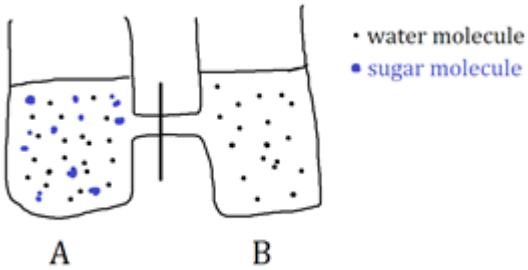
Credit :4

Unit 1: STRUCTURE AND ORGANIZATION OF CELL

Very short questions (1 mark)

1. Name the region in eukaryotic cell where ds single circular DNA is present.
2. What are the subunits of ribosome of prokaryotic cell?
3. Which transcriptional control features are found in both prokaryotes and eukaryotes?
4. Kearns-Sayre syndrome is a disease caused by deletions in circular DNA that code for proteins of the electron transport chain. What is its inheritance pattern?
5. Tay Sachs is a congenital disorder in which molecules called gangliosides are not properly digested and instead accumulate in cells, causing toxicity. Misfunction in which organelle can lead to Tay Sachs?
6. How large molecules are transported across the cell membrane?
7. What is the name of the hollow sphere formed by lipid bilayer? Which ABC transport protein transports lipid in opposite direction?
8. How do potassium ions travel as they move into the cell?
9. Name the technique which is used to visualize the lateral movement of lipids?
10. How many filamentous structures together comprise the cytoskeleton?
11. Which subunits form microtubules?
12. Why no known motor proteins have been found to utilize intermediate filaments?
13. What are the different types of actin found in the cell?
14. What is the microtubule organizing center of most eukaryotic cells?
15. What is the function of tight junctions in epithelial cells?
16. What two drugs will prevent polymerization of microtubules?
17. What is the structural subunit of desmosome ?
18. What molecule, when bound to g-actin, promotes polymerization?
19. Which factor would slow sugar equilibrium the most once the shutter is raised to connect the two solutions?



Short questions (2 marks)

1. Give chemical composition of plasma membrane.
2. What is role of cholesterol in plasma membrane?

3. Differentiate between simple and facilitated diffusion.
4. What is role of carrier protein in facilitated protein?
5. What is isotonic solution? Give its effect on plasma membrane.
6. Write the common and different properties of Cadherin and Integrins
7. Define active transport and passive diffusion.
8. The openings of membrane channel proteins are controlled by gates. What factors can cause these gates to open?
9. What drugs prevent polymerization of actin? What prevents it from depolymerizing?
10. What is the structure of microtubules?
11. What structures found at the centrosome?
12. How thick are actin filaments, Intermediate filaments and Microtubules?

Broad questions (greater than 2 marks)

1. What factors influence the rate of diffusion across a membrane? Give examples of how membranes might be altered in a biological system to change the rate of diffusion. Can you give a few examples of where diffusion is important for proper physiological function?

   (2+2+2)

2. 2. State the functions of the sodium potassium ATPase pump. Name the inhibitor of Na+-K+ ATPase. Two solutions (A & B) are separated by a semi-permeable membrane which only allows the passage of water solution A contains 600 mmoles of NaCl and solution B contains 250 mmoles of NaCl. In which direction osmosis will occur?

   (2+1+1)

3. What is the main function of intermediate filaments? What is the structure of intermediate filaments? What are the chief types of intermediate filaments and where are they found?

   (1+2+2)

4. Explain why no known motor proteins have been found to utilize intermediate filaments?
5. A common chemotherapeutic agent, called Vincristine, is used to treat cancers. It acts by inhibiting tubulin. What can you conclude about Vincristine? Write the structure of microfilaments with simple diagram.

   (2+1+2)

Unit 2: NUCLEUS

Very short questions (1 mark)

1. Define apoplast and symplast.
2. What is desmotubule?
3. What are micelles?
4. What is cell plate?

5. Out of P-wall and S-wall which one is optically active?
6. What is Nucleoplasm?
7. What is Nuclear Pore Complex?

Short questions (2 marks)

1. What is the chemical composition of middle lamella?
2. What is molecular trafficking?
3. What is meant by gross structure of plant cell wall.?
4. What is the chemical composition of primary wall?
5. What role played by IAA for the formation of S-wall?
6. Write the function of the nuclear membrane
7. Write the function nucleus.

Broad questions (greater than 2 marks)

1. Two components are evident in the fine structure of plant cell wall- write in brief these two components. (3+3)
2. Explain the orientation of microfibrilsin the light of apposition and intussuception theories. (2.5+2.5)
3. Write a note on the chemical nature of plant cell wall. (4)
4. Describe the ultrastructure of plasmodemata. (4)
5. What is phragmoplast? Write its role in the formation of middle lamella. (1+3)
6. Describe the structure of nuclear envelope
7. Write short note on Nuclear Pore Complex

Unit 3: PROTEIN SORTING AND TRANSPORT

Very short questions (1 mark)

1. Cite 2 examples of microtubule destabilising drugs.
2. What do you mean by Overlap Microtubules?
3. How the Early cell plate is formed?
4. Describe the significance of the term N-linked glycosylation.
5. What marker does designate the proteins targeted to lysosome?
6. What is the significance of the term ‘Gro’ in GroEL or GroES?
7. How is the energy harnessed in protein folding mediated by GroEL/GroES system?
8. What is cotranslational translocation?
9. Cite the functions of SecB & SecA.
10. What is Signal patch?
11. Define Karyopherin.

12. Define Peroxin.
13. What is the peroxisomal targeting signal?
14. Define Chaperonin.
15. What is NIR?
16. What is the Full form of SNARE?
17. What is the significance of the terms R-SNARE & Q-SNARE?
18. Give suitable examples of v-SNARE & t-SNARE.
19. Define glycosaminoglycan with example.
20. Define: Anterograde & Retrograde transport.
21. Comment on Bottlebrush structure.
22. Define lateral gating mechanism.
23. Cite the function of PDI & BiP.
24. What is Lipid-linked protein?

25. Write the names of the types of sugar chains associated to the protein during N-linked glycosylation.
26. What do you mean by I-cell disease?
27. Define autophagy.
28. Define Residual bodies.

Short questions (2 marks)

1. Name the components which control the Dynamic Instability of microtubules during separation
2. of sister chromatids.
3. What is the constituent of microtubule nucleator?
4. What are the features of lipid raft?
5. How does neurotoxin like BOTOX or TetTox interact with vesiclular traffic?
6. Describe the properties of leader peptide in Sec system.
7. Give the significance of the terms: TOM & TIM.
8. How does Oxa complex locate the proteins in proper position?
9. Comment on Zellweger's syndrome.
10. What is the specific function of peroxisomes?
11. Cite the specific functions of sER.
12. Ribosome can't be considered as a true organelle-justify.
13. How the nuclear membrane and ER membrane are located?
14. Define the terms: Stop transfer sequence; Retention signal.
15. Comment on the structural & functional aspects of lipid carrier molecule involved in glycosylation
16. of proteins.
17. Describe the utilities of "Coat" structure in vesicular trafficking.
18. State the functions of Rab effector proteins.
19. What exactly Rab proteins do in vesicle fusion?
20. What do you mean by Trans-SNARE complex?
21. What are the different portions of Golgi complex?
22. What are the various sulphated oligosaccharides synthesised in Golgi complex?
23. What are the types of oligosaccharide chains attached to proteins?

24. Why the cytosolic proteins are commonly not glycosylated?
25. Cite the role of DOlichol in glycosylation of proteins.
26. Indicate the functions of GPI-Anchored proteins.
27. What is the main difference between N & O-linked glycosylation?
28. What is the purpose of these both types of glycosylation?
29. How the pH in lysosomal vesicle is kept at fairly acidic?
30. Differentiate between early & late endosome.
31. Describe the utility of lipid raft structure in vesicular trafficking.
32. What are the differences between cellular drinking & cellular eating?
33. Why don't macrophages engulf any live animal cell?

Broad questions (greater than 2 marks)

1. Briefly describe the function of GroEL/GroES system in folding a particular target protein with suitable diagram.
2. Elaborate the features of protein translocation through NPC.
3. Define injectiosome & injectosome.
4. What is the probable function of Hsp70 in two proposed models for protein translocation in bioblasts?
5. What are the various proteins functioning in formation of Clathrin coat? Discuss with proper functions of them.
6. Describe the role of GTPases in vesicular trafficking process.
7. What is nucleolus? Why it is known as 'ribosome producing factory'?
8. Give the functions of SRP & SRP receptor.
9. Cite two crucial functions of Golgi apparatus.
10. Write short notes on: Maturation of vesicles in Golgi complex.
11. Discuss the roles vesicular transport & cisternal maturation model in movement of vesicles through Golgi complex with justification.
12. Give the function of Sec61 complex briefly.
13. How do calnexin & calreticulin function to give correct conformation of target proteins?
14. Write the MOA of Tunicamycin & Bacitracin briefly.
15. Define local recycling with respect to neurotransmission.
16. Differentiate between clathrin & caveolin mediated endocytosis.
17. Describe transcytosis with suitable diagram.
18. Enlist the features of receptor mediated endocytosis.

Unit 4: CELL SIGNALLING

Broad questions (greater than 2 marks)

1. Write in brief the molecular circuits in which signal transduction depends. (4)
2. What is G-protien? Write the role of G-protien in signal transduction pathway. (1+4)
3. What is cross talk? How do diacyl lipids play crucial roles in cell signaling? (1+4)

4. What are ligands and effectors? Explain how IP_3 causes rapid release of $Ca^{2+}$from the intracellular stores in the ER. (2+4)
5. How can one estimate free Ca^{2+} concentrations inside living cells? What is calmodulin? (3+1)
6. Many signals are transduced by mitogen-activated protien kinase (MAPK)cascade-Explain. (4)

Unit 5: CELL CYCLE,CELL DEATH AND CELL RENEWAL

Very short questions (1 mark)

1. What are the various growth phases in cell cycle?
2. What is the basis of the nomenclature 'cyclin'?
3. Define 'restriction point'.
4. Define CKI.
5. What are the enzymes to regulate apoptosis?
6. Define apoptosome.
7. What is replicative cell senescence?
8. Define the terms: Chondroma, Adenosarcoma, Ganglioma.
9. Define Metastasis.
10. Define carcinogen.
11. What is Cancer critical gene?
12. Cite the function of catastrophin.
13. What is Philadelphia chromosome?
14. Cite two examples of viruses causing cancer.
15. Cite two examples of viral proteins which are known to induce cancer of host cells.
16. Give two examples of RNA viruses causing cancer in host cells.
17. What is MTOC?
18. Define the terms: contractile ring, preprophase band, early cell plate.

Short questions (2 marks)

1. What are the utilities of xenopus oocytes in cell cycle studies?
2. What is the role of CAKs in cell cycle control?
3. What are the various types of Cdks available in mammalian system?
4. How does Cyclosome lead the cell to anaphase?
5. How can p53 be activated in mammalian system?
6. What role does p53 play in inducing apoptosis?
7. Cite two examples each of anti & pro apoptotic genes.
8. What is the difference between Mitogen & MPF?
9. Differentiate between malignant & benign tumour.
10. What are the principal causes of cancer?
11. Differentiate between tumour promoter and tumour inducer.

12. p53 is not required for normal development of cells but it is indispensable- justify.
13. Ionising radiations are not always fruitful in treating cancers- explain.
14. Why carcinoma is mostly found compared to other types of cancers?
15. Differentiate between Chondroma & Chondrosarcoma.
16. Why a single mutation only is not enough to cause cancer?
17. What is the difference between potential & ultimate carcinogen?
18. What is asymmetric cell division?
19. Why zygote is not considered as stem cell?
20. Why ESCs are known as pluripotent cells?
21. What are the master transcription factors in controlling stem cell behaviour?

Broad questions (greater than 2 marks)

1. How can the cell cycle stages be identified?
2. Yeasts are considered as very suitable model organism for cell cycle studies – justify.
3. Inhibitory phosphorylation is necessary in cell cycle progression- justify.
4. Briefly describe the functions of Cdc6, Polo kinase, Separase, Cohesin complex.
5. Discuss the role of MPF with diagram.
6. The event of DNA replication occurs once per cycle- explain with proper justification.
7. What preparatory functions are performed by MCdk prior to plunge into mitosis?
8. Ubiquitination of cyclins is key to regulate cell cycle progression- explain with examples.
9. How can a same protein APC trigger as well as finish M-phase witing stipulated time period?
10. Describe the role of pRb in regulating the entry of cell in S-phase.
11. p53 is saviour of genetic traits- explain.
12. What do you mean by Ataxia Telangiectasia? How ATM & ATR are related to Ataxia Telangiectasia?
13. Cell membrane asymmetry can be a measure of apoptosis- justify.
14. Enlist at least three methods for detection of induction apoptosis.
15. Describe the functions of FasL & APAF-1 in initiating apoptotic pathways.
16. How chromosome translocation can be related to cancer development?
17. DNA damage always does not lead to cancer- explain.
18. Replicative senescence is opposite to cancer development- explain.
19. How cell adhesion molecules can be related to metastatic development?
20. What do you mean by nondisjunction? Classify it.
21. Define recombination nodule. What function it does play?
22. Describe the factors controlling the pluripotency of stem cells.
23. How X-inactivation phenomenon can be used in studying cancer cells?
24. How can the defect in DNA repair system be attributed to cancer? Explain with example.

25. How genetic instability can be related to cancer development?
26. Describe various steps of Metastasis.
27. Give examples of some environmental carcinogens.
28. How mutations can generate an oncogene?
29. How can bridge-breakage-fusion cycle lead to neoplasia?
30. How telomere shortening can be related to cancer development?
31. Discuss the role of cohesion & condensin complexes in mitosis.
32. What are the three classes of microtubules detected in mitotic division of animal cells?
33. What is cellularisation?
34. What are the totipotent & pluripotent cells?
35. How iPSC can be stably prepared?
36. Haemoatopoetic stem cells are multipotent not pluripotent- justify.

Head of the Department

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