



FIJI NATIONAL UNIVERSITY
College of Agriculture, Fisheries & Forestry
School of Agriculture & Forestry
Department of Crop Science
Bachelor of Science in Agriculture – Year III
Trimester II – Final Examination – 2019

GPB 705: APPLICATION OF BIOTECHNOLOGY IN FIELD CROPS BREEDING

Time Allowed: 3.00 hours (excluding reading time) Total Marks: 100

INSTRUCTIONS:

1. This paper consists of **four** pages.
2. Please check to see that all your paper is complete.
3. Answer all the Objective Type and Descriptive Type Questions in the Answer Booklet only.
4. Please write on the Answer Booklet according to the order of the questions.
5. **NO** written or printed material and mobile phones are allowed in the examination hall.
6. Marks allocated for each question appears at the side of each question so allocate your time accordingly.
7. This paper is divided into **Two (2)** parts. First part contains Objective Type Questions, which is having **two (2)** Sections – A and B. Second part is Descriptive Type Questions, which is having **eight (8)** questions that you need to **pick six (6)** to answer.

I. OBJECTIVE TYPE QUESTIONS (40 Marks)

Section A: Multiple choice questions. (10 Marks)

Section B: Short answers. (30 Marks)

II. DESCRIPTIVE TYPE QUESTIONS (60 marks)

There are **eight (8)** descriptive type questions, which you only need to **pick six (6)** to answer. Please provide precise answers. Please write on the Answer Booklet according to the order of the questions. Answer every question from a new page to facilitate evaluation.

Student ID No.:

Date.....

I. OBJECTIVE TYPE QUESTIONS

Note: Answer only on the answer booklet.

Total Marks: 40

A. Multiple choice questions: please select the correct answer. (10x1=10 Marks)

1. Recombinant DNA technology uses which type of bacterial DNA to carry the DNA of interest for cloning and multiplication?
 - a. Mitochondria
 - b. Extracellular
 - c. Nucleolus
 - d. Plasmid
2. Markers for which both alleles are expressed when co-occurring in an individual can be referred to which of following?
 - a. Partial dominant markers
 - b. Dominant markers
 - c. Codominant markers
 - d. Compatible markers
3. Which of the following statement is **INCORRECT** regarding plant biotechnology?
 - a. The use of living systems and organisms to develop or make products
 - b. The integrated use of plant breeding, quantum mechanics, fluid dynamics and engineering science in order to achieve technological application
 - c. Based on UN Convention on Biological Diversity, Art. 2
 - d. Any technological application that uses biological systems, living organisms or derivatives
4. Which of the following refers to each of two or more enzymes with identical function but different structure?
 - a. Isozyme
 - b. Lysozyme
 - c. Exoenzyme
 - d. Holoenzyme
5. Which of the following best describes a combination of using restriction enzyme digestion and Southern blotting technique in detection of DNA polymorphism?
 - a. Amplified Fragments Length Polymorphism (AFLP)
 - b. Restriction Fragment Length Polymorphism (RFLP)
 - c. Single Nucleotide Polymorphism (SNP)
 - d. Single-strand conformation polymorphism (SSCP)
6. Which of the following is **NOT** a description regarding morphogenesis?
 - a. A biological process to cause plant development
 - b. A complex mechanism occurs in both juvenile and mature plants
 - c. In plant tissue culture, it occurs when an explant receives stimulation from PGR(s)
 - d. Beginning of shape, a word originated from Italy

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7. Which of the following transformation technique utilizes small size whiskers to delivery bounded DNA by penetrations?
 - a. Biolistic particle delivery system
 - b. Liposome mediated gene transfer
 - c. Silica carbide fibers transformation
 - d. Microinjection
 8. Which of the following best describes the process of transferring genetic material from the same species to a host.
 - a. Cisgenesis
 - b. Transgenesis
 - c. Dysgenesis
 - d. Anagenesis
 9. Which of the following does NOT belong to the physical plant transformation method?
 - a. Microinjection
 - b. Particle bombardment
 - c. Electroporation
 - d. PEG
 10. In forensic biotechnology, which type of DNA can be used in determining genetic relationship?
 - a. Genomic DNA
 - b. Mitochondrial DNA
 - c. Chloroplast DNA
 - d. Cytoplasmic DNA

B. Short answers.

(10x3=30 Marks)

11. Which type of technology utilizes computational analysis of biological data such as sequence analysis, macromolecular structures and high-throughput profiling data analysis?
12. How do you define the third generation of DNA markers?
13. In plant tissue culture, how do you describe the cell characteristic and the potential for forming all the cell types in the adult organism?
14. Which type of viruses has genetic information in the form of RNA and utilizes the enzyme reverse transcriptase?
15. How do you describe the development of an embryo containing only male nucleus to a haploid?
16. Please define polyadenylation.
17. Which phenomenon in plant tissue culture can be affected by seasonal variation on the source of explant or incomplete sterilization?
18. In restriction enzyme cleavage, how would you describe an end of a DNA double helix at which a few unpaired nucleotides of one strand extend beyond the other?
19. How do you describe the technology of utilizing living seed-like structure, somatic embryoids derived from plant tissue culture and encapsulated by a hydrogel?
20. If the freshly isolated protoplasts are directly added to the normal culture medium, they will burst. What would be the reason for this phenomenon?

II. DESCRIPTIVE TYPE QUESTIONS

(60 Marks)

Note: Please provide precise answers. Only pick 6 to answer. Each question is ten marks.

1. **Please provide formulas to calculate the following.** Magnesium sulphate pentahydrate ($\text{MgSO}_4 \cdot 5\text{H}_2\text{O}$), ($\text{Mg}=24$, $\text{S}=32$). **(Please make sure you write down the formulas and units).**
 - a) What is the molecular weight of Magnesium sulphate pentahydrate?
 - b) Preparing a 500 ml of 10 M Magnesium sulphate pentahydrate stock solution, what amount of Magnesium sulphate pentahydrate will be needed? 10
 - c) Make a dilution to obtain 100 ml of 1 M Magnesium sulphate pentahydrate, how much 10 M stock solution will be needed?
2. Please **provide** the important properties of an ideal DNA marker. 10
3. Please **provide** the applications of using transgenic plants. 10
4. Please **provide** the definition and common features of a cloning vector. 10
5. Please **provide** a description for *Agrobacterium* and describe how genetic transformation works. 10
6. Please **provide** protoplast applications in crop improvement. 10
7. Please **provide** the principle steps of running a polymerase chain reaction (PCR). 10
8. Please **provide** steps of plant regeneration via somatic embryogenesis. 10

The End

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