ADVANCED CELL BIOLOGY AND IMMUNOTECHNOLOGY
(BIOT 5231)

Time Allotted : 2½ hrs **Full Marks : 60**

Figures out of the right margin indicate full marks.

Candidates are required to answer Group A and any 4 (four) from Group B to E, taking one from each group.

Candidates are required to give answer in their own words as far as practicable.

Group – A

1. Answer any twelve: **12 × 1 = 12**

Choose the correct alternative for the following

(i) Glycocalyx is rich in
(a) Glycolipids and glycoproteins (b) Lipoproteins
(c) Choleserol (d) Ionic compounds

(ii) Carrier mediated transport follows
(a) First order kinetics (b) Zero order kinetics
(c) Michaelis Menten kinetics (d) Second order kinetics

(iii) Glycosylation of proteins begin in
(a) Nucleus (b) Mitochondria
(c) Plasma membrane (d) Endoplasmic reticulum

(iv) FGF propagates signal through which pathway?
(a) Second messengers (b) Cytosolic receptors
(c) Enzyme linked receptors (d) Nuclear receptors

(v) What is the relation between PKA and cAMP?
(a) PKA is inhibited by Camp (b) PKA is activated by cAMP
(c) PKA is partially activated by cAMP (d) PKA is hydrolysed by cAMP

(vi) Which of the following cell organelle actively participates in animal apoptosis?
(a) Vacoules (b) Chloroplast
(c) Nucleus (d) Mitochondria

(vii) Shrinking of the nucleus is caused when _____ are degraded.
(a) Gelsolin (b) Tubulin
(c) Actin (d) Lamin

(viii) One major vaccine component that causes allergic reaction is
(a) Viral antigen (b) Bacterial antigen
(c) Egg antigen (d) Endotoxin

(ix) The hybridomas are made by
(a) Fusing T cells with myeloma cells
(b) Fusing B cells with myeloma cells
(c) Fusing T helper cells with myeloma cells
(d) Fusing B memory cells with myeloma cells

(x) Which immune cells are generally used in the treatment of cancer using adoptive immunotherapy?
(a) Mast cells (b) Dendritic cells
(c) Neuronal cells (d) Malignant cells

Fill in the blanks with the correct word

(xi) Movement of lipid molecules from one layer to the other layer of the membrane is called _____movement.

(xii) The protein _____is associated for the formation of transport vesicles of ER.

(xiii) IP3 and DAG are generated from the hydrolysis of phospholipids by the enzyme_____

(xiv) Nuclear DNA replicates in the _____ phase of cell cycle.

(xv) _____ gene is called as the 'Guardian of the genome'.

Group - B

2. (a) Discuss the structure of Na+K+ATPase. Why is it called a pump? *[(CO1)(Understand/IOCQ)]*
(b) Describe the structure of Ca2+ channel. *[(CO1)(Understand/IOCQ)]*
(6 + 2) + 4 = 12

3. (a) Discuss glycosylation of proteins in ER and Golgi apparatus. *[(CO1)(Remember/LOCQ)]*
(b) How proteins are transported to lysosome? *[(CO1)(Understand/IOCQ)]*
(c) Differentiate between constitutive exocytosis and regulated exocytosis. *[(CO4)(Understand/IOCQ)]*
(2 + 2 + 3) + 3 + 2 = 12

Group - C

4. (a) Discuss the glycogen breakdown pathway through second messengers. *[(CO2)(Understand/IOCQ)]*
(b) Discuss how RTKs are activated by phosphorylation. *[(CO2)(Understand/IOCQ)]*
(c) Jak-STAT pathway is the most direct pathway for signal transduction through receptors. Comment on the statement. *[(CO2)(Comment/HOCQ)]*
6 + 3 + 3 = 12

5. (a) Discuss the generation of IP3 and DAG by PLC. *[(CO2)(Understand/IOCQ)]*
(b) State three examples of propagation of signal through calcium-calmodulin complex. *[(CO2)(Remember/LOCQ)]*
(c) Some PKCs do not need Ca^{2+} for their activation. Justify. *[(CO2)(Justify/HOCQ)]*

(d) Discuss the role of G protein in signal transduction. *[(CO2)(Justify/HOCQ)]*

2 + 3 + 3 + 4 = 12

Group - D

6. (a) Differentiate between Apoptosis and Necrosis. *[(CO4)(Remember/LOCQ)]*

(b) Describe the activation of apoptotic pathway by TNF receptor signalling. *[(CO4)(Describe/LOCQ)]*

(c) Analyze the role of cell cycle checkpoints in cell growth and proliferation. *[(CO3)(Analyze/IOCQ)]*

4 + 4 + 4 = 12

7. (a) Comment on the function of selectins with respect to cell-cell interaction. *[(CO4)(Analyze/IOCQ)]*

(b) Explain how Tight junctions help to maintain cellular communication. *[(CO4)(Remember/LOCQ)]*

(c) Describe briefly the functions of the Gap junctions. *[(CO4)(Understand/LOCQ)]*

4 + 4 + 4 = 12

Group - E

8. (a) People who have Parkinson's disease experience difficulty with movement, balance and speech. These problems result from the death of specialized brain cells called dopamine neurons. Design a treatment plan with stem cells to replace the dead dopamine neurons with healthy dopamine-producing cells. *[(CO5)(Design/HOCQ)]*

(b) Give a comparative study between Direct, Indirect and Competitive ELISA. *[(CO5)(Compare/IOCQ)]*

(c) Discuss the ethical issues related to stem cell research. *[(CO5)(Describe/LOCQ)]*

4 + 4 + 4 = 12

9. (a) Discuss the cutting edge techniques in the domain of cellular imaging. *[(CO5) (Understand/LOCQ)]*

(b) What are the applications of phage display technique? *[(CO5) (Remember/LOCQ)]*

(c) Compare between Pleuripotent, Multipotent, Unipotent and Totipotent stem cells. *[(CO5) (Compare/HOCQ)]*

4 + 4 + 4 = 12

Cognition Level	LOCQ	IOCQ	HOCQ
Percentage distribution	39.58	41.67	18.75