

MSc DEGREE EXAMINATION MAY 2026

(First Semester)

Branch - **BIOCHEMISTRY****CELLULAR BIOCHEMISTRY**

Time: Three Hours

Maximum: 75 Marks

SECTION-A (10 Marks)Answer **ALL** questions**ALL** questions carry **EQUAL** marks (10 × 1 = 10)

Module No.	Question No.	Question	K Level	CO
1	1	Which of the following best describes the fluid mosaic model of biomembranes? (i) A rigid structure composed of a double layer of proteins (ii) A lipid bilayer with embedded proteins that can move laterally (iii) A single layer of phospholipids with fixed protein components (iv) A carbohydrate matrix enclosing proteins and lipids	K1	CO1
	2	Infer the type of transport that requires energy in the form of ATP? (i) Facilitated diffusion (ii) Simple diffusion (iii) Active transport (iv) Osmosis	K2	CO1
2	3	Which of the following statements about Gibbs free energy (ΔG) is correct? (i) A positive ΔG indicates a spontaneous reaction (ii) A negative ΔG indicates a non-spontaneous reaction (iii) A negative ΔG indicates a spontaneous reaction (iv) ΔG is independent of temperature	K1	CO2
	4	Show the mode by which ATP is primarily generated during oxidative phosphorylation (i) Substrate-level phosphorylation in the cytosol (ii) Direct transfer of phosphate from NADH to ADP (iii) Proton gradient-driven ATP synthesis via ATP synthase (iv) Oxidation of glucose in the nucleus	K2	CO2
3	5	Which of the following best describes the role of second messengers in cell signaling? (i) They directly bind DNA to regulate gene transcription (ii) They amplify the signal received by cell surface receptors (iii) They degrade signaling molecules to terminate the signal (iv) They function only outside the cell	K1	CO3
	6	Contrast why the transcription factor CREB (cAMP response element-binding protein) is important in neurons? Because it (i) Inhibits synaptic plasticity and memory formation (ii) Promotes gene expression involved in neuronal survival and memory (iii) Degrades neurotransmitters in synapses (iv) Blocks calcium ion channels in neurons	K2	CO3
4	7	Which of the following checkpoints ensures that DNA replication is complete before the cell enters mitosis? (i) G ₁ checkpoint (ii) S phase checkpoint (iii) G ₂ /M checkpoint (iv) Metaphase checkpoint	K1	CO4
	8	Show the protein that plays a key role in initiating the intrinsic (mitochondrial) pathway of apoptosis (i) Cyclin D (ii) Caspase-9 (iii) DNA polymerase (iv) Tubulin	K2	CO4

Cont...

5	9	Which of the following best describes the “initiation” stage of chemical carcinogenesis? (i) Reversible changes in gene expression without DNA damage (ii) Permanent DNA damage caused by reactive carcinogenic metabolites (iii) Rapid proliferation of already mutated cells (iv) Activation of immune responses against tumor cells	K1	CO5
	10	Contrast the key function of tumor suppressor genes (i) Promoting uncontrolled cell division (ii) Enhancing oncogene expression (iii) Regulating cell cycle progression and preventing abnormal growth (iv) Increasing mutation rates in cells	K2	CO5

SECTION - B (35 Marks)

Answer **ALL** questions

ALL questions carry **EQUAL** Marks (5 × 7 = 35)

Module No.	Question No.	Question	K Level	CO
1	11.a.	Infer on ionophores.	K2	CO2
		(OR)		
	11.b.	Summarize on the passive diffusion.		
2	12.a.	Make use of glycerol phosphate shuttle.	K3	CO3
		(OR)		
	12.b.	Organize the laws of thermodynamics.		
3	13.a.	Analyze the functions of cell surface receptors.	K4	CO3
		(OR)		
	13.b.	Contrast the importance of Ras.		
4	14.a.	Interpret the check points in cell cycle regulation.	K5	CO4
		(OR)		
	14.b.	Assess the inhibitors of apoptosis.		
5	15.a.	Discuss the properties of cancer cell.	K5	CO5
		(OR)		
	15.b.	Elaborate on tumor suppressor genes.		

SECTION -C (30 Marks)

Answer **ANY THREE** questions

ALL questions carry **EQUAL** Marks (3 × 10 = 30)

Module No.	Question No.	Question	K Level	CO
1	16	Illustrate the active transport mechanism.	K2	CO2
2	17	Organize the ATP synthesis by chemiosmotic mechanism.	K3	CO3
3	18	Analyze the role of NF-κB pathway.	K4	CO3
4	19	Build the overview of cell cycle and its control.	K3	CO4
5	20	Explain the molecular diagnosis of cancer.	K5	CO5