



**NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY**

FACULTY OF HEALTH, APPLIED SCIENCES AND NATURAL RESOURCES

**SCHOOL OF NATURAL AND APPLIED SCIENCES
DEPARTMENT OF BIOLOGY, CHEMISTRY AND PHYSICS**

QUALIFICATION: BACHELOR OF SCIENCE HONOURS	
QUALIFICATION CODE: 08BOSH	LEVEL: 8
COURSE CODE: PAB811S	COURSE NAME: PLANT AND ANIMAL BIOTECHNOLOGY
SESSION: JUNE 2023	PAPER: THEORY
DURATION: 3 HOURS	MARKS: 110

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER	
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INSTRUCTIONS
<ol style="list-style-type: none">1. Answer ALL the questions2. Write clearly and neatly3. Number the answers clearly4. All written work MUST be done in blue or black ink5. No books, notes and other additional aids are allowed6. Draw diagrams wherever necessary

PERMISSIBLE MATERIALS

None

THIS QUESTION PAPER CONSISTS OF 6 PAGES
(Including this front page)

QUESTION 1: MULTIPLE CHOICE QUESTIONS

[15]

- There are 15 multiple choice questions in this section. Each question carries 1 mark.
 - Answer **ALL** questions by selecting the **LETTER** with the correct answer.
- 1.1 Range of osmolarity tolerated/accepted in mOsm/Kg of H₂O by mammalian cells is;
- (a) 150
 - (b) 280
 - (c) 300
 - (d) 400
- 1.2 Which of the following is not true of *Agrobacterium tumefaciens*?
- (a) It causes crown gall disease when it carries a tumour inducing (Ti) plasmid
 - (b) Virulence genes on the Ti plasmid is responsible for DNA transfer to the plant
 - (c) Plant hormones (auxin and cytokinin) encoded genes in the T-DNA
 - (d) It is a gram-positive bacterium
- 1.3 Which one of the following statements about plant tissue culture is correct?
- (a) The culturing of root is not possible
 - (b) Any cell that is totipotent can be cultured
 - (c) The pH of the media need not be maintained
 - (d) Fruit juices are added to media as carbon source
- 1.4 POMATO, is;
- (a) A transgenic plant
 - (b) A plant obtained through protoplast hybridization
 - (c) A plant obtained by organ culture
 - (d) A plant developed by plant breeding method
- 1.5 Tobacco plant resistant to a nematode have been developed by the introduction of DNA that produced in the host cells_____.
- (a) Both sense and anti-sense RNA
 - (b) A particular hormone
 - (c) An antifeedant
 - (d) A toxic protein
- 1.6 Which indicator is used in the cell culturing medium?
- (a) Methyl red
 - (b) Phenol red
 - (c) Methyl orange
 - (d) Trypan blue
- 1.7 Routinely used proteolytic enzyme to detach adherent cells from the substratum;
- (a) Papain
 - (b) Elastase
 - (c) Collagenase
 - (d) Trypsin

- 1.8 Name the type of culture which is prepared by inoculating directly from the tissue of an organism to culture media?
- (a) Primary cell culture
 - (b) Secondary cell culture
 - (c) Cell lines
 - (d) Transformed cell culture
- 1.9 Transplant organs from transgenic animals;
- (a) Xenotransplantation
 - (b) Lactoferrin
 - (c) Atryp
 - (d) Phytase
- 1.10 The blastocyst is harvested and mixed with recombinant DNA and inserted back in the blastocyst.
- (a) DNA microinjection
 - (b) Sperm mediated transfer
 - (c) Retrovirus mediated transgenics
 - (d) Embryonic stem cell-mediated gene transfer
- 1.11 The choice of animal to test is usually determined by; (A) genetic similarity to humans (B) potential to mimic conditions in humans (C) small number with the correct insertion are selected and cloned numerous times in culture (D) genetic similarity to humans but different from animal.
- (a) Both A and B
 - (b) Both A and C
 - (c) Both C and B
 - (d) A, B and C
- 1.12 Introducing the transgene DNA directly into the fertilized egg at an early stage of development.
- (a) DNA microinjection
 - (b) Embryonic stem cells
 - (c) Sperm mediated transfer
 - (d) Retrovirus mediated transgenics
- 1.13 What are myeloma cells?
- (a) Cancerous white blood cells
 - (b) Cancerous red blood cells
 - (c) Cancerous spleen cells
 - (d) β -lymphocyte

- 1.14 What is the problem with biofilming on the hull of ships? (A) increase the resistance of the ship as it moves through the water, slowing its travel time and reducing its fuel efficiency (B) a progressive accumulation of biofilms can clog pipes, block water intake and filtration systems for ships (C) corrode metal surfaces
- (a) Both A and B
 - (b) Both A and C
 - (c) Both B and C
 - (d) All A, B and C
- 1.15 What is a handheld antibody test kit developed for?
- (a) To detect *Vibrio cholerae* in oysters
 - (b) Detect several viral diseases of shrimp
 - (c) To detect infectious salmon anaemia
 - (d) To detect infectious hematopoietic necrosis

QUESTION 2: FILL IN THE BLANK

[9]

Each answer carries one mark

- 2.1 The two polypeptides of human insulin are linked together by _____.
- 2.2 Activated charcoal is used in nutrition media to _____.
- 2.3 In Bt Cotton, the Bt toxin present in plant tissue as protoxin is converted into active toxin due to _____.
- 2.4 A homogenous cell line will proliferate from a _____ primary culture.
- 2.5 In the pronucleus method, microinjections are mostly done in the _____.
- 2.6 The pigment that gives shrimp their pink colour _____.
- 2.7 Screenable markers, also called _____, typically cause a colour change or other visible change in the tissue of the transformed organism.
- 2.8 If initial tests on cell cultures indicate dangerous levels of toxicity, the product is never tested on _____.
- 2.9 _____ is used to prevent the introduction of bacteria into our culture while the device _____ is used to create a clean working environment by killing anything it shines on by ultraviolet radiation.

QUESTION 3: ONE-SENTENCE ANSWERS

[8]

Each answer carries one mark

- 3.1 Name the scientist who developed pest resistant plants by using RNA interference technique.
- 3.2 Name the compound used as cryoprotectants.
- 3.3 What type of LAFs are present in plant tissue culture laboratory?
- 3.4 What is the name of the portion of DNA in the Ti plasmid that gets transferred into a plant cell after the Agrobacterium binds to the plant cell?
- 3.5 What is an example of a fish that is genetically modified via microinjection?
- 3.6 Name the bacterium which is used to produce insect-resistant plants by genetic engineering.
- 3.7 What is the other word (name) for aquacultures?
- 3.8 Name two organisms responsible for biofilming?

QUESTION 4: SHORT QUESTIONS

[13]

The number of marks is given in brackets () at the end of each question.

- 4.1 What are hybridoma cells made from? (2)
- 4.2 What is an artificial seed? (2)
- 4.3 Explain the concept of “reduce, replace, and refine” in the use of animals in biological research. (3)
- 4.4 What is the function of AFPs and give an example where AFPs are used? (3)
- 4.5 Write three uses of cell suspension cultures? (3)

QUESTION 5: LONGER QUESTIONS

[37]

The number of marks is given in brackets () at the end of each question.

- 5.1 Explain the methods used for vectorless gene transfer into the host. (8)
- 5.2 Define and explain the types of organogenesis. (9)
- 5.3 Currently, relatively few products derived from aquatic organisms are used in medical applications, but this is rapidly changing. A wide number of marine species contain compounds of interest including antibiotics, antiviral molecules, and anticancer compounds. Give some examples of marine animals and their special characteristics include: (10)
- 5.4 In a tabular column form differentiate between animal cell culture and plant tissue culture and mention its similarities. (10)

QUESTION 6: ESSAY QUESTION

[28]

- 6.1 Virus infected plants will continue to carry latent virus pathogens when propagated by vegetative means. Explain a procedure by which virus-infected plants can be "cleaned" by tissue culture method. Include in your answer the advantages and disadvantages of this procedure. (14)
- 6.2 As a NUST science student, you have been approached by a small-scale farmer to give advice about triploid grass carp, how they were created and what will be the issues regarding triploid grass carp? What is the difference between transgenic fish and triploids? You can advise the farmer from the theory point of view what have you learned? (14)

THE END