


Name:			
Enrolment No:			
UNIVERSITY OF PETROLEUM AND ENERGY STUDIES End Semester Examination, December 2022			
Course: Cell Biology Program: B. Tech (Biotechnology) Course Code: HSMB 2018		Semester: IIIrd Time : 03 hrs. Max. Marks: 100	
Instructions:			
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.	The numbers of chromosomes in a normal human being a) 46 b) 73 c) 43 d) 42	1.5	CO1
2.	Cell organelle also referred to as power house of a cell is a) Nucleus b) Mitochondria c) Golgi complex d) Cell membrane e) None of the above	1.5	CO1
3.	Ribosomes are synthesized in part of the cell called a) Golgi complex b) Mitochondria c) Nucleolus d) Nucleus e) None of the above	1.5	CO1
4.	Phagocytosed food is digested with the help of enzymes which are present in a) Ribosome b) Lysosomes c) Mitochondria d) Golgi complex e) None of the above	1.5	CO2
5.	A definite shape given to cell is by a) Cell membrane b) Ribosome c) Cell wall d) Nucleus e) None of the above	1.5	CO1

6.	Fill in the blanks: As the growing polypeptide chain enters the lumen of the ER, the signal sequence is cleaved by _____	1.5	CO3
7.	Lysosomes which eat parts of their own cell in a state of starvation are called. a) Autophagosomes b) Autophagocytosis c) Auto retarded d) Auto destruction e) None of the above	1.5	CO2
8.	Compare between anterograde and retrograde transport vesicles?	1.5	CO2
9.	Microfilaments are composed of a protein called a) Tubulin b) Actin c) Myosin d) Chitin	1.5	CO3
10.	What is the role of Signal recognition particle (SRP) in the events of protein targeting?	1.5	CO3
11.	An organelle that mainly serves as a packaging area for molecules that are distributed across the cell and are called ____? a) Golgi apparatus b) Mitochondria c) Plastids d) Vacuole	1.5	CO2
12.	In the below-given list, which one includes the blood tissue? a) Muscle tissue b) Connective tissue c) Epithelial tissue d) Nervous tissue	1.5	CO3
13.	State True or False: The endocytosis happens in the apical surface and the exocytosis happens in the baso-lateral surface a) True b) False	1.5	CO2
14.	What is an "Uptake targeting Sequence". Explain with the help of a relevant example.	1.5	CO3
15.	What is a "Translocon" in protein sorting? Explain with the help of an example.	1.5	CO4
16.	State True or False	1.5	CO4

	The unidirectional transfer of a protein into an organelle, without sliding back out into the cytoplasm, is usually achieved by coupling translocation to an energetically favorable process such as hydrolysis of ATP c) True d) False		
17.	Briefly describe what is “Co-translational translocation”?	1.5	CO3
18.	Compare between v-SNARE and t-SNARE?	1.5	CO4
19.	Glycolipids in the plasma membrane are located at a) Inner leaflet of the plasma membrane b) The outer leaflet of the plasma membrane c) Evenly distributed in the inner and outer leaflets d) It varies according to cell types	1.5	CO4
20.	Lysosomes are known as “suicidal bags” because a) Parasitic activity b) Presence of food vacuole c) Hydrolytic activity d) Catalytic activity	1.5	CO4
	Section B	(4x5=20 Marks)	CO
Q	Statement of question (each question carries 5 marks)		
1.	a) Compare between adherens junction and desmosomes. b) What are ATP-powered pumps. Explain with the help of a relevant example.	2+3	CO1
2.	a) Give a detailed overview of a vesicle budding off from a parent membrane and its fusion with a target membrane. b) Compare between COPI and COPII vesicles in terms of coat proteins and transport step mediated	2+3	CO2
3.	a) How do Rab-GTPases control docking of vesicles on target membrane b) Describe the role of NSF and alpha SNAP in vesicle fusion.	2+3	CO3
4.	a) Describe different stages of mitotic cell cycle. Draw a well labelled diagram for each stage. b) Discuss the role of cohesin in mitotic cycle.	3+2	CO4
	Section C	(2x15=30 Marks)	
Q	Statement of question (Case studies) (each question carries 15 marks)		CO
1.	Like synthetic lipid bilayers, cell membranes allow small nonpolar molecules to permeate by diffusion. Cell membranes, however, also have to allow the passage of various polar molecules, such as ions, sugars, amino acids, nucleotides, water, and many cell metabolites that cross	15	CO1

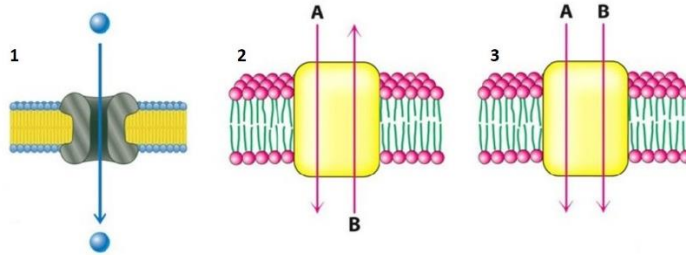
synthetic lipid bilayers only very slowly. Special membrane transport proteins transfer such solutes across cell membranes. These proteins occur in many forms and in all types of biological membranes.

(3+4+3+1+1+3)

- What are the two major classes in which the membrane transport protein fall? Give an example for each
- Based on mechanisms for transporting ions and small molecules across cell membranes, fill the underlying table with (+) or (-)

Property	Transport mechanism			
	Passive Diffusion	Facilitated Diffusion	Active transport	Co-transport
Requires specific proteins				
Solute is transported against its gradient				
Coupled to ATP hydrolysis				
Driven by movement of co-transported ion down its conc. Gradient				

- This schematic diagram shows three different transporters.



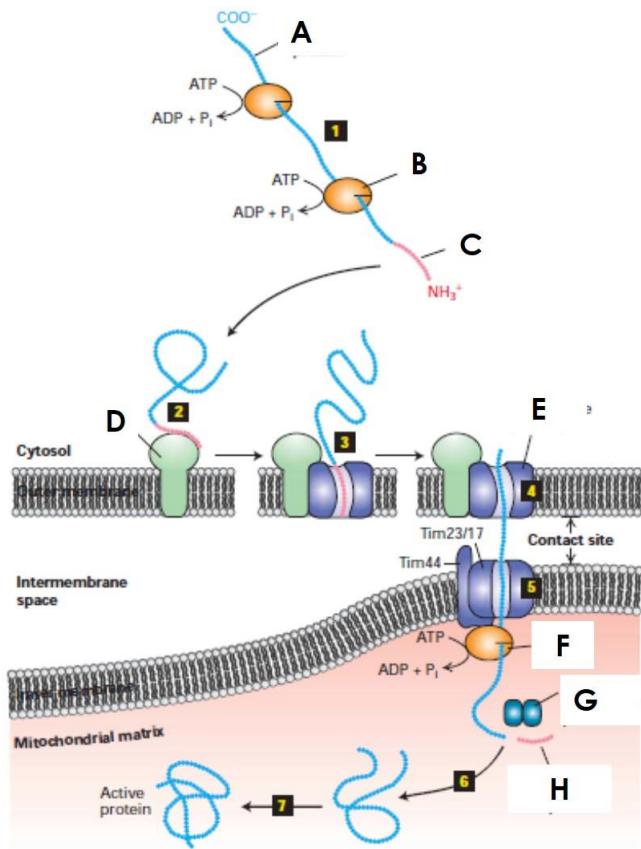
- Name the transporters 1, 2, and 3?
- State the kind of diffusion across transporter 1, if the solute is moving down the concentration gradient?
- State the kind of transport across transporters 2 and 3, if solute A is moving down the concentration gradient while solute B is moving against its concentration gradient?
- Briefly explain the mechanism of solute transport in coupled transporters (represented by 2&3)

2. The following figure presents an overview of protein import from the cytosol into the mitochondrial matrix: The route is followed by most of the imported proteins that are targeted to the mitochondrion or the compartments of the mitochondrion.

15

CO3

(4+7+1+2+1+)



With reference to the figure answer the following questions:

- Label the key candidates A-H participating in the import or targeting of cytosolic proteins to the mitochondrion or mitochondrial matrix.
- Give a detailed account of steps 1-7.
- What could happen if B fails to associate with the nascent protein that is to be imported?
- Yeast mutants is defective in F, how this mutation would affect the conformation of the protein imported in the mitochondrial matrix?
- What does “Tim” in Tim 23/17 or 44 stand for?

	Section D	(2x10=20 Marks)	
Q	Statement of question (each question carries 10 marks)		CO
1.	<ol style="list-style-type: none"> Give a detailed overview of the model for regulation of the eukaryotic cell cycle, describing the interaction of stage specific cyclins-CDK complexes and their regulators in G1, S, G2 and M phases of mitosis. Give a detailed account of the three crucial mitotic checkpoints. Draw a well labelled diagram for the same. Discuss the role of p53 in DNA damage checkpoints. 	5+3+2	CO4
2.	<ol style="list-style-type: none"> Explain the “Fluid mosaic model” for the lipid bilayer membrane structure. Draw a well labelled diagram for the same. Differentiate between integral, peripheral and lipid anchored membrane proteins? What is the basis for their classification? 	5+3+2	CO2

	c) Describe the different types of cytoskeleton prevalent in the cell. Give one example for each		
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