



**ELIZADE UNIVERSITY,  
ILARA-MOKIN,  
ONDO STATE**

**FACULTY: BASIC & APPLIED SCIENCES**

**DEPARTMENT: BIOLOGICAL SCIENCES**

**SECOND SEMESTER EXAMINATION**

**2013/2014 ACADEMIC SESSION**

**COURSE CODE: BTH 202**

**COURSE TITLE: Introduction to Biotechnology and Genetic  
Engineering II**

**DURATION: 2 HOURS**

A rectangular box containing a handwritten signature in black ink.

**HOD's SIGNATURE**

**INSTRUCTIONS**

**NAME:.....MAT. No:.....**

**SECTION A: Answer on this examination question sheet.**

- I. Answer briefly. True or False, explain your answer if false (Eppendorf style). 10 marks
- II. Short answer questions (10 marks)
- III. Briefly describe the biotechnology tools in bullet form. (30) marks

**SECTION B: Answer only 5 out of 7 in a separate booklet (50 marks).**

SECTION A

**Question 1. Answer briefly. True or False, explain your answer if false (Eppendorf style) 11 marks**

1. Animal or plant breeding's ultimate goal is to improve genetic merit of an animal or plant by using only modern biotechnology methods.
2. Restriction mapping involves mapping restriction sites in a genome that can be revealed by electrophoresis, after which electrophoretic bands can be scored in parents and progeny.
3. *In situ* hybridization is direct gene localization on chromosome spreads using autoradiography.
4. Marker-assisted selection improves breeding by identifying short oligonucleotide landmarks in the genome close to genes controlling a particular trait in parents and inherited with the genes in the young progeny.
5. S-blot, N-blot and W-blot cannot be done without electrophoresis.
6. To know whether one succeeds in producing a transgenic organism, one has to do screening methods like replica plating, electrophoresis, S-blot, autoradiography, sequencing and PCR in that order.
7. Recombinant technology involves the DNA being the genetic material where 2 DNAs can be digested and ligated together to produce a particular protein (or trait) not originally present in the host DNA.
8. Native PAGE differs from SDS-PAGE in that it uses reducing agents like acrylamide to break polypeptides.
9. Cloning in plants differs from cloning in animals because it uses retroviruses that contain genes that will enable it to infect the host genome.
10. Beta and gamma radiations both produce radioactive electrons that can be used as tracers or molecular labels.
11. Transcription and translation differ from each other in that both messenger RNA and transfer RNA are involved.

**Question II. 1. Given below are 3 fragments cleaved from the same gene (5 marks)**

DNA Fragment 1: 5' T TAA AAA TAC 3'

DNA Fragment 2: 3' TTT AAA GGC CGG 5'

DNA Fragment 3: 5' CCC CCG GCA CAT 3'

Construct the mRNA; remember transcription produces a 5' to 3' mRNA from a 3' to 5' template underlining the start and termination codons. To identify the first fragment look for a start codon in the 3' end; to identify the last segment look for a 3' to 5' sequence corresponding to any of the termination codons. (5 marks)

Answer:

---

---

**2. a. Which is longer, the prokaryotic or eukaryotic mRNA? Explain your answer. (3 marks)**

Answer:

---

---

**b. How come the tiny maize plant can have a longer genome than the cattle genome? (2marks)**

Answer

---

**Question 3. Short answer questions. Answer briefly and concisely:**

1. Give 4 requirements in constructing a restriction map of DNA (12 marks)
    - a.
    - b.
    - c.
  2. Enumerate the steps in DNA recombinant technology.
    - a.
    - b.
    - c.
    - d.
    - e.
  3. In the selection of bacterial colonies that carry cloned DNA in plasmids, such as pBR 3222, that contain two antibiotic resistance genes, discuss the steps briefly
    - a.
    - b.
    - c.
    - d.
- List 3-5 steps in the following molecular genetics tools: Answer any four (20 marks)
- |                              |                              |
|------------------------------|------------------------------|
| 1. Marker-assisted selection | 4. Polymerase chain reaction |
| 2. Cloning                   | 5. Electrophoresis           |
| 3. DNA isolation             |                              |

4. **Marker- Assisted selection:**

- a.
- b.
- c.
- d.

5. **Cloning**

- a.

b.

c.

d.

6. DNA isolation

a.

b.

c.

d.

7. Polymerase chain reaction (the following steps take place in a programmable thermocycler in tubes containing template DNA (DNA to be copied or amplified), free nucleotides or dNTP's, Taq (*Thermus aquaticus*) polymerase,  $Mg^{++}$  and buffer)

a.

b.

c.

8. Electrophoresis

a.

b.

c.

d.

e.

Question IV. Bonus (5 marks). Choose any one. Write your answer below, continue at the back if you need more space.

1. Can modern biotechnology replace conventional breeding? Explain your answer.
2. Explain why transgenic animals like transgenic bacteria can be used for molecular bio-(ph) farming?

SECTION B. In a separate booklet, answer any 5.

**Question 1**

Describe the steps involved in gene expression

**Question 2**

- (a) Define the following terms (i) inducible genes (ii) constitutive genes (iii) repressible genes (iv) structural genes.  
(b) Why is **lac operon** of *Escherichia coli* regulated?

**Question 3**

- (a) Define (i) a proteome and (ii) proteomics  
(b) Name the three branches of proteomics  
(c) Differentiate between denaturing and non-denaturing gel electrophoresis

**Question 4**

- (a) Describe four chromatographic methods used for protein purification  
(b) List five techniques that can be used to disrupt cells for extraction of intracellular proteins

**Question 5**

- (a) Why is mutagenesis used as a tool in biotechnology  
(b) Describe (i) random mutagenesis and (ii) insertional mutagenesis

**Question 6**

- (a) List five applications of DNA sequencing  
(b) Why is Sanger sequencing method also referred to as chain termination method?  
(c) What are the limitations of Sanger sequencing.

**Question 7**

- (a) Define intellectual property  
(b) Differentiate between patent and copyright  
(c) Discuss the importance of bio-safety and bio-security