
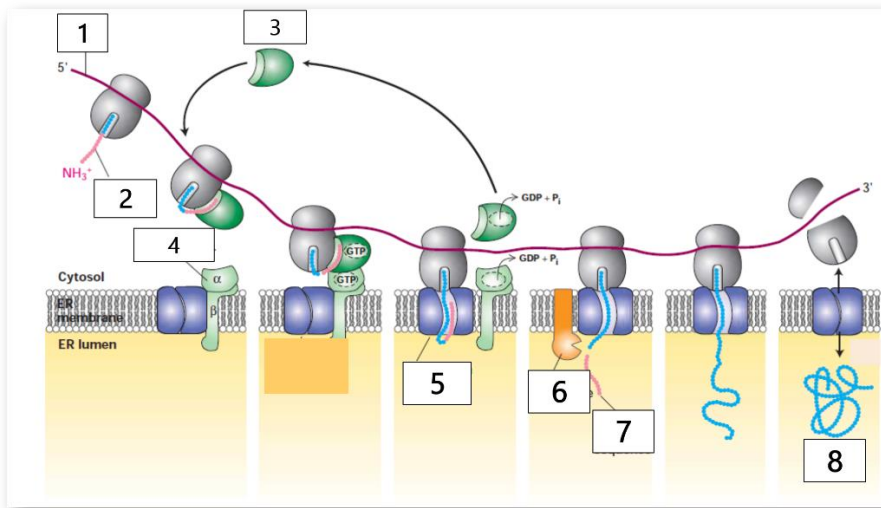


Name:			
Enrolment No:			
UPES End Semester Examination, December 2023			
Course: Cell and Molecular Biology Program: B.Sc. (Microbiology) Course Code: HSMB 1012		Semester: Ist Time : 03 hrs Max. Marks: 100	
Instructions: Answer all Questions			
Q.No	Section A MCQs/Short answer questions/True &False	(20x1.5= 30 Marks)	COs
Q	Statement of question (each question carries 1.5 marks)		CO
1.	Semi-conservative DNA replication was first demonstrated in..... a. <i>Drosophila melanogaster</i> b. <i>Escherichia coli</i> c. <i>Streptococcus pneumoniae</i> d. <i>Salmonella typhi</i>	1.5	CO1
2.	Eukaryotes differ from prokaryotes in the mechanism of DNA replication due to..... a. Use of DNA primer rather than RNA primer b. Different enzymes for the synthesis of lagging and leading strands c. Discontinuous rather than semi-discontinuous replication d. Unidirectional rather than semi-discontinuous replication	1.5	CO1
3.	Which of the following reactions is required for proofreading during DNA replication by DNA polymerase III? a. 5' to 3' exonuclease activity b. 3' to 5' exonuclease activity c. 3' to 5' endonuclease activity d. 5' to 3' endonuclease activity	1.5	CO1
4.	State True or False: The DNA molecule has the same amount of adenine and thymine.	1.5	CO2
5.	Which three people were awarded the Nobel Prize for the discovery of the structure of DNA—the double helix? a. James Watson, Rosalind Franklin, and Maurice Wilkins b. Francis Crick, James Watson, and Rosalind Franklin c. James Watson, Francis Crick, and Maurice Wilkins d. Maurice Wilkins, Rosalind Franklin, and Francis Crick	1.5	CO1
6.	According to the central dogma, which of the following represents the flow of genetic information in cells? a. protein to DNA to RNA b. DNA to RNA to protein c. RNA to DNA to protein d. DNA to protein to RNA	1.5	CO3
7.	Which of the following components is involved in the initiation of transcription? a. Primer b. Origin c. Promoter	1.5	CO2

	d. start codon		
8.	Mature mRNA from a eukaryote would contain each of these features except which of the following? a. exon-encoded RNA b. intron-encoded RNA c. 5' cap d. 3' poly-A tail	1.5	CO2
9.	Which of the following is the name of the three-base sequence in the mRNA that binds to a tRNA molecule? a. P site b. Codon c. Anticodon d. CCA binding site	1.5	CO3
10.	Which component is the last to join the initiation complex during the initiation of translation? a. the mRNA molecule b. the small ribosomal subunit c. the large ribosomal subunit d. the initiator tRNA	1.5	CO3
11.	In the given list, which is the simplest amino acid? a) Alanine b) Glycine c) Tyrosine d) Asparagine	1.5	CO2
12.	The mRNA is synthesized in _____ a) Golgi body b) Nucleus c) Nucleolus d) Cytoplasm	1.5	CO3
13.	Which of the following is known as protoplast? a) Plant cell without cell-wall b) Animal cell without cell membrane c) Chloroplast without membranes d) Mitochondria without inner membrane	1.5	CO2
14.	P-pumps actively transport _____ ions a. Na ⁺ / K ⁺ b. H ⁺ c. Cl ⁻ d. OH ⁻	1.5	CO3
15.	State True or False: Genomic analyses suggest that the first eukaryotic cells formed after an archaeal cell engulfed an aerobic bacterium.	1.5	CO4
16.	Fill in the blanks:increase the surface area for absorption of nutrients from surrounding medium	1.5	CO4

17	Transverse diffusion (flip-flop) is the movement of _____ a) cholesterol molecule b) amino acid c) protein d) phospholipid	1.5	CO3
18	GTP-bound 'Rabs' (G-proteins) associated with membranes by a _____ anchor. a) lipid b) protein c) carbohydrate d) ribonucleic acid	1.5	CO4
19	Where is the proton pump located in a lysosome? a) cytosol b) membrane c) attached with enzymes d) extracellularly connected	1.5	CO4
20	The entry of a cell into M phase is initiated by _____ a) interleukin factor b) maturation promoting factor c) transcription factor d) necrosis factor	1.5	CO4
Section B		(4x5=20 Marks)	CO
Q	Statement of question (each question carries 5 marks)		
1.	a) What are uptake targeting sequences? b) Briefly describe Co-translational translocation.	2+3	CO1
2.	a) Describe different stages of mitotic cell cycle. Draw a well labelled diagram for each stage. b) Discuss the role of securin in the anaphase stage of cell-cycle.	3+2	CO2
3.	a) Below is a DNA sequence. Imagine that this is a section of a DNA molecule that has separated in preparation for replication, so you are only seeing one DNA strand. Construct the complementary DNA sequence (indicating 5' and 3' ends). DNA sequence: 3'-T A C T G A C T G A C G A T C-5'	5	CO3
4.	a) If deoxyribonucleotides that lack the 3'-OH groups are added during the replication process, what do you expect will occur? b) Why is primase required for DNA replication?	3+2	CO4
Section C		(2x15=30 Marks)	
Q	Statement of question (Case studies) (each question carries 15 marks)		CO
1.	The following figure presents an overview of targeting of signal sequence bearing protein to endoplasmic reticulum, in an yeast cell. In reference to the figure, answer the following questions:	(4+4+2+3+2)	CO1



- Label 1-8
- Give a detailed account of events in the process of targeting of a nascent protein to Endoplasmic reticulum, as shown in the figure above.
- What could happen if 3 fails to associate with the nascent protein that is to be translocated?
- How does GTP-hydrolysis affect the translocation in this figure?
- What would happen to the translocated protein if the yeast cell is mutant for 6?

2.	<ol style="list-style-type: none"> Which three steps contribute to eukaryotic transcription? Explain with schematically labeled diagrams? The base composition of an organism was found to be 11% A, 32% G, 18% U and 39% C. Is this a DNA or RNA organism? Is it single-stranded or double-stranded? 	8+4+3	CO3
Section D		(2x10=20 Marks)	
Q	Statement of question (each question carries 10 marks)		CO
1.	<ol style="list-style-type: none"> Briefly describe how do cyclins-CDK complexes regulate G1, S, G2 and M phases of mitosis. Describe how v-SNARE and t-SNARE interact to dock a cargo-vesicle on a target membrane. 	5+5	CO4
2.	<ol style="list-style-type: none"> Discuss the role and significance of DNA helicase and DNA polymerase in the process of DNA replication? How does the synthesis of the lagging strand differ from that of the leading strand? Why is DNA ligase important in this process? 	6+2+2	CO2