

M. SC. BIO-TECHNOLOGY PART I EXAMINATION, 2017**CELL BIOLOGY****PAPER - 1/2**

Time : Four hours

Full Marks : 100

GROUP - A

[Answer Q. No. 1 and any three from the rest in the Group]

1. Answer **any eight** .**8x2=16**

- a. Which types of proteins are most responsible for assuring that cells do not replicate if there is DNA damage?
- b. During which cellular process is a 146 base pair ladder frequently observed?
- c. What is the primary substrate for caspase-9 during the process of initiating apoptosis?
- d. The retinoblastoma protein controls which phase transition of cell cycle?
- e. A particular strain of yeast produces strains with a mutant *cdc2* gene, resulting in little to no production of the Cdc2 protein kinase. As a result, one would expect that these cells would be arrested at which phase of cell cycle?
- f. Is adenylate cyclase a signaling molecule?
- g. In cholera, there is uncontrolled secretion of sodium ions and water into the intestinal lumen because of the action of cholera toxin on a G protein coupled receptor system. How does the toxin act?
- h. What type of protein is Ras?
- i. Insulin receptor substrates IRS 1/2 are phosphorylated by the receptor tyrosine kinase domain. What would happen if the IRS 1/2 were phosphorylated on a serine/threonine residue?
- j. Do intermediate filaments have polarity?
- k. In which of the human cells is telomerase active?
- l. Name one cancer in humans which is directly caused by a viral infection?
- m. A mutation in which gene makes nearby DNA more susceptible to replication errors?
- n. What is triple negative breast cancer (TNBC)?
- o. Name the virus which can inhibit apoptosis.

2. a. Cyclin B and Metaphase promoting complex change together when cells enter and exit from mitosis ———Demonstrate. What conclusion you can draw ?
- b) Does segregation of chromosome depend on MPF activity? How chromosome condensation is regulated by MPF and APC?
- c. Mention the different cell cycle check point in mammalian cells. What is wait anaphase signal?
(4+2)+(2+4)+ (2+2)

- a. Both Ras and Gsα are active when associated with GTP, what is the major differences between the signaling events?
- b. How insulin and Glucagon work together to maintain blood glucose level?
- c. How activation of PI3K pathway leads to activation of Protein kinase B? How mammalian target of rapamycin (mTOR) is activated by Protein kinase B? What are the cellular function of mTOR.

(3)+(3)+ (4+4+2)

4. a. How Arp2/3 complex promote actin filamentation from young filament only? How actin myosin interaction helps skeletal muscle contraction?

[Turn over

- b. Discuss the **dynamic instability model for microtubules assembly**. Where MTOC is located in animal cell.
- c. How can you prove Intermediate filament are dynamic polymer? $(3+4)+(4+2)+3$
5. a. Why the person having familial history of colon carcinoma are often suggested for routine colonoscopy after the age 50 years, Explain.
- b. Why c-myc is over expressed in burkitts lymphoma? Mention the functional character of myc oncogene.
- c. How mutation of PTEN may leads to development of many types of cancer. Discuss briefly about Cancer stem cells.
- $(3)+(3+4)+(3+3)$
6. a. What is Hayflick limit? How it is related with mitotic aging and cellular senescence?
- b. Describe briefly the characteristics of initiator caspases.
- c. Discuss how Bcl2 family protein regulate Mitochondria outer membrane permeabilization and hence apoptosis.
- $(3+3)+(4)+6$

GROUP- B**Answer any TWO questions.**

7. (a) Write the differences between uniport transport and passive diffusion. (2)
- (b) Briefly describe the structure and function of Na^+K^+ -pump. How does cardiac glycoside like, Digoxin, help in congestive heart failure patient? (3+1=4)
- (c) " Cystic Fibrosis (CF) is an autosomal recessive genetic disease mostly in Caucasians."
Which gene is mutated in CF? Explain the mechanism of causing disease pathophysiology in CF patients. (1+3=4)
8. (a) "Most lipids and proteins are laterally mobile in biomembranes."
- i) How would you experimentally demonstrate that cell surface proteins are laterally mobile? (2)
- ii) How would you quantify the proportion of the mobile protein in the biomembranes? (2)
- (b) Phospholipid bilayer is only slightly permeable to small polar molecules like water and yet placing an animal cell in hypotonic solution leads to swelling of it. But surprisingly, frog oocytes and eggs are protected from osmotic lysis if placed in hypotonic solution. Explain this phenomenon with proper justification. (3)
- (c) What is endomembrane system? Write any two signaling events that get activated upon induction of ER stress. (2)
9. (a) What are the factors that can alter lysosomal membrane permeabilization (LMP) in a cell? What would happen upon alteration of LMP in a cell? (1+2=3)
- (b) "Mitochondrial fission and fusion network is tightly regulated for cell viability"- Justify the statement. (3)
- (c) How do uncouplers work in a cell? Give examples of one endogenous and one exogenous uncouplers. (2+2=4)

10. A) What are the major functions of Auxin hormone in plant growth and development? B) Compare C_3 and C_4 photosynthetic pathways. C) Write one application of Anther culture and Protoplast culture. D) Write two major differences between plant and animal cell. $6 + 6 + 2 + 2$

Or,

- A) What are the major applications of Plant Cell and Tissue Culture in crop improvement? Define Cell-Totipotency. B) How can Kranz anatomy in leaves help C_4 plants to perform photosynthesis? What two products formed during light reaction in photosynthesis process are used up in the Calvin cycle? C) What are the major effects of Gibberellin in plant growth and development? $(6 + 1) + (4 + 2) + 3$