

UNIVERSITY OF RUHUNA
BACHELOR OF SCIENCE (GENERAL DEGREE) LEVEL I (SEMESTER I)
EXAMINATION – October, 2021

SUBJECT: BOTANY

Time: 1 1/2 hours

Course unit: Advanced Molecular Biology (BOT3182)

Answer three (03) questions including the question No 1

1.

1A. Underline the correct answer

(20 marks)

1A

The type of restriction enzyme used in rDNA technology is

- a) Type I
- b) Type II
- c) Type III
- d) All of these

ii) Which of the following DNA will migrate faster when the molecular weight of the following is equal?

- a) Supercoiled circular DNA
- b) Nicked circular DNA
- c) Single stranded DNA
- d) Double stranded DNA

iii) Which of the following statements about agarose gel electrophoresis is false?

- a) Electrophoresis in agarose is a common way to separate DNA molecules according to size
- b) Ethidium bromide is used to detect DNA
- c) Under the influence of the electrical field, positively charged DNA will migrate towards the negative charged end of the gel
- d) None of them

iv) Ethidium bromide is a stain that specifically binds to DNA or RNA and appears _____ if viewed under ultraviolet light.

- a) red
- b) yellow
- c) orange
- d) blue

v) Size of the DNA that can be packaged into a λ phage is

- a) 50 kb
- b) 35-53 kb
- c) 40-50 kb
- d) any size

vi) Which one of the following is wrongly paired with its role and the location?

- a) Transcription – nucleus
- b) Post transcriptional mechanism – ER
- c) Translation – cytoplasm
- d) Post translational mechanism – ER

vii) Where is the mRNA synthesized in a eukaryotic cell?

- a) nucleus
- b) nucleolous
- c) ribosome
- d) cytoplasm

viii) Bacteria containing recombinant plasmids are often identified by which process?

- a) examining the cells with an electron microscope
- b) using radioactive tracers to locate the plasmids
- c) exposing the bacteria to an antibiotic that kills cells lacking the plasmid
- d) removing the DNA of all cells in a culture to see which cells have plasmids

ix) Most commonly known hairpin structures are found in;

- a) DNA
- b) mRNA
- c) tRNA
- d) rRNA

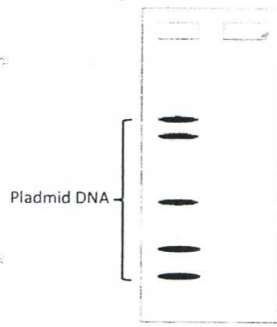
x) Which of the following is not a part of a gene?

- a) Ori
- b) Promoter
- c) Start codon
- d) Operator

1B

i) Mention the precautions that you would follow in order to obtain a non-degraded and pure DNA sample. **(20 marks)**

ii) Following figure shows the banding pattern of a plasmid DNA preparation after run on an agarose gel. How would you explain this banding pattern? **(20 marks)**



iii) How does denature a DNA molecule? **(10 marks)**

iv) Why DNA cross-linking is an essential step in DNA blotting? **(10 marks)**

v) Mention the main role of the following enzymes that are used in molecular biology? **(20 marks)**

1. Restriction endonucleases
2. Alakaline phosphatase
3. Dnase
4. Rnase
5. Reverse transcriptase

2.

i) Compare the prokaryotic and eukaryotic chromosome structure. **(30 marks)**

ii) What are the similarities and differences you would find in prokaryotic and eukaryotic promoters? **(20 marks)**

iii) State two functions of the “sigma factor” in bacteria? **(10 marks)**

iv) What is an “alternative sigma factor”? **(10 marks)**

v) Giving a fully labeled diagram explaining the basic components of cpDNA? **(20 marks)**

vi) Name four properties of cpDNA. **(10 marks)**

3.

i) What are the key features of a cloning vector? State these features are important in cloning?
(20 marks)

ii) Draw the products you would expect if the following sequence cuts with a restriction enzyme to leave a 5' overhang of one nucleotide.
(10 marks)

iii) Name 5 different types of vectors used in DNA cloning. Give the size of the DNA fragment that can be inserted to each type.
(20 marks)

iv) What are the roles of gene promoters?
(10 marks)

v) Giving an example, explain the importance of having a reporter gene in a vector system?
(30 marks)

vi) What do you mean by C value of a genome?
(5 marks)

vii) What is the range of genomic DNA in plant?
(5 marks)

4.

i) What do you mean by "transposable element" (TE)?
(10 marks)

ii) Mention the function of transposase enzyme?
(5 marks)

iii) Describe the bad effects of transposable elements regarding the human health?
(15 marks)

iv) What are the components of an operon?
(10 marks)

v) With fully labelled diagrams and an example, explain the regulation of an inducible operonic system found in *E. coli*.
(40 marks)

v) With a suitable figure, show the basic components found in a eukaryotic coding gene
(20 marks)