

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

SUBJECT: BOTANY

Time: 2 hours

Course unit: Advanced Molecular Biology (BOT4062)

Answer ~~three~~ ^{four} (04) questions including the question No 1

1.

1A. Underline the correct answer giving explanation

(50 marks)

Use the space provided

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

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

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ii) Which of the following sequence forms a palindromic sequence?

- a) ATTGCAAT
- b) AGTCCTGA
- c) GTTCCAAG
- d) GTTGGAAC

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iii) Most commonly known hairpin structures are found in;

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

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iv) During DNA cloning which of the following is not a crucial requirement?

- a) DNA inserts
- b) Vector
- c) Protein expression
- d) DNA restriction enzymes

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v) "The fluorescent dye ethidium bromide is used for visualizing DNA". How does ethidium bromide bind to DNA?

- a) Stacked between histone molecules
- b) Binds to the nucleotide base
- c) Intercalated between the stacked bases
- d) Binds to the phosphodiester backbone

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vi) Which of the following migrates most quickly during electrophoresis under the same conditions?

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

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vii) With respect to polycistronic mRNAs, which of the following is wrong?

- a) Contain multiple open reading frames (ORFs)
- b) Found in eukaryotes
- c) Encode proteins with related functions
- d) Multiple polypeptide chain

- viii) "Nucleosome" is made up of;
- a) DNA, histone core protein
 - b) DNA, histone core protein, linker H1
 - c) RNA, histone core protein
 - d) RNA, histone core protein, linker H1

- ix) How does ribosome recognize eukaryotic mRNA?
- a) Randomly
 - b) Shine - Dalgarno sequence
 - c) by binding to the 5' capping
 - d) by binding to the 3' tailing

- x) "Eukaryotic mRNA generally codes for a single polypeptide" because the eukaryotic translation includes _____
- a) A single ORF
 - b) Monocistronic codons
 - c) Polycistronic codons
 - d) Starts at the first triplet codon

1B.

i) What are the five precautions that should be taken during DNA extraction in order to get good quality DNA? **(20 marks)**

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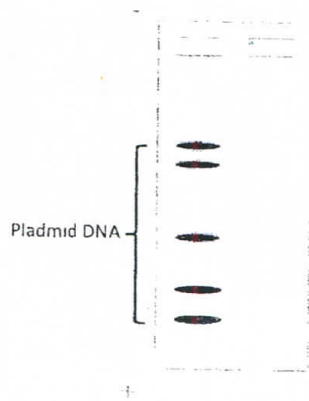
ii) State how a DNA molecule can be denatured? **(10 marks)**

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iii) 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)**



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2.

i) The following is part of a sequence of an 8-base pair, palindromic restriction enzyme recognition sequence:

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CTAA

i) Complete the sequence of the restriction enzyme recognition site **(15 marks)**

ii) Draw the products you would expect if the sequence cuts with a restriction enzyme to leave a 5' overhang of one nucleotide. **(15 marks)**

iii) Draw the resulting products after treating the cut DNA from part b) with alkaline phosphatase. **(10 marks)**

iv) List the important points that should be considered in performing gel electrophoresis and 'Southern blotting' techniques. **(30 marks)**

v) Mention the advantages and disadvantages of using radioactive probes versus non-radioactive probes. **(30 marks)**

3.

i) State two functions of the sigma factor in bacteria? **(10 marks)**

ii) What is an alternative sigma factor? **(10 marks)**

iii) What is the most common eukaryotic promoter sequence? Name the promoter elements found in eukaryotes? **(08 marks)**

iv) What are enhancers found in eukaryotes? **(12 marks)**

v) Fill in the table giving appropriate facts of eukaryotic RNA polymerase **(40 marks)**

Type of RNA polymerase	Location	Product	α -Amanitin Sensitivity	Promoter

vi) Giving an example, explain the importance of having a reporter gene in a vector system? **(20 marks)**

4.

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

ii) What are the types of transposable elements found in bacteria? (10 marks)

iii) Explain the features of Insertion Sequences (IS element) found in bacteria. (20 marks)

iv) Briefly explain the non-replicative transposition mechanism of a IS element. (30 marks)

vi) Describe the structure of a composite transposon. (30 marks)

5.

i) State the purpose of model organisms used in scientific research. (10 marks)

ii) List the major characteristics of model organisms. (10 marks)

iii) List five model organisms which belong to viruses, prokaryotes, fungi, plants and animals used in scientific research. (20 marks)

iv) Describe two different post modifications that take place in eukaryotic pre-messenger RNA. (60 marks)