Name:

Enrolment No:

UPES

End Semester Examination, December 2024

Course : Cell and Molecular Biology **Semester : I**

Program : B.Sc.-Microbiology **Duration : 3 Hours**

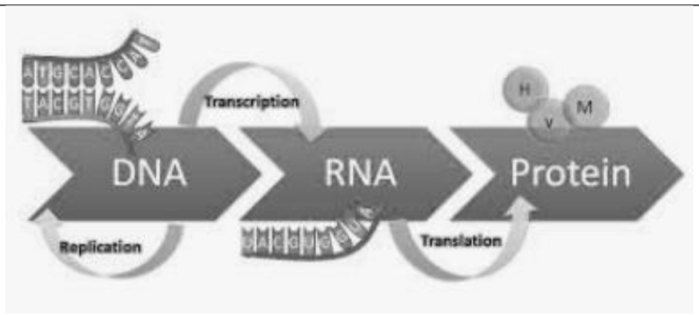
Course Code: HSMB1012 **Max. Marks:100**

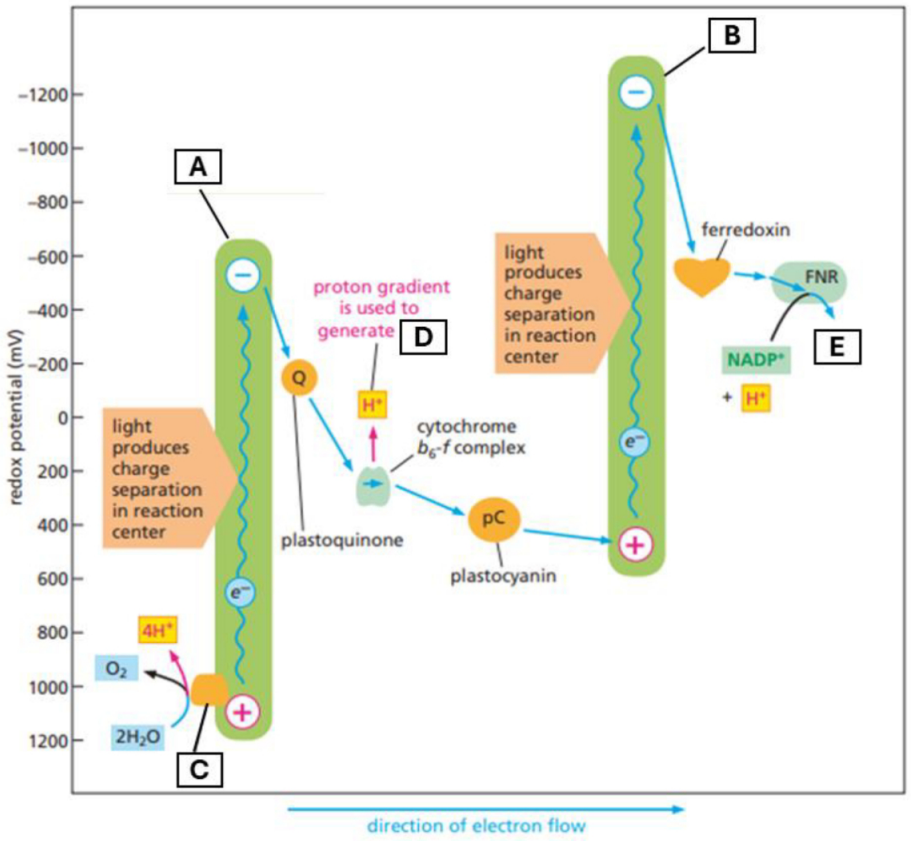
Instructions: All questions are compulsory.

Please read the questions carefully. The paper contains four sections

S. No.	Section A Short answer questions/ MCQ/T&F (20Qx1.5M= 30 Marks)	Marks	COs
Q 1	1. Who is known as the father of microscope a. Robert Hooke b. Anton von Leeuwenhoek c. Louis Pasteur d. Rudolf Virchow	1.5	CO1
Q2	Cell theory is the unifying theme of biology. Which is true about cell theory a. All life is made of cells b. Cells come from pre-existing cells c. Cells are the smallest units of life d. All of these above	1.5	CO1
Q3	A eukaryotic cell differs from a prokaryotic cell in having a. Aerobic rather than anaerobic cellular respiration b. Three photosystems c. True cell membranes d. Organelles	1.5	CO1
Q4	The main function of a plasma membrane is to a. Prevent water from entering or leaving b. Control what goes into and out of the cell c. Act as a sieve, allowing only lipids to pass d. Move the cell from place to place	1.5	CO1
Q5	Which of these is not part of light microscope a. Condensor b. Eyepiece c. Light source d. Electron source	1.5	CO1
Q6	1 metre (m) = _____ micrometers (μm) a. 10^{6} b. 10^{-3} c. 10^{3} d. 10^{-6}	1.5	CO2
Q7	Which of the following substances does not pass across the membrane by simple diffusion a. O_2 b. CO_2 c. H_2O d. H^+	1.5	CO2

Q8	Which organelle is known to produce hydrogen peroxide a. Lysosomes b. Peroxisomes c. Endoplasmic Reticulum d. Golgi bodies	1.5	CO2
Q9	Which of the organelles is known as the powerhouse of the cell	1.5	CO2
Q10	ATP synthase _____ a. synthesizes APT molecules b. breaks ATP molecules c. is not a part of mitochondria d. is not a part of chloroplast	1.5	CO2
Q11	Enlist and name the types of RNA present in a prokaryotic cell.	1.5	CO1
Q12	Classify and comment that how many DNA polymerases are present in *E. coli*	1.5	CO2
Q13	Recall that synthetic activities in molecular biology are a) Bidirectional b) Unidirectional c) In 5'-3' direction, always d) In 3'-5' direction, always	1.5	CO1
Q14	Cite correctly that splicing happens in a) Nucleus b) Nucleolus c) Cytoplasm d) Both nucleus and cytoplasm	1.5	CO1
Q15	Identify the molecule that is not required in DNA replication a) dATP b) dCTP c) GTP d) dTTP	1.5	CO3
Q16	Spot the nucleotide that is not required in transcription a) ATP b) dCTP c) GTP d) UTP	1.5	CO3
Q17	Identify the portions of eukaryotic mRNA sequence that are removed during RNA processing are _____ a. Exons b. Caps c. poly-A tails d. introns	1.5	CO1
Q18	Spot the correct one. Short strands of _____ primers are used in DNA replication are a) DNA b) RNA c) Okazaki fragments d) Both RNA and DNA hybrid	1.5	CO3
Q19	'RNA is a stable molecule as compared to DNA.' Comment on the statement Whether true or false and why.	1.5	CO2
Q20	Find a mistake in the following illustration	1.5	CO2

			
Section B (4Qx5M=20 Marks)			
Q21	a. Note one difference between the structure of molecules of detergent and membrane lipids. **(2.5 marks)** b. Illustrate the packaging detergent molecules (based on their shape) in a micelle using a diagram **(2.5 marks)**	5	CO1
Q22	a. Define mitosis **(1 mark)** b. Illustrate different stages of mitosis using a labeled diagram **(4 mark)**	5	CO2
Q23	Demonstrate how Griffith's discovered transformation.	5	CO1
Q24	With the help of illustration, flow chart and text; differentiate between group I and group II introns. Also, highlight one similarity.	5	CO2
Section C (2Qx15M=30 Marks)			
Q 25	Chloroplasts are large, green organelles found only in the cells of plants and algae, not in the cells of animals or fungi. These organelles have an even more complex structure than mitochondria: in addition to their two surrounding membranes, they possess internal stacks of membranes containing the green pigment chlorophyll. Chloroplasts carry out photosynthesis. Plant cells can then extract this stored chemical energy when needed by oxidizing these sugars in their mitochondria, just as animal cells do. Chloroplasts thus enable plants to get their energy directly from sunlight. a. Describe the process through which chloroplast became part of the eukaryotic system. Draw a labeled diagram showing the process **(2 marks)** b. Illustrate the structure of chloroplast and label its parts. **(3 marks)** c. Write the basic chemical equation for the reaction that occurs in mitochondria. **(2 marks)** d. Explain the mechanism of light reaction in the chloroplast **(1.5*2= 3 marks)** e. Label the letters A, B, C, D, and E in the following diagram **(1*5 = 5 marks)**	15	CO4

			
Q26	In a prokaryotic cell, it was found out that ribosome was making proteins incorrectly and therefore the growth of the cell was very slow. Therefore, you set out to investigate the molecular processes in the cell. Based on your knowledge of microbiology, answer the following: a. Correlate which is the pathway being referred to here? (1) b. Which organelle is responsible for protein synthesis in the cell? (1) c. In which location of the cell protein synthesis occurs? (1) d. Does the location of protein synthesis differ in prokaryotes and eukaryotes? (1) e. Write the composition of this organelle. Categorize if this organelle differs compositionally in prokaryotes and eukaryotes. (2+3) f. This organelle reinforces the belief that RNA came before DNA. Comment if true or false and why? (2) g. There are 64 codons and only 20 amino acids. Reason using your knowledge of genetic code how is this likely to happen. (4)	15 (1+1+1+ 1+2+3+2 +4)	CO3
	Section D **(2Qx10M=20 Marks)**		
Q 27	I. Define the following terms **(1 mark each*5 = 5 marks)** a. Euchromatin b. Cell surface receptors c. Diploid d. GPCRs e. Apoptosis	10	CO3

	II. Illustrate the difference between the cell walls of gram-positive and gram-negative bacteria with the help of a labeled diagram **(2 marks)** III. Explain the steps of protein transport into the nucleus with the help of a diagram. **(3 marks)**		
Q28	Explain the process of transcription in eukaryotes. Distinguish between transcription in prokaryotes and eukaryotes	10 (7+3)	CO1