

(4)
GROUP—D

Answer *any two* questions.

5×2=10

13. (a) Mention briefly the function of G1 Cyclins. How is APC (Anaphase Promoting Complex) inactivated in G1 phase?
(b) Activity of S phase Cyclin-cdk (Clb5/6-CDK1) is primarily sequestered by Sic1. How does G1 cyclin activate S-phase cyclin? (2+1)+2=5
14. (a) How is CMG complex (cdc45-MCM-GINS) formed during replication? Describe briefly.
(b) How does mitotic check point complex induce 'wait anaphase signal'? Explain indicating the role of Mad2 and Bub proteins. p27, knockout mice show a 30% increase in body size, why? 2+(2+1)=5
15. (a) Which type of cell death is induced by Caspase-2? Give a brief account of their activation.
(b) Mention the functions of different molecules which are leaked during MOMP and responsible for apoptosis. (1+2)+2=5
16. (a) Clearly portray 'end replication problem' in mammalian cells.
(b) Mention the significance of heterochromatin formation during senescence and proteins involved in SASP (Senescence Associated Heterochromatin Protein). Why does senescent cells often induce inflammation? 2+(2+1)=5

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Ex/SC/BT/PG/131T/2024

M. Sc. BIOTECHNOLOGY EXAMINATION, 2024

(1st Year, 1st Semester)

CELL BIOLOGY

PAPER : PG/131T

Time : 2 Hours

Full Marks : 40

GROUP—A

Answer *any three* questions.

5×3=15

1. (a) "A Nuclear Localization Sequence (NLS) is often consists of a short stretch of basic amino acids." You have identified a novel short basic amino acid sequence, which you think is a putative nuclear localization signal. How will you experimentally prove that newly identified sequence is indeed a NLS?
(b) How do nucleotide sugars get into the golgi apparatus? 3+2=5
2. (a) "Mitochondrial fission and fusion networks are tightly regulated for cell viability." Justify the statement.
(b) How can the use of proton pump inhibitors be beneficial for the treatment of heartburn? 3+2=5
3. (a) What would be the consequence of using uncouplers on the rate of Electron Transport Chain (ETC) reaction and on ATP synthesis?

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- (b) How does glutathione molecule predict the oxidative status of a cell? $(1\frac{1}{2}+1\frac{1}{2})+2=5$
4. (a) Outline any two signaling events that are activated upon induction of ER stress.
- (b) How would you experimentally prove that ATP hydrolysis is required to keep the protein in an unfolded state for incorporation of the proteins into mitochondria? $3+2=5$
5. (a) Write down the impacts of inactive dynamin protein in clathrin-mediated vesicular transport.
- (b) What are the purposes of performing inside-out and outside-out patch clamp techniques in the context of membrane physiology? $2+3=5$
6. (a) Name one insulin-dependent and one insulin-independent glucose transporters present in our body. Explain the mode of transport by these transporters.
- (b) What is the principle behind the use of digoxin in heart failure patient? $(1+2)+2=5$

GROUP—B

Answer *any two* questions. $5\times 2=10$

7. Which family of adhesion proteins can be seen in desmosomes and hemidesmosomes respectively? Name any two intracellular anchor proteins. Describe the formation of gap junctions. State any function of tight junction. $1+1+2+1=5$

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[Continued]

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8. State the difference between filopodium and lamellipodium based on the cellular actin organization. How does Arp2/3 promote Actin polymerization? What is the function of cdc42 in Actin polymerization? State the relevance of critical concentration in actin polymerization process. $1+2+1+1=5$
9. What is the function of Myosin Light Chain Phosphatase (MLCP)? What are the functions of Titin and Nebulin? State the functions of inhibitory Smad proteins. Define the role of SARA in TGF- β /Smad signaling pathway. $1+1+2+1=5$
10. Write down the functions of LRP and Axin in Wnt signaling. What is the pathway for Ca-release-mediated activation of ventral patterning in Wnt signaling? Mention the role of Cul3 in Nrf2/Keap1 signaling pathway. $2+2+1=5$

GROUP—C

Answer *any one* question. $5\times 1=5$

11. (a) How can DNA repair genes sometimes cause cancer?
- (b) The retinoblastoma protein is a tumor suppressor protein which acts as a tumor suppressor. Explain the sentence mentioning the molecular mode of action. $2+3=5$
12. (a) How can you distinguish between a tumor suppressor gene and a proto-oncogene?
- (b) "PTEN is one of the most frequently inactivated tumor suppressor genes in cancer."
- Is the statement true or false? Justify. $2+3=5$

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[Turn Over]