

**RAN-2506000101032701/2406000101030701**
**1<sup>st</sup> M.B.B.S. Examination November - 2025**
**Biochemistry (Paper - 1 Set - 1)**
**સૂચના : / Instructions**

- (1) ઉપરોક્ત દર્શાવેલ વિગતો ઉત્તરવહી પર અવશ્ય લખવી.  
Fill up strictly the above details on your answer book

Seat No.:

     

Student's Signature

**Instructions for Section A:**

- All questions are compulsory.
- Each MCQ has only one correct answer.
- One Mark for correct answer. No negative marking.

**SECTION: A**
**(1×20=20)**

- A 28-year-old woman with a history of chronic vomiting due to a gastric outlet obstruction presents with weakness and muscle cramps. ABG reveals: pH = 7.50,  $\text{HCO}_3^- = 32 \text{ mEq/L}$ ,  $\text{PaCO}_2 = 48 \text{ mmHg}$ ,  $\text{K}^+ = 2.9 \text{ mEq/L}$ ,  $\text{Cl}^- = 91 \text{ mEq/L}$ . What is the most likely acid-base disorder?
  - Respiratory acidosis
  - Metabolic acidosis with respiratory compensation
  - Metabolic alkalosis with respiratory compensation
  - Mixed acid-base disorder
- If blood for glucose estimation is collected in a tube without fluoride, what error may occur?
  - Falsely high glucose due to hemolysis
  - Falsely low glucose due to ongoing glycolysis
  - No change in glucose level
  - Falsely elevated sodium level
- A 35-year male was brought to emergency in an unconscious state. He was a habitual drinker. When his blood sample was analyzed, blood glucose levels were found to be low (48mg/dl). Blood glucose levels were low due to:
  - Increase in the catabolism of blood glucose
  - Increased availability of  $\text{NAD}^+$
  - Decreased availability of pyruvate and oxaloacetate
  - Increased availability of  $\text{NADPH}$
- A 15-year-old girl from a hilly village presents with a gradually enlarging swelling in the front of her neck over the past year. On examination, the thyroid is diffusely enlarged but non-tender. She has no signs of hyperthyroidism or hypothyroidism. Her diet mainly consists of locally grown vegetables and has limited access to iodized salt. Which of the following mineral deficiency is associated with this condition?
  - Iodine
  - Iron
  - Zinc
  - Magnesium

5. Superoxide dismutase protects the cell by converting superoxide radicals into:
  - a. Oxygen and water
  - b. Nitric oxide
  - c. Hydrogen peroxide
  - d. Hydroxyl radicals
6. Gaucher's disease is due to deficiency of the enzyme:
  - a. Sphingomyelinase
  - b. Glucocerebrosidase
  - c.  $\alpha$ -Galactosidase
  - d.  $\beta$ -Galactosidase
7. A 32-year-old female working in a laboratory accidentally ingests cyanide and is rushed to the hospital. She is declared dead upon reaching the hospital. Which complex of the electron transport chain is most likely inhibited by cyanide?
  - a. Complex I (NADH dehydrogenase)
  - b. Complex II (Succinate dehydrogenase)
  - c. Complex III (Cytochrome  $bc_1$  complex)
  - d. Complex IV (Cytochrome c oxidase)
8. Which one of the following molecules act as a donor in detoxification by Conjugation.
  - a. S-Adenosine Methionine (SAM)
  - b. Glutathione (GSH)
  - c. Phospho-adenosine phosphosulphate (PAPS)
  - d. All the above
9. All the following are detoxifying agents except:
  - a. Glycine
  - b. Glutathione
  - c. Glucuronic Acid
  - d. Glycogen
10. Which vitamin is required for transamination reactions?
  - a. Biotin
  - b. Pyridoxine (Vitamin B6)
  - c. Vitamin K
  - d. Thiamine (Vitamin B1)
11. A 32-year-old poorly controlled diabetic pregnant lady is undergoing amniocentesis at 36 weeks for fetal lung maturity prior to having a caesarean delivery. Which of the following laboratory tests results on the amniotic fluid would best indicate that the Fetal lungs are mature?
  - a. Phosphatidylglycerol is present
  - b. Lecithin/sphingomyelin (L/S) ratio of 1:1
  - c. Cephalin is present
  - d. Phosphatidylinositol is present
12. The most important extracellular buffer is:
  - a. Carbonic acid-bicarbonate buffer
  - b. Phosphate buffer
  - c. Haemoglobin buffer
  - d. None of the above
13. A 7-day-old male neonate is brought to the emergency room with bleeding from the umbilical stump and fresh blood in stools. There is no family history of bleeding disorders. On examination, the baby is pale, irritable, and has mild hepatomegaly. Laboratory findings reveal Prolonged prothrombin time and, low levels of clotting factors II, VII, IX, and X. Which of the following deficiency leads to this condition?
  - a. Vitamin A
  - b. Vitamin D
  - c. Vitamin E
  - d. Vitamin K
14. A medical student has been studying for exams, and neglects to eat anything for 12 hours. At this point, the student opens a large packet of potato chips and eats every one of them in a short period. Which one of the following is elevated in his plasma?
  - a. Chylomicrons
  - b. Glucagon
  - c. Acetolactate
  - d. Free fatty acids
15. All of the following serve as cofactors for enzymes of TCA cycle, except:
  - a. Biotin
  - b. Pantothenic Acid
  - c. Riboflavin
  - d. Niacin

16. A hypochromic microcytic anemia with increased iron stores in the bone marrow may be
  - a. Iron responsive
  - b. Pyridoxine responsive
  - c. Vitamin B12 responsive
  - d. Folate responsive
17. Which of the following amino acids can act as anaplerotic sources by conversion into TCA cycle intermediates?
  - a. Leucine and lysine
  - b. Glutamate and aspartate
  - c. Tyrosine and phenylalanine
  - d. Tryptophan and histidine
18. A person with Type 1 diabetes went on a trip and ran out of insulin, after 4 days she felt lethargic, nauseous, and had difficulty standing. After appropriate treatment, which one of the following liver enzymes would be reduced in activity as compared to before treatment?
  - a. Phosphofructokinase-2
  - b. Pyruvate dehydrogenase
  - c. Pyruvate kinase
  - d. Fructose 1,6-bisphosphatase
19. Ribosomes are primarily involved in which of the following processes?
  - a. Lipid synthesis
  - b. Protein synthesis
  - c. DNA replication
  - d. Detoxification
20. A 3-month-old girl is developing cataracts. Other than not having a social smile or being able to track objects visually, all other aspects of the girl's examination are normal. Tests on the baby's urine are positive for reducing sugar but negative for glucose, which enzyme is most likely deficient in this girl?
  - a. Aldolase B
  - b. Fructokinase
  - c. Galactokinase
  - d. Galactose 1-phosphate uridylyltransferase

**Instructions for Section B and C:**

- a. Use Blue/Black Ball-point pen only.
- b. The numbers on the right indicates full marks.
- c. Draw Labelled diagrams wherever necessary.

**SECTION: B**

**Q.2. Long Question-Answers. (1 out of 2) (1×10=10)**

1. Describe the Hexose Monophosphate (HMP) shunt pathway with its phases, regulation, and clinical significance. (3+2+5)
2. What are blood buffers? Describe in detail role of plasma buffers & renal mechanism in maintenance of acid-base balance. Add a short note on Metabolic Acidosis. (1+3+4+2)

**Q.3. Justification Questions. (5 out of 6) (5×3=15)**

1. Glucose is added in Oral Rehydration Solution (ORS) for treatment of diarrhoea.
2. Oral iron treatment should be supplemented with ascorbate and tocopherol. Explain.
3. Effect of cyanide poisoning on ETC.
4. Oral iron treatment should be supplemented with Ascorbic acid and tocopherol. Explain.
5. Aspirin is used as an antiplatelet drug.
6. Hypoglycaemia is seen in chronic alcoholics. Explain.

**Q.4. Short Notes. (3 out of 4) (3×5=15)**

1. Antioxidants
2. Mucopolysaccharides
3. Describe activation, function and deficiency manifestations of Vitamin D.
4. Significance of Eicosanoids.

## SECTION: C

### Q.5. Clinical Aspects/Cases. (4×5=20)

1. A 4-year child was brought to pediatric OPD with edema over legs and face. She also had discoloration of hair, skin and retarded growth, on enquiring by doctor, mother told to the doctor that child was on breast milk only for one and half year of the age and for the last two years she was being given rice. The child was admitted in pediatric ward and diagnosed as Protein Energy Malnutrition (PEM). The laboratory data of child showed hypoalbuminemia and abdominal sonography showed enlarged liver (fatty liver).
  - a. What is the type of PEM in this case? (1)
  - b. What are the different types of Protein Energy Malnutrition (PEM)? What are the clinical features of different type of PEM? (3)
  - c. Why there is fatty liver in PEM? (1)
2. A primigravida with 28 weeks of gestation had premature rupture of membranes (amniorrhesis) and gave birth to premature live baby with birth weight of 1.2 kg. The infant within few hours after birth showed rapid, laboured, grunting respirations with suprasternal and substernal retractions and flaring of the nasal alae. A provisional diagnosis of respiratory distress syndrome.
  - a. What is the composition of lung surfactant? (2)
  - b. How to assess the foetal lung maturity before delivery? (2)
  - c. Name the different types of phospholipids? (1)
3. A young software engineer was diagnosed for hypercholesterolemia during routine laboratory investigations. His Laboratory reports were as following;  
Total Cholesterol: 230 mg/dl  
Triglyceride: 130 mg/dl  
HDL Cholesterol: 29 mg/dl  
LDL Cholesterol: 175 mg/dl
  - a. In which organ Cholesterol is synthesized in our Body? Name the regulatory enzyme of Cholesterol Biosynthesis? (2)
  - b. How Cholesterol is transported from peripheral tissue to Liver? (2)
  - c. How statin group of drugs reduces blood Cholesterol level? (1)
4. A 12-year-old boy comes with repeated episodes of diarrhea, flatulence and abdominal pain. Symptoms occur after taking milk products and subside on a milk free diet.
  - a. What is diagnosis in this case? (1)
  - b. Give biochemical basis for signs and symptoms (2)
  - c. Which tests can be done to confirm the diagnosis? (1)
  - d. How will you treat this patient? (1)

### Q.6. Short Notes. (4×5=20)

1. Mucosal Block Theory
2. Discuss metabolic changes and complications of diabetes mellitus.
3. Describe the importance of commitment to lifelong learning in physician's growth.
4. Ketone bodies - synthesis, breakdown and regulation.