

Name:

Enrolment No:



UPES

End Semester Examination, December 2024

Course : Cell and Molecular Biology

Semester : I

Program : BSC-MICROBIOLOGY

Duration : 3 Hours

Course Code: HSMB1012

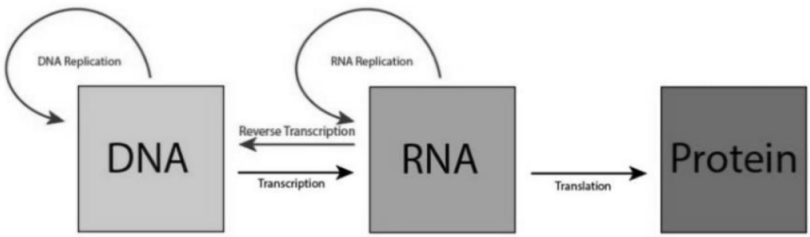
Max. Marks:100

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	Which of the following is stained purple in gram staining a. Gram-positive bacteria b. Gram-negative bacteria c. Both a and b d. None of a or b	1.5	CO1
Q2	Which of the following order of organization is correct a. Biosphere>Ecosystem>Organelle>Organ system b. Biosphere>Organism>Organ system>Tissue c. Tissue>Organism>Organ system>Cell d. Organism>Molecule>Organ system>Cell	1.5	CO1
Q3	What is the size range of prokaryotes a. 1-2 pm b. 1-2 nm c. 1-2 μm d. 1-2 mm	1.5	CO1
Q4	Cholesterol is a(n) a. Diglyceride b. Saturated fat c. Unsaturated fat d. Steroid	1.5	CO1
Q5	When the fluid outside the cell has a greater concentration of a given molecule than the fluid inside, the external fluid is called a. Isotonic b. Hypertonic c. Hypotonic d. Ultratonic	1.5	CO1
Q6	The type of cellular transport that does not require energy is a. Endocytosis b. Exocytosis c. Protein pump d. Passive transport	1.5	CO1

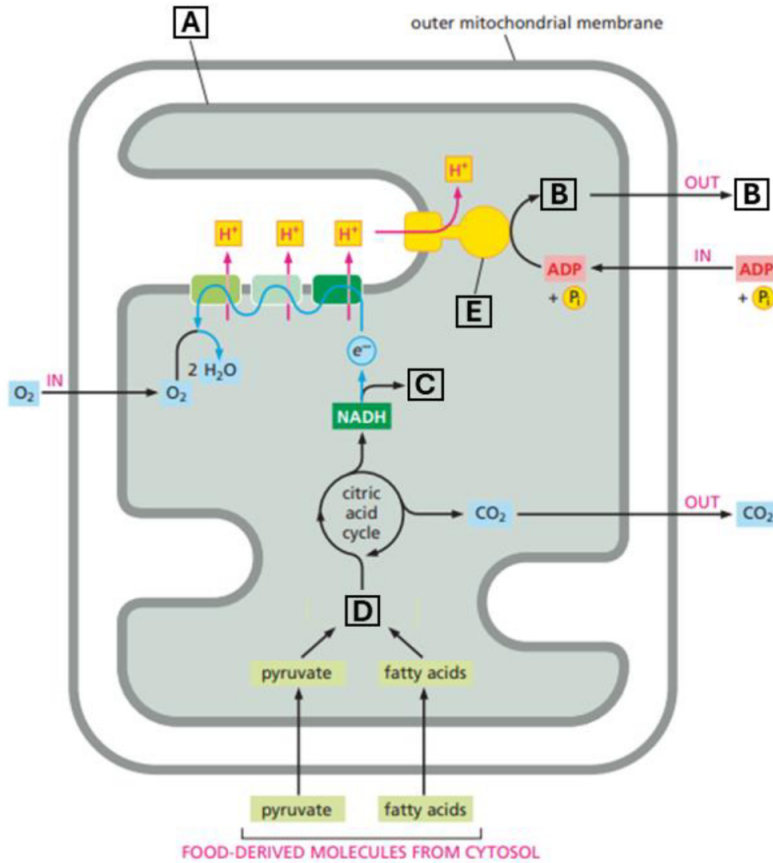
Q7	In a eukaryotic cell, the region between the nucleus and the plasma membrane is called the a. Junction b. Nucleoplasm c. Cytoplasm d. Lumen	1.5	CO2
Q8	Which organelle is called suicidal bags of cell a. Lysosomes b. Peroxisomes c. Endoplasmic Reticulum d. Golgi bodies	1.5	CO2
Q9	ATPase _____ a. synthesizes ATP molecules b. breaks ATP molecules c. is not a part of mitochondria d. is not a part of chloroplast	1.5	CO2
Q10	Which organelle is called solar cell of the cell.	1.5	CO2
Q11	Enlist and name the types of RNA present in a eukaryotic cell.	1.5	CO1
Q12	Molecular biology is a branch of biology that deals with 1) Structure and function of macromolecules and associated processes in living cell <i>i.e.</i> nucleic acids and proteins 2) Catalytic and anabolic processes associated with living cell 3) Structure and function of micromolecules and their associated biological function 4) The study of breakdown of complex molecules in living organisms together with the release of energy	1.5	CO2
Q13	Classify and comment that how many RNA polymerases are present in <i>E. coli</i>	1.5	CO1
Q14	Recall that synthetic activities in molecular biology are a) Bidirectional b) Unidirectional c) In 3'-5' direction, always d) In 5'-3' direction, always	1.5	CO1
Q15	Identify the molecule that is not required in transcription a) ATP b) CTP c) GTP d) TTP	1.5	CO3
Q16	Identify the portions of eukaryotic mRNA sequence that are retained during RNA processing are _____ a. Exons b. Cap c. poly-A tail d. introns	1.5	CO1
Q17	Spot the correct one. Okazaki fragments are composed of 1. DNA 2. RNA 3. Both RNA and DNA	1.5	CO2

	4. Double stranded DNA		
Q18	Cite the correct reason for DNA is more stable than RNA due to a. Lack of hydroxyl at 3'-position b. Presence of hydroxyl at 3'-position c. Presence of hydroxy at 2'-position d. Absence of hydroxyl at 2'-position	1.5	CO3
Q19	Interpret which has more secondary structure DNA or RNA and comment why?	1.5	CO2
Q20	Infer from the illustration below. What is this flow of information in molecular biology called? 	1.5	CO1
Section B (4Qx5M=20 Marks)			
Q21	a. Note one similarity between the structure of molecules of detergent and membrane lipids. (2.5 marks) b. Illustrate the packaging membrane lipids molecules (based on their shape) in the lipid bilayer based on their shape using a diagram (2.5 marks)	5	CO1
Q22	a. Briefly describe the 4 phases of the cell cycle. (4 marks) b. Illustrate the four phases of the cell division cycle using a labeled diagram. (1 mark)	5	CO3
Q23	a. Categorize promoters of prokaryotes using illustration. (3) b. Define a promoter. (2)	5 (3+2)	CO1
Q24	a. Differentiate between prokaryotic and eukaryotic replication. (2) b. With the help of an illustration show a replication fork (detailed, all components) (3)	5 (3+2)	CO2
Section C (2Qx15M=30 Marks)			
Q25	Mitochondria are generators of chemical energy for the cell. They harness the energy from food molecules, such as sugars, to produce adenosine triphosphate or ATP— the primary chemical fuel that powers most of the cell's activities. This process is called cellular respiration, essentially breathing on a cellular level. Without mitochondria, animals, fungi, and plants could not use oxygen to extract the energy they need from the food molecules that nourish them. a. Describe the process through which mitochondria became part of the eukaryotic system. Draw a labeled diagram. (2 marks) b. Illustrate the structure of mitochondria and label its parts. (3 marks)	15	CO4

c. Write the basic chemical equation for the reaction that occurs in mitochondria. (2 marks)

d. Explain the mechanism of ATP production in mitochondria (1.5*2 = 3 marks)

e. Label the parts A, B, C, D, E in the following diagram (1*5 = 5 marks)



Q26

Bacterial protein synthesis machinery is extracted from cells and treated with protease, the peptide bond formation activity is retained. Given this answer the following:

- 1) Cite the name of this protein synthesis machinery. (1)
- 2) Where in the cell (location/compartment) is this protein synthesis machinery found? (1)
- 3) Enlist the components of protein synthesis machinery. (2)
- 4) Are there structural differences between protein synthesis machinery in prokaryotes and eukaryotes? (3)
- 5) Reason why is the activity of this protein synthesis machinery retained upon treatment with protease? (2)
- 6) Explain the process of prokaryotic protein synthesis with suitable illustrations. (6)

15
(1+1+2
+3+2+6
)

CO3

Section D
(2Qx10M=20 Marks)

Q27

I. Define the following terms (1 mark each*5 = 5 marks)
a.. Heterochromatin

10

CO3

	<p>b. Intracellular receptors c. Haploid d. GPCRs e. Necrosis</p> <p>II. Illustrate the difference between eukaryotic and prokaryotic cells with the help of a labeled diagram. (2 marks)</p> <p>III. Explain the steps of protein transport into the endoplasmic reticulum with the help of a diagram. (3 marks)</p>		
Q28	<p>a. Define Splicing. (1) b. Evaluate the need for splicing and where does it happen in the cell. (3) c. Describe the types of introns that are present. (6)</p>	<p>10 (1+3+6)</p>	CO2