



Name:

Enrolment No:

UNIVERSITY OF PETROLEUM AND ENERGY STUDIES

End Semester Examination, May 2023

Course: Molecular Biology and Recombinant DNA Technology

Program: B. Tech (Biotechnology)

Course Code: HSBT 1002

Semester: II<sup>nd</sup>

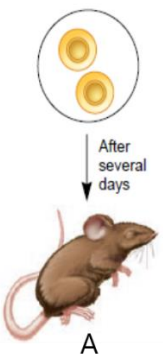
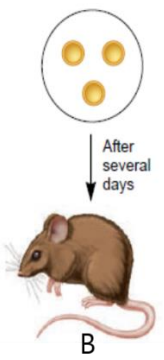
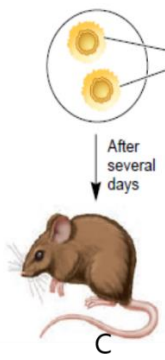
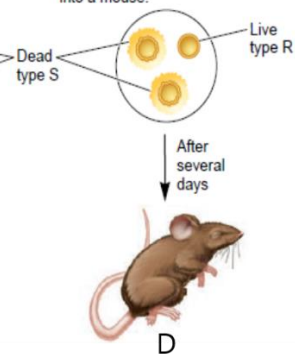
Time : 03 hr

MM: 100

Instructions: Attempt all questions

Q.No	Section A MCQs/Short answer questions/True &False	(20x1.5= 30 Marks)	COs
Q	Statement of question (each question carries 1.5 marks)		CO
1.	RNA polymerases lack a separate proofreading _____ exonuclease active site?	1.5	CO3
2.	State True or False:  The error rate for transcription is higher than that for chromosomal DNA replication.	1.5	CO3
3.	Avery, MacLeod, and McCarty experiment for the validation of DNA as a genetic material was based on which principle?  a) Transformation b) Transduction c) Conjugation d) None of the above	1.5	CO2
4.	Who is credited with the discovery of Semi-conservative nature of DNA replication?	1.5	CO2
5.	The initiating codon AUG codes for _____ in prokaryotes  a) Formyl methionine b) Formic acid c) Methionine d) Glutamine	1.5	CO4
6.	Nucleotides are :  (a) The structural components of an array of enzyme cofactors and metabolic intermediates. (b) They are the constituents of nucleic acids: DNA and RNA, the molecular repositories of genetic information. (c) All of the above (d) None of the above	1.5	CO1
7.	What are the three characteristic components of a nucleotide?	1.5	CO1

8.	Compare between a nucleotide and nucleoside, with relevant example for each.	1.5	C01
9.	What are “consensus” sequences? Name one such sequence in a prokaryotic genome.	1.5	C03
10	Compare between “euchromatin” and “heterochromatin”?	1.5	C01
11	State True or False:  The average number of nucleotides added before a polymerase dissociates defines its processivity.	1.5	C03
12	Which of the following is TRUE for the RNA polymerase activity?  a) DNA dependent DNA synthesis b) Direct repair c) DNA dependent RNA synthesis d) RNA dependent RNA synthesis	1.5	C03
13	Robert Holley is credited with the discovery of  a) mRNA b) tRNA c) rRNA d) sRNA	1.5	C04
14	State True or False:  The Genetic Code Was Cracked Using Artificial mRNA Templates	1.5	C04
15	Which of the following ensure stable binding of RNA polymerase at the promoter site?  a) DNA photolyase b) Sigma factor c) DNA glycosylase d) RecA	1.5	C03
16	Compare between codon and anticodon.	1.5	C04
17	What is the significance of Ori C site?	1.5	C02
18	Which of the following introns have capability of auto-splicing:  a) Group I and II b) Group III and IV c) All of the above d) None of the above	1.5	C02
19	This is incorrect about the nature of genetic code:  Codons are  (a) universal	1.5	C04

	(b) overlapping (c) commaless (d) triplet		
20	Which of the following transcription termination technique has RNA dependent ATPase activity?  a) Intercalating agents b) Rho dependent c) Rho independent d) Rifampcin	1.5	CO2
	Section B	(4x5=20 Marks)	CO
Q	Statement of question (each question carries 5 marks)		
1.	(a) Draw a well labelled diagram of DNA backbone. (b) State which of the two molecules- DNA and RNA is more stable and why?	2+3	CO1
2.	(a) Differentiate between “proof-reading” and “processivity” traits of DNA polymerase (b) Give a diagram highlighting different subunits of DNA Pol III.	3+2	CO2
3.	(a) Explain the significance of “promoter sequences” in the process of RNA transcription. (b) Draw a well labelled diagram for the Group I intron splicing. Briefly explain what is an auto-splicing intron?	2+2	CO3
4.	(a) Where do you find a: (i) codon and (ii) anticodon? (b) Give three salient traits of “wobble hypothesis”	2+3	CO4
	Section C	(2x15=30 Marks)	
Q	Statement of question (Case studies) (each question carries 15 marks)		CO
1.	<p>Living type S bacteria were injected into a mouse.</p>  <p>After several days</p> <p>Living type R bacteria were injected into a mouse.</p>  <p>After several days</p> <p>Heat-killed type S bacteria were injected into a mouse.</p>  <p>After several days</p> <p>Living type R and heat-killed type S bacteria were injected into a mouse.</p>  <p>After several days</p> <p>With relevance to the diagram above, state:</p>	15	CO1
		(2+2+2+2+2+3+2)	

	<p>a) The scientists who conducted the above experiment.</p> <p>b) What was the objective of the experiment?</p> <p>c) Briefly explain the underlying principle of the experiment?</p> <p>d) State the fate of mouse A, B, C and D</p> <p>e) Which bacterium was used for the experiment?</p> <p>f) What does R and S stand for? In what characteristic trait does an R form differ from S?</p> <p>g) How does heat kill a bacterium?</p>		
2.	<p>With relevance to the diagram above, state:</p> <p>a) What bio-molecule is this?</p> <p>b) Who is credited with the discovery of this bio-molecule?</p> <p>c) Label A-G in the diagram.</p> <p>d) What is the significance of A and E?</p> <p>e) Mention one unique base each, in B and G.</p> <p>f) Which bases in the codon-anticodon complex account for specificity and which base facilitates detachment of unactivated t-RNA?</p>	15	CO4
	Section D	(2x10=20 Marks)	
Q	Statement of question (each question carries 10 marks)		CO
1.	<p>Explain the events of:</p> <p>i) Initiation,</p> <p>ii) Elongation and</p> <p>iii) Termination in prokaryotic DNA replication? (Draw a well labelled diagram for each step)</p>	10	CO2
2.	<p>a) What are Topoisomerases? Describe different classes they belong to?</p> <p>b) What are nucleosomes? Describe different components of a nucleosome.</p> <p>c) Compare between solenoid and plectonemic model of DNA compaction.</p>	3+3+4	CO3