


Name:	
Enrolment No:	

UPES
End Semester Examination, December 2024

Course: Cell Biology	Semester: III
Program: B. Tech (Biotechnology/ Biomedical Engg)	Time : 03 hrs
Course Code: HSMB 2038	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	Which of the following is used by cells to interact with other cells? a) Cell tubules b) Cell junctions c) Cell adhesions d) Cell detectors	1.5	CO1
2	In which of the following types of cells Sarcoplasmic reticulum is found? a) muscle cells b) liver cells c) kidney cells d) neurons	1.5	CO1
3	Lysosomes are produced by which of the following cell organelles? a) Mitochondria b) Endoplasmic Reticulum c) Golgi Complex d) DNA	1.5	CO1
4	Which of the following cell organelle is responsible for transporting, modifying, and packaging proteins and lipids? a) Mitochondria b) Endoplasmic Reticulum c) Golgi Complex d) DNA	1.5	CO2
5	Who is the father of cell biology? a) George N. Papanicolaou b) George Emil Palade c) Robert Hooke d) None of the above	1.5	CO1
6	Which of the following is released when a Hydrogen atom loses an electron? a) Nucleus b) Proton c) Charge d) Ion	1.5	CO3
7	A solution having a pH of 6 has a proton concentration of ____ a) 10^{-6} M b) 10^6 M	1.5	CO2

	c) 6 M d) 0.6 M		
8	Ribozymes are _____ a) cell organelle b) enzymes c) nucleotide 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. a) nitrogen b) sulphur c) hydrogen d) carbon	1.5	CO3
10	Which types of bonds are found in fats? a) amide b) glycosidic c) ester d) acidic	1.5	CO3
11	Which of the following steroids is a precursor of hormones such as testosterone, progesterone and estrogen? a) Collagen b) Glycogen c) Cholesterol 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 _____ a) isoforms b) allotropes c) enantiomers d) isomers	1.5	CO3
13	Protein folding is a process in which a polypeptide folds in to _____ a) 2-D structure b) Globular form c) 3-D structure d) Linear form	1.5	CO2
14	The resting phase of the cell, where it undergoes growth and DNA replication is called _____ a) Mitosis phase b) G1 phase c) Interphase d) M phase	1.5	CO3
15	Name the state where never-dividing cells of neurons and skeletal muscle are present. a) G0 b) G1 c) G2 d) M	1.5	CO4
16	Name the regulatory component of the cell cycle? a) Cyclin b) CDK	1.5	CO4

	c) DNA d) APC		
17	Name the enzyme that causes ubiquitylation and destruction of cyclin. a) Acid hydrolases b) Hyaluronidase c) Ubiquitin ligase d) Phosphatase	1.5	CO3
18	The G-proteins bind only to _____ a) cytosine b) guanine c) thymine d) adenine	1.5	CO4
19	At which cell cycle checkpoint, the cell cycle is halted if the cell's DNA is damaged? a) G ₁ - S b) S - G ₂ c) G ₂ - M d) G ₀ - G ₁	1.5	CO4
20	Which of the following enzymes is activated by apoptotic cells? a) Caspase protease b) Nuclease c) Peroxidase d) Telomerase	1.5	CO4
	Section B	(4x5=20 Marks)	CO
Q	Statement of question (each question carries 5 marks)		
1.	a) Explain the concept of pH. How is the pH of a solution related to its acidity? 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. 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) (each question carries 15 marks)		CO

<p>1.</p>	<p>Labels: A, B, C, D, E, Cytosol, ER membrane, ER lumen, Signal sequence, NH₃⁺, GTP, GDP + P_i, Cleaved signal sequence, Folded protein.</p> <p>Steps: 1, 2, 3, 4, 5, 6, 7, 8.</p> <p>About the diagram answer the following questions:</p> <ol style="list-style-type: none"> Label A-E. Describe the structure and function of B in ER protein transport. Differentiate between co-translational and post-translational transport of proteins to the ER. What is the role of D in protein transport to the ER? Briefly discuss the steps from 1-8. 	<p>15</p> <p>(5+3+2+2+3)</p>	<p>C03</p>
<p>2.</p>	<p>Labels: A, B, C, D, E, F, G, Cytosol, Outer membrane, Intermembrane space, Mitochondrial matrix, COO⁻, NH₃⁺, ATP, ADP + P_i, Tim23/17, Contact site, Tim44, Cleaved targeting sequence, Active protein.</p> <p>Steps: 1, 2, 3, 4, 5, 6, 7.</p>	<p>15</p> <p>(7+2+3+3)</p>	<p>C02</p>

	In reference to the diagram given above, answer the following questions: a) Label A-G and briefly outline the steps 1-7. b) Why do mitochondria require imported proteins, and where are these proteins synthesized? c) What is the role of E and G in mitochondrial protein import? d) What is the role of B and F in mitochondrial protein import?		
	Section D	(2x10=20 Marks)	
Q	Statement of question (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 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. b) Describe the role of death receptors in the extrinsic pathway of apoptosis. Draw a well-labeled diagram depicting the mechanism.	5+5	CO2