| Name:<br>Enrolment No: | |
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**UPES**

**End Semester Examination, December 2024**

**Course:** Cell Biology
**Program:** B. Tech (Biotechnology/ Biomedical Engg)
**Course Code:** HSMB 2038

**Semester:** III
**Time :** 03 hrs
**Max. Marks:** 100

**Instructions: Answer all questions**

| Q.No | **Section A**<br>MCQs/Short answer questions/True &False | (20x1.5= 30 Marks) | COs |
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| Q | Statement of question<br>(each question carries 1.5 marks) | | CO |
| 1 | Which of the following is used by cells to interact with other cells?<br>a) Cell tubules<br>b) Cell junctions<br>c) Cell adhesions<br>d) Cell detectors | 1.5 | CO1 |
| 2 | In which of the following types of cells Sarcoplasmic reticulum is found?<br>a) muscle cells<br>b) liver cells<br>c) kidney cells<br>d) neurons | 1.5 | CO1 |
| 3 | Lysosomes are produced by which of the following cell organelles?<br>a) Mitochondria<br>b) Endoplasmic Reticulum<br>c) Golgi Complex<br>d) DNA | 1.5 | CO1 |
| 4 | Which of the following cell organelle is responsible for transporting, modifying, and packaging proteins and lipids?<br>a) Mitochondria<br>b) Endoplasmic Reticulum<br>c) Golgi Complex<br>d) DNA | 1.5 | CO2 |
| 5 | Who is the father of cell biology?<br>a) George N. Papanicolaou<br>b) George Emil Palade<br>c) Robert Hooke<br>d) None of the above | 1.5 | CO1 |
| 6 | Which of the following is released when a Hydrogen atom loses an electron?<br>a) Nucleus<br>b) Proton<br>c) Charge<br>d) Ion | 1.5 | CO3 |
| 7 | A solution having a pH of 6 has a proton concentration of _____<br>a) $10^{-6}$ M<br>b) $10^{6}$ M | 1.5 | CO2 |

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| | c) 6 M<br>d) 0.6 M | | |
| 8 | Ribozymes are _____<br>a) cell organelle<br>b) enzymes<br>c) nucleotide<br>d) nucleoside | 1.5 | CO2 |
| 9 | In an amino acid, the carboxyl group and amino group are separated from each other by a single _____ atom.<br>a) nitrogen<br>b) sulphur<br>c) hydrogen<br>d) carbon | 1.5 | CO3 |
| 10 | Which types of bonds are found in fats?<br>a) amide<br>b) glycosidic<br>c) ester<br>d) acidic | 1.5 | CO3 |
| 11 | Which of the following steroids is a precursor of hormones such as testosterone, progesterone and estrogen?<br>a) Collagen<br>b) Glycogen<br>c) Cholesterol<br>d) Glycerol | 1.5 | CO2 |
| 12 | The compounds that have same chemical reactivity but structures that are mirror images of each other are known as _____<br>a) isoforms<br>b) allotropes<br>c) enantiomers<br>d) isomers | 1.5 | CO3 |
| 13 | Protein folding is a process in which a polypeptide folds in to _____<br>a) 2-D structure<br>b) Globular form<br>c) 3-D structure<br>d) Linear form | 1.5 | CO2 |
| 14 | The resting phase of the cell, where it undergoes growth and DNA replication is called_____<br>a) Mitosis phase<br>b) G1 phase<br>c) Interphase<br>d) M phase | 1.5 | CO3 |
| 15 | Name the state where never-dividing cells of neurons and skeletal muscle are present.<br>a) G0<br>b) G1<br>c) G2<br>d) M | 1.5 | CO4 |
| 16 | Name the regulatory component of the cell cycle?<br>a) Cyclin<br>b) CDK | 1.5 | CO4 |

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| | c) DNA<br>d) APC | | |
| 17 | Name the enzyme that causes ubiquitylation and destruction of cyclin.<br>a) Acid hydrolases<br>b) Hyaluronidase<br>c) Ubiquitin ligase<br>d) Phosphatase | 1.5 | CO3 |
| 18 | The G-proteins bind only to _____<br>a) cytosine<br>b) guanine<br>c) thymine<br>d) adenine | 1.5 | CO4 |
| 19 | At which cell cycle checkpoint, the cell cycle is halted if the cell's DNA is damaged?<br>a) $G_1$ – S<br>b) S – $G_2$<br>c) $G_2$ – M<br>d) $G_0$ – $G_1$ | 1.5 | CO4 |
| 20 | Which of the following enzymes is activated by apoptotic cells?<br>a) Caspase protease<br>b) Nuclease<br>c) Peroxidase<br>d) Telomerase | 1.5 | CO4 |
| | **Section B** | (4x5=20 Marks) | CO |
| Q | Statement of question<br>(each question carries 5 marks) | | |
| 1. | a) Explain the concept of pH. How is the pH of a solution related to its acidity?<br>b) Explain the concept of amphoteric substances with an example. | 2+3 | CO1 |
| 2. | a) With the help of a well-labeled diagram, explain how the lipid bilayer contributes to the selective permeability of the cell membrane.<br>b) Differentiate between passive and active transport across the lipid bilayer. | 3+2 | CO2 |
| 3. | Differentiate between microtubules, microfilaments, and intermediate filaments based on structure and function. Give one example for each. | 5 | CO3 |
| 4. | What is the significance of the Na+/K+ pump in nerve impulse transmission? Draw a well-labeled diagram for the same. | 5 | CO4 |
| | **Section C** | (2x15=30 Marks) | |
| Q | Statement of question (Case studies)<br>(each question carries 15 marks) | | CO |

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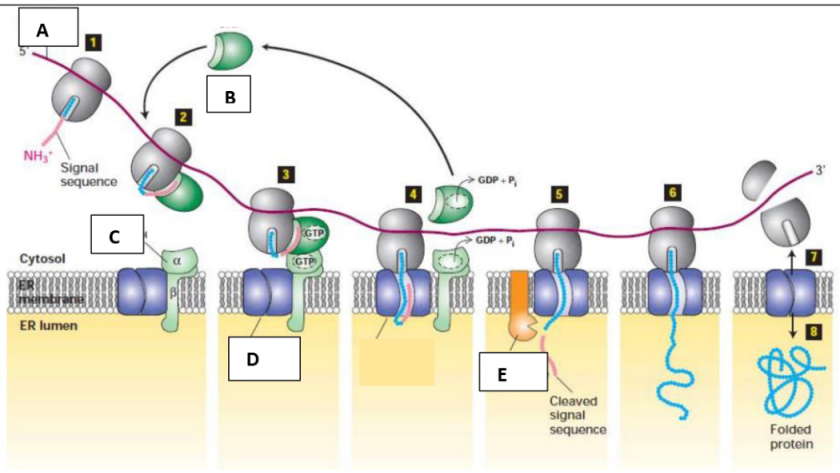
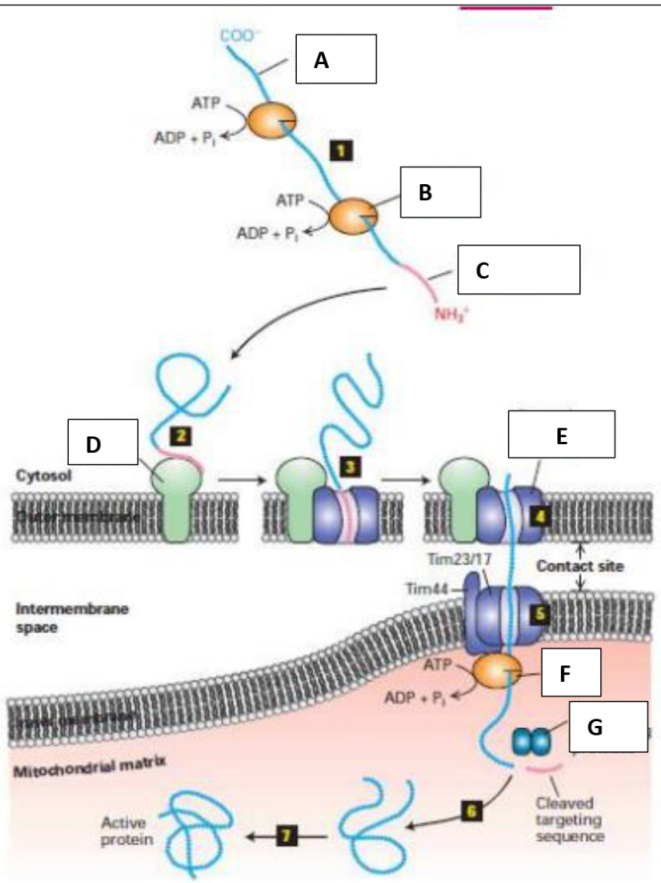
| 1. |  <br>About the diagram answer the following questions:<br>a) Label A-E.<br>b) Describe the structure and function of B in ER protein transport.<br>c) Differentiate between co-translational and post-translational transport of proteins to the ER.<br>d) What is the role of D in protein transport to the ER?<br>e) Briefly discuss the steps from 1-8. | 15<br><br>(5+3+2+2+3) | CO3 |
| 2. |  | 15<br><br>(7+2+3+3) | CO2 |

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| | In reference to the diagram given above, answer the following questions:<br>a) Label A-G and briefly outline the steps 1-7.<br>b) Why do mitochondria require imported proteins, and where are these proteins synthesized?<br>c) What is the role of E and G in mitochondrial protein import?<br>d) What is the role of B and F in mitochondrial protein import? | | |
| | **Section D** | (2x10=20 Marks) | |
| Q | Statement of question<br>(each question carries 10 marks) | | CO |
| 1. | a) How do cyclin-CDK complexes coordinate the events of mitosis (M phase. Explain with the help of a well-labeled diagram<br>b) Discuss the consequences of defective p53 in enhancing genome instability. | 6+4 | CO4 |
| 2. | a) Discuss the process of SNARE complex formation and its role in vesicle fusion.<br>b) Describe the role of death receptors in the extrinsic pathway of apoptosis. Draw a well-labeled diagram depicting the mechanism. | 5+5 | CO2 |