UNIT 1: Basic Biochemistry (BC1)

Long Essay (15 Marks)
1. Describe the structure and functions of cell membrane. Add a note on membrane transport.
Short Answers(6 Marks)
1. Fluid mosaic model of cell membrane.
2. Mitochondria and its functions.
3. Cell organelles and their functions.
4. Biological membranes.

Very Short Answers (3 Marks)
1. Define apoptosis.
2. Functions of lysosomes.
3. Endocytosis and exocytosis.
4. Tight junctions.
5. Active transport.

UNIT 2: Enzymes (BC2)

Long Essays
1. Explain enzyme kinetics. Describe factors affecting enzyme activity.
2. Explain enzyme inhibition with suitable examples and clinical applications.

Short Answers
1.Isoenzymes of LDH.
2.Diagnostic importance of CK-MB.
3.Competitive inhibition.
4.Allosteric enzymes.
5.Michaelis-Menten equation.
6.Coenzymes and cofactors.

Clinical Questions
1. A patient presents with chest pain. Discuss the biochemical markers used in diagnosis of myocardial infarction.
Interpret elevated AST, ALT and ALP values in liver disease.

Very Short Answers
1.Km value.
2.Turnover number.
3.Examples of enzyme inhibition.
4.Proenzymes.
5.Therapeutic enzymes.

UNIT 3: Carbohydrates & Metabolism (BC3)

Long Essays
1.Glycolysis: steps, regulation and significance.
2.TCA cycle and its regulation.
3.HMP shunt and clinical importance.
4.Glycogen metabolism.
5.Diabetes mellitus: biochemical basis.

Short Answers
1.Cori cycle.
2.Gluconeogenesis.
3.Glycogen storage diseases.
4.Lactose intolerance.
5.Fructose metabolism.
6.Galactosemia.

Clinical-Based Questions
1. Explain biochemical basis of diabetic ketoacidosis.
Discuss laboratory investigations in diabetes mellitus.
Why does hypoglycemia occur in glycogen storage diseases?

Very Short Answers
1.Hexokinase.
2.Glucokinase.
3.Pyruvate dehydrogenase.
4.Glycemic index.
5.HbA1c.

UNIT 4: Lipids (BC4)

Long Essays
1.Beta oxidation of fatty acids.
2.Cholesterol metabolism and regulation.
3.Lipoproteins and their clinical significance.
4.Short Essays
5.Ketone bodies.
6.Fatty liver.
7.Essential fatty acids.
8.Familial hypercholesterolemia.
9.HDL functions.

Clinical Questions
1. Explain biochemical abnormalities in atherosclerosis.
Discuss lipid profile interpretation.

Very Short Answers
1.LDL receptor.
2.Carnitine shuttle.
3.Ketosis.
4.Lecithin.
5.Lipotropic factors.

UNIT 5: Proteins & Amino Acid Metabolism (BC5)

Long Essays
1.Urea cycle and inherited defects.
2.Protein digestion and absorption.
3.Phenylketonuria.

Short Answers
1.Transamination.
2.Deamination.
3.Alkaptonuria.
4.Maple syrup urine disease.
5.Plasma proteins.

Clinical Questions
1. Explain biochemical basis of hepatic encephalopathy.
Discuss investigations in nephrotic syndrome.

Very Short Answers
1.Essential amino acids.
2.Nitrogen balance.
3.Albumin functions.
4.BUN.
5.Creatinine.

UNIT 6: Integration of Metabolism (BC6)

Long Essays
1.Metabolic changes during starvation.
2.Metabolic adaptation in fed and fasting states.
3.Short Essays
4.Hormonal regulation of metabolism.
5.Metabolic changes in uncontrolled diabetes.

UNIT 7: Molecular Biology (BC7)

Long Essays
1.DNA replication.
2.Transcription and translation.
3.Recombinant DNA technology.

Short Answers
1.PCR.
2.Gene therapy.
3.DNA repair mechanisms.
4.Southern blotting.
5.Human genome project.
6.Clinical Questions
7.Applications of PCR in diagnosis.
8.Molecular basis of sickle cell anemia.

Very Short Answers
1.Codon.
2.Exon and intron.
3.Reverse transcriptase.
4.Mutation.
5.Restriction enzymes.

UNIT 8: Nutrition (BC8)

Long Essays
1.Balanced diet.
2.Protein-energy malnutrition.
3.Obesity.

Short Answers
1.BMI.
2.Glycemic index.
3.Nutritional assessment.
4.Dietary fiber.

UNIT 9: Vitamins and Minerals

Long Essays
1.Vitamin A deficiency.
2.Vitamin D metabolism.
3.Iron metabolism.

Short Essays
1.Vitamin B12 deficiency.
2.Folic acid deficiency.
3.Zinc functions.
4.Calcium homeostasis.
5.Vitamin C.
6.Clinical Questions
7.Megaloblastic anemia.
8.Rickets and osteomalacia.
9.Iron deficiency anemia.

UNIT 10: Hemoglobin & Porphyrins

Long Essays
1.Hemoglobin synthesis and degradation.
2.Jaundice: classification and biochemical findings.

Short Answers
1.Sickle cell anemia.
2.Thalassemia.
3.Heme synthesis.
4.Bilirubin metabolism.
5.Clinical Questions
6.Differentiate hemolytic, hepatic and obstructive jaundice.
7.Interpretation of liver function tests.

UNIT 11: Clinical Biochemistry (BC11)

Long Essays
1.Liver function tests.
2.Renal function tests.

Short Answers
1.Cardiac markers.
2.Thyroid function tests.
3.CSF analysis.
4.Quality control in laboratory.

Clinical Case Scenarios
1.A patient presents with jaundice. Interpret bilirubin, AST, ALT and ALP values.
2.A diabetic patient has HbA1c of 9%. Explain significance.
3.A patient with nephrotic syndrome has proteinuria and hypoalbuminemia. Explain.

KNRUHS "Must Read" Long Essays

Glycolysis
TCA Cycle
HMP Shunt
Glycogen Metabolism
Lipoproteins
β-Oxidation
Cholesterol Metabolism
Urea Cycle
Phenylketonuria
DNA Replication
Transcription
Translation
Liver Function Tests
Renal Function Tests
Jaundice
Vitamin D
Iron Metabolism
Enzyme Inhibition
Enzyme Kinetics
Diabetes Mellitus

MCQs

1. Which enzyme is the rate-limiting enzyme of glycolysis?

A. Hexokinase
B. Glucose-6-phosphatase
C. Phosphofructokinase-1
D. Pyruvate kinase

Answer: C

2. Competitive inhibition is characterized by:

A. Decreased Km
B. Increased Km
C. Decreased Vmax

D. Irreversible inhibition

Answer: B

UNIT: CARBOHYDRATE METABOLISM

MCQs

1. HMP shunt produces:

A. ATP
B. NADPH
C. $FADH_2$
D. Acetyl CoA

Answer: B

2. Deficiency of glucose-6-phosphate dehydrogenase leads to:

A. Scurvy
B. Hemolytic anemia
C. Rickets
D. Diabetes

Answer: B

3. HbA1c reflects blood glucose control over approximately:

A. 1 week
B. 2 weeks
C. 2–3 months
D. 1 year

Answer: C

UNIT: LIPID METABOLISM

MCQs

1. Rate-limiting enzyme of cholesterol synthesis is:

A. Lipoprotein lipase
B. HMG-CoA reductase
C. Acyl transferase
D. Hormone-sensitive lipase

Answer: B

2. HDL is protective because it:

A. Delivers triglycerides to tissues
B. Transports cholesterol from tissues to liver

C. Increases LDL formation
D. Forms ketone bodies

Answer: B

UNIT: PROTEIN METABOLISM

MCQs

1. Deficiency of phenylalanine hydroxylase causes:

A. Alkaptonuria
B. PKU
C. MSUD
D. Homocystinuria

Answer: B

2. Urea cycle occurs mainly in:

A. Brain
B. Kidney
C. Liver
D. Heart

Answer: C

UNIT: MOLECULAR BIOLOGY

MCQs

1. DNA replication is:

A. Conservative
B. Semiconservative
C. Dispersive
D. Random

Answer: B

2. Which enzyme joins Okazaki fragments?

A. Helicase
B. Primase
C. Ligase
D. Topoisomerase

Answer: C

3. PCR requires:

A. DNA ligase

B. Restriction enzyme
C. Taq polymerase
D. Reverse transcriptase

Answer: C

UNIT: VITAMINS

MCQs

1. Night blindness occurs due to deficiency of:

A. Vitamin A
B. Vitamin D
C. Vitamin K
D. Vitamin C

Answer: A

2. Scurvy is caused by deficiency of:

A. Vitamin A
B. Vitamin D
C. Vitamin C
D. Vitamin K

Answer: C

UNIT: HEMOGLOBIN & JAUNDICE

MCQs

1. Increased unconjugated bilirubin occurs in:

A. Obstructive jaundice
B. Hemolytic jaundice
C. Cholangitis
D. Hepatitis B

Answer: B

2. Direct bilirubin is:

A. Unconjugated bilirubin
B. Albumin-bound bilirubin
C. Conjugated bilirubin
D. Free bilirubin

Answer: C

CLINICAL CASE-BASED MCQs
Case 1

A 12-year-old child presents with polyuria, polydipsia, weight loss, fasting blood glucose 280 mg/dL, HbA1c 10%.

Question: Most likely diagnosis?

A. Type 1 Diabetes Mellitus
B. Type 2 Diabetes Mellitus
C. Gestational Diabetes
D. Renal Glycosuria

Answer: A

Case 2

A child develops hemolysis after taking primaquine. G6PD deficiency is suspected.

Question: Which pathway is affected?

A. Glycolysis
B. TCA cycle
C. HMP shunt
D. Gluconeogenesis

Answer: C

Case 3

A patient has elevated LDL and tendon xanthomas.

Question: Most likely defect?

A. HDL deficiency
B. LDL receptor deficiency
C. Apo A deficiency
D. Carnitine deficiency

Answer: B