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| **Name:**<br>**Enrolment No:** | UPES<br>UNIVERSITY WITH A PURPOSE |

**UNIVERSITY OF PETROLEUM AND ENERGY STUDIES**
**End Semester Examination, May 2021**

**Course: Molecular Microbiology** **Semester: II**
**Program: B.Sc. Allied Biosciences (Microbio., FND., clinical res.)** **Time: 03 hrs.**
**Course Code: HSMB1008** **Max. Marks: 100**

**Instructions:**

**SECTION A**

| S. No. | MCQs or Fill in the blanks (1.5 marks each) | **30 Marks** | **CO** |
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| 1 | The β' subunit of polymerase has a function of _____<br>a) Promoter binding<br>b) Elongation<br>c) Cation binding<br>d) Termination | **1.5** | **CO3** |
| 2 | Which of the following is the most energetically costly process among the following?<br>a) Replication<br>b) Transcription<br>c) Post transcriptional processing<br>d) Translation | **1.5** | **CO2** |
| 3 | If a double stranded DNA has 20% Thymine, the percentage of Guanine in the DNA<br>a) 30%<br>b) 10%<br>c) 90%<br>d) 40% | **1.5** | **CO1** |
| 4 | Which component of the rRNA binds to the mRNA?<br>a) 16S<br>b) 5S<br>c) 28S<br>d) 23S | **1.5** | **CO2** |
| 5 | Prokaryotic ribosome is recruited to the mRNA by _____<br>a) Randomly<br>b) Shine – Dalgarno sequence<br>c) 5' capping<br>d) 3' tailing | **1.5** | **CO3** |
| 6 | The end of all tRNAs is _____<br>a) 5' ACC 3'<br>b) 5' CCA 3'<br>c) 3' CAC 5'<br>d) 3' GAG 5' | **1.5** | **CO3** |

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| 7 | How many loops are seen in the tRNA?<br>a) 1<br>b) 2<br>c) 3<br>d) 4 | **1.5** | **CO3** |
| 8 | How many tRNA synthetases are found in a cell?<br>a) 64<br>b) 32<br>c) 10<br>d) 20 | **1.5** | **CO4** |
| 9 | Which mRNA will be translated to a polypeptide chain containing 8 amino acids?<br>a) AUGUUAAUAGACGAG**UAG**CGACGAUGU<br>b) AUGAGACGGACUGCAUUCCCAACC**UGA**<br>c) AUGCCCAACCGUUAUUCAUGCUAG<br>d) AUGUCGACAGUC**UAA**AACAGCGGG | **1.5** | **CO4** |
| 10 | Which part of the large subunit of ribosome helps in the formation of the peptide bond?<br>a) 5S rRNA<br>b) Proteins<br>c) 23S rRNA<br>d) 18S rRNA | **1.5** | **CO4** |
| 11 | If a DNA contains 1000 base pairs, what would be its length?<br>a) 3400 Å<br>b) 34000 Å<br>c) 6800<br>d) 1000 Å | **1.5** | **CO1** |
| 12 | Histones have a high content of negatively charged amino acids.<br>a) True<br>b) False | **1.5** | **CO1** |
| 13 | If the sequence of bases in DNA is TACCGACCA, then the sequence of codons on the transcript will be<br>a) ATGGCTGGT<br>b) ATCCGAACU<br>c) AUGGCUGGU<br>d) AUGGACUAA | **1.5** | **CO3** |
| 14 | How many bases are there in per turn of the A form of DNA?<br>a) 11 bp<br>b) 10 bp<br>c) 12 bp<br>d) 8 bp | **1.5** | **CO1** |
| 15 | The structural genes of lac operon transcribe mRNA which is<br>a) polycistronic<br>b) replicative<br>c) monokaryotic<br>d) monocistronic | **1.5** | **CO5** |
| 16 | Which of the following is used in prokaryotic replication? | **1.5** | **CO2** |

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| | a) DNA polymerase I<br>b) DNA polymerase II<br>c) DNA polymerase III<br>d) DNA polymerase δ | | |
| 17 | The nitrogenous base is covalently linked to the _____ carbon of the pentose sugar.<br>a) C1<br>b) C2<br>c) C3<br>d) C4 | **1.5** | **CO1** |
| 18 | Non – coding sequence in *m*RNA is known as _____<br>a) Template<br>b) Non – template<br>c) Intron<br>d) Exon | **1.5** | **CO3** |
| 19 | The investigation of the *lac* operon for the metabolism of lactose was done by _____<br>a) Gilbert<br>b) Walter Gilbert<br>c) Francois Jacob and Jacques Monod<br>d) Walter | **1.5** | **CO5** |
| 20 | Fredrick Griffith's experiment involving Streptococcus pneumonia lead to the discovery of_____<br>a) DNA as genetic material<br>b) RNA as genetic material<br>c) Protein as genetic material<br>d) Transforming principle | **1.5** | **CO3** |
| **SECTION B the word limit 20 marks 4 questions 5 marks each** | | | |
| Q | Short Answer Type Question (5 marks each) Scan and Upload 4 questions 5 marks each (word limit : 5 marks-150-200 words) | **20 Marks** | **CO** |
| 1 | Write a short note on DNA polymerase in prokaryotes | **5** | **CO2** |
| 2 | Compare mRNA, tRNA, and rRNA | **5** | **CO1** |
| 3 | How translation in prokaryotic cell initiate? | **5** | **CO4** |
| 4 | Write a short note on promoter sequence | **5** | **CO3** |
| **SECTION C 30 marks** | | | |
| Q | **Two case studies 15 marks each** (word limit : 5 marks-150-200 words max; 3 marks- 120 words max; 2 marks- below 100 words) | **30 Marks** | **CO** |
| 1 | Case Study 1<br><br>Suppose you suspect a common bacterial contamination in your laminar air flow work station and you want to sterilize your work station with UV irradiation. For that you keep the UV lights on inside the laminar air flow for 15 minutes. Now try to answer following: | **15** | **CO4** |

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| | **a)** What types of damage do you expect in the bacterial DNA? **2**<br>**b)** Discuss the type of repair mechanism that would be activated if you put-on the visible light source immediately after 15 minutes of UV irradiation? Discuss in detail. **5**<br>c) If we use and chemical disinfectant (instead of UV irradiation) that introduced mismatch types of error, how the cell will repair those errors? **5**<br>d) Write short note on Error prone or SOS repair **3** | | |
| 2 | Case Study 2<br>You want to grow *E. coli* in laboratory. You mistakenly added lactose as the sole carbon source instead of glucose. You incubated the bacteria and next day found that the bacteria grown in the lactose containing media.<br>a) The operon that was responsible for lactose utilization was repressible or inducible. Who discovered those concepts? **2**<br>b) Describe the lactose utilization operon in *E. coli* in details with its controlling mechanisms. 5<br>c) Compare operator and regulator genes **3**<br>d) What is feedback inhibition? **2**<br>e) If we add glucose, how the inducible operon will be turned off? 3 | **15** | **CO5** |
| | **SECTION- D 20 marks** (word limit : 5 marks-150-200 words max; 3 marks- 120 words max; 2 marks- below 100 words) | | |
| Q | Long Answer type Questions Scan and Upload (10 marks each) **word limit** | **20 Marks** | **CO** |
| 1 | a) Compare A, B, and Z DNA. 5<br>b) In a molecular biology experiment you extracted the genetic materials form an unknown virus. You found that the genetic materials had 15% T and 40% G. Now answer, what type of virus that was according to its genetic material? Explain if the virus had a double stranded genetic material. 2**+3**<br><br>OR<br><br>What is nucleosome? Describe organization of DNA in eukaryotic cell. Describe C-value paradox. **2+5+3** | **10** | **CO1** |
| 2 | a) Discuss about RNA polymerase in prokaryotes. 5<br>b) Discuss about the post-transcriptional modification in eukaryotic cells briefly. **5**<br>OR<br>a) Draw the structure of a tRNA and describe the function of each arm. **3+3**<br>b) Outline the essential features of genetic code. **4** | **10** | **CO3** |