containing the haploid (n) set of chromosomes from each parent. (2)
17. **Two step or sequential method:** (3)
firstly, cells are separated by the use of a maceration enzyme – a pectin hydrolyzing enzyme such as, macerozyme or Pectolyase.
Once the cells are separated, they are washed in Cell Protoplast Washing (CPW) solution free of enzymes but containing plasmolyticum by gentle centrifugation.
The pellet is retained and resuspended in the second enzyme like, cellulases and hemicellulases, used to hydrolyse the remaining cell wall component.
Once the protoplasts are released, they are washed with CPW to remove the debris.
One step or simultaneous method: (3)

Plant tissues are plasmolysed in the presence of a mixture of pectinases and cellulases, thus, inducing simultaneous separation of cells and degradation of their walls to release the protoplasts directly in a single step.

18. At high density, the cell colonies arising from individual protoplasts tend to grow into each other resulting into chimera tissue if the protoplast population is genetically heterogeneous.
An excessively high plating density rapidly depletes nutrients, and protoplast-derived cells can fail to undergo sustained division. (4)
21. Cryoprotectants are the compounds that can prevent the damage caused to cells by freezing or thawing.
The freezing point and super-cooling point of water are reduced by the presence of cryoprotectants as they limit formation of large ice crystals and help dehydrate cells during freezing. (3)
23. Introns are intervening sections that do not code for amino acids. Introns are transcribed but not represented in the mature mRNA and hence not translated. (3)
24. Enhancer regions are binding sequences, or sites, for transcription factors involved in the process of transcription (3)
29. Protease digests the protein and RNAase digests the RNA (2)
32. Microprojectile bombardment (2)
40. It is generally the presence or absence of specific forms of midgut receptors that determines whether a particular insect species is susceptible to a given Bt protein. (2)
41. A gene from bacteria that can produce Polyhydroxyalkanoates (PHAs) which are biodegradable biopolymers naturally synthesized and accumulated as intracellular energy and carbon reserves by a wide range of bacteria is transferred to plants. PHAs have properties similar to those of conventional petrochemical plastics. Therefore, PHAs can be used in place of plastics to reduce plastic use. (3)