PSG COLLEGE OF ARTS & SCIENCE
(AUTONOMOUS)

MSc DEGREE EXAMINATION DECEMBER 2025
(First Semester)

Branch – **BIOTECHNOLOGY**

METABOLIC REGULATION

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 molecules is considered the "universal energy currency" of the cell? a) NADH b) $FADH_2$ c) ATP d) GTP	K1	CO1
	2	Feedback inhibition of metabolic pathways usually involves _____. a) Activation of first enzyme by end product b) Inhibition of rate-limiting enzyme by end product c) Irreversible enzyme denaturation d) Increase in enzyme transcription	K2	CO2
2	3	The committed step in glycolysis is catalyzed by _____. a) Hexokinase b) Phosphofructokinase-1 (PFK-1) c) Pyruvate kinase d) Aldolase	K1	CO1
	4	Reciprocal regulation of glycolysis and gluconeogenesis ensures that : _____. a) Both pathways are fully active simultaneously b) One pathway is active while the other is inhibited c) ATP is consumed in both directions d) NADPH is always produced	K2	CO2
3	5	Which amino acid is the precursor for serotonin synthesis? a) Valine b) Tryptophan c) Methionine d) Histidine	K1	CO1
	6	The salvage pathway of purine metabolism is essential because it: _____. a) Prevents DNA degradation b) Reduces uric acid formation by reusing free bases c) Promotes pyrimidine synthesis d) Decreases amino acid turnover	K2	CO2
4	7	The rate-limiting enzyme in fatty acid synthesis is _____. a) Carnitine acyltransferase b) Acetyl-CoA carboxylase c) Fatty acid synthase d) Thiolase	K1	CO1
	8	During prolonged fasting, increased ketone body formation is primarily due to _____. a) Inhibition of fatty acid oxidation b) Excess acetyl-CoA from β-oxidation c) Enhanced glycolysis d) Increased cholesterol synthesis	K2	CO2
5	9	Which of the following acts as a key metabolic junction linking carbohydrate, lipid, and protein metabolism? a) Glucose-6-phosphate b) Pyruvate c) Acetyl-CoA d) Lactate	K1	CO1
	10	In prolonged starvation, brain energy requirements are met largely by _____. a) Glucose only b) Fatty acids c) Ketone bodies d) Amino acids	K2	CO2

Cont...

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.	Explain the role of Gibbs free energy in determining the spontaneity of metabolic reactions.	K3	CO3
		(OR)		
	11.b.	Illustrate the mechanisms of feedback inhibition with a case study on enzyme regulation.		
2	12.a.	Describe the regulation of glycogen metabolism.	K3	CO3
		(OR)		
	12.b.	Summarize the hormonal regulation of carbohydrate metabolism by insulin.		
3	13.a.	Analyze the regulation of the urea cycle and its significance.	K4	CO4
		(OR)		
	13.b.	Evaluate the biochemical basis of Lesch-Nyhan syndrome and its clinical implications.		
4	14.a.	Explain the regulation of β-oxidation and its integration with energy metabolism.	K3	CO3
		(OR)		
	14.b.	Describe the role of acetyl-CoA carboxylase in fatty acid synthesis and its regulation.		
5	15.a.	Assess the role of metabolic specialization of the liver in maintaining energy homeostasis.	K4	CO4
		(OR)		
	15.b.	Critically analyze the metabolic adaptations occurring during prolonged starvation.		

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	Examine the role of cyclic AMP-dependent protein kinase in hormonal regulation of metabolism with suitable examples.	K4	CO4
2	17	Highlight the reciprocal regulation of glycolysis and gluconeogenesis in energy balance.	K5	CO4
3	18	Critically evaluate disorders of purine and pyrimidine metabolism.	K5	CO5
4	19	Integrate the regulation of cholesterol metabolism with metabolic disorders.	K5	CO5
5	20	Evaluate the metabolism at glucose-6-phosphate and pyruvate level and correlate it with diabetes.	K5	CO5

Z-Z-Z END