2406000101030701
EXAMINATION AUGUST 2024
FIRST MBBS
BIO-CHEMISTRY (PAPER - I) (NEW) - LEVEL 3

[Time: As Per Schedule] **[Max. Marks:100]**

Instructions:
1. Fill up strictly the following details on your answer book
   a. Name of the Examination: **FIRST MBBS**
   b. Name of the Subject: **BIO-CHEMISTRY (PAPER - I) (NEW) - LEVEL 3**
   c. Subject Code No: **2406000101030701**
2. Sketch neat and labelled diagram wherever necessary.
3. Figures to the right indicate full marks of the question.
4. All questions are compulsory.

Seat No:

Student's Signature

Section A

Q.1 Multiple choice questions (20 out of 20) **20x1=20**

1) A known diabetic patient went for the consultation, his clinician asked him to go for the analysis of HbA1c. He visited clinical laboratory with requisition slip. The duty technician collected blood sample into a vacutainer. What was that vacutainer.
   a) sodium fluoride containing
   b) sodium oxalate containing
   c) Both sodium fluoride and oxalate containing
   d) EDTA containing

2) 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:
   a) Increase in the catabolism of blood glucose
   b) Increased availability of NAD+
   c) Decreased availability of pyruvate and oxaloacetate
   d) Increased availability of NADPH

3) A 40-year-old chronic alcoholic enters the hospital because of a variety of symptoms, including loss of feeling in his hands and feet, nystagmus, and difficulty with his balance when walking. This patient would have difficulty catalyzing which one of the following reactions?
   a) α-Ketoglutarate dehydrogenase b) Pyruvate carboxylase
   c) Succinate dehydrogenase d) Fumarase

4) Which one of the following statements concerning dietary lipid is correct?
   a) Corn oil and soybean oil are examples of fats rich in saturated fatty acids.
   b) Triacylglycerols obtained from plants generally contain less unsaturated fatty acids than those from animals.
   c) Fatty acids containing double bonds in the trans configuration, unlike the naturally occurring cis isomers, raise plasma cholesterol levels.
   d) Coconut and palm oils are rich in polyunsaturated fats.

5) A 32-year-old poorly controlled diabetic pregnant lady is undergoing amniocentesis at 36 weeks for fetal lung maturity prior to having a cesarean 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

6) A final MBBS student represented marathon events in the interuniversity sports event. Prior to participation he prepared himself with shifting of his diet to carbohydrates with high starch content. What will be products which are sequentially formed by the action of pancreatic amylase.
   a) Amylose, amylopectin, and maltose
   b) Limit dextrin, maltotriose and maltose
   c) Maltotriose, maltose and glucose
   d) Amylose, maltotriose and maltose

7) Defective enzyme in Hereditary fructose intolerance is
   a) Fructokinase
   b) Aldolase B
   c) Phosphofructokinase
   d) Fructose 1,6 bisphosphatase

8) Which one of the reactions listed replenishes a TCA cycle intermediate?
   a) Heme Synthesis
   b) Carboxylation of pyruvate
   c) Transamination of oxaloacetate
   d) carboxylation of acetyl CoA

9) 52-year-old man suddenly collapsed at work. He was diagnosed with acute myocardial infarction. Tissue plasminogen activator was administered to the patient, but further damage to the affected organ resulted from this treatment. This may have happened owing to which one of the following?
   a) Elevated lactic acid levels
   b) Increased generation of oxygen-derived radicals
   c) Release of cytochrome a from the mitochondria
   d) Inhibition of the TCA cycle due to plasminogen activator administration

10) A woman develops severe abdominal cramps and flatulence whenever she eats dairy products, so she has decided to eliminate all such products from her diet. Which one of the following is an accurate statement concerning sugar metabolism in this woman?
   a) She cannot produce mucopolysaccharides that contain galactose.
   b) She cannot produce lactose during lactation.
   c) She can eat curd in the dairy products.
   d) She is likely to have high levels of galactose-1-phosphate.

11) 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

12) A man presents to the emergency room with an elevated temperature, sweats, and increased rate of breathing. He had been spraying insecticide and accidentally inhaled some of the poison. Using the insecticide on cultured cells, it was demonstrated that the rate of

oxygen consumption by the cells was much greater than in the absence of the compound. Identify the most likely causative agent from below:

a) Carbon monoxide. b) Dintrophenol
c) Rotenone d) Cyanide

13) A 4-year-old boy has had a history of skin infections, pneumonia, nausea, vomiting, and abdominal pain. He has been on antibiotics prophylactically for the past year, but still contracts various sort of infections, both bacterial and fungal. The boy most likely has inherited a mutation that prevents which one of the following reactions?

a) Oxidized glutathione to reduced glutathione
b) The formation of superoxide
c) Hydrogen peroxide conversion to hydroxyl radicals
d) Superoxide conversion to hydrogen peroxide and oxygen

14) A 50-years old female obese was recently diagnosed with coronary artery disease was advised to increase green leafy vegetables intake in her diet. All of the following are the beneficial effects of that diet, EXCEPT

a) Dietary fibers increase glycemic index.
b) Dietary fibers decrease absorption of bile acids and increase production of bile acids.
c) Sitosterol present in the diet decreases cholesterol absorption
d) Dietary fibers retain water in feces and increase stomach fullness.

15) 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

16) A lab technician has collected the blood sample of a patient in a plain vacuum cleaner for glucose estimation. The sample was analyzed four hours after sample collection. The lab in charge observed that the value of serum glucose was lower than the actual value. So he advised the lab technician to collect blood samples in which of the following containing vacutainer for glucose estimation to have accurate results.

a) Sodium Qxalate b) Ethylenediamine tetra acetate
c) Sodium fluoride (EDTA) d) Heparin

17) Leptin is a hormone secreted by adipose tissue which regulates energy intake and expenditure. It regulates appetite by
a) Inhibiting Melanocyte stimulating hormone
b) Inhibiting Neuropeptide Y
c) Increasing secretion of Insulin
d) Increasing secretion of orexin

18) A baby boy 10-month-old comes with vomiting severe jaundice, hepatomegaly and features of irritability on starting weaning with fruit juice. Which of the following enzymes is defective?
a) Fructokinase
b) Aldolase B
c) Galactose 1 Phosphate Uridyl transferase
d) Medium chain fatty acyl CoA dehydrogenase

19) Hemolyzed sample is not suitable for estimation of which parameter?
a) Potassium b) Calcium
c) Chloride d) Sodium

20) A diabetic patient develops paresthesia and loss of sensations in lower limbs. This has resulted from which one of the following?
a) Reduced glucose levels in the blood
b) Elevated glucagon levels
c) Elevated LDL levels in the blood
d) Increased sorbitol levels in Schwann cells

Section B

Q.2 Long Answer Questions (2 out of 3) 2x10=20

1) Describe the metabolism of alcohol. **3**
Describe and explain biochemical alterations that occur during alcoholism. **3**
Describe the effects of chronic alcoholism on the liver, central nervous system, and heart. **3**
Enumerate biochemical markers for monitoring of alcoholism. **1**

2) Describe the electron transport chain and oxidative phosphorylation. **5+3**
What are uncouplers and explain them by giving suitable examples. **2**

3) Describe at least six risk factors for Atherosclerosis. **3**
Describe LDL-cholesterol metabolism. **3**

Describe the causes of primary familial hypercholesterolemia. **2**

Explain the basis of using the 'Statin' group of drugs to reduce cholesterol levels. **2**

Q.3 Short Answer Questions (10 out of 11) **10x2=20**

1) Explain why excess lipoprotein (a) is atherogenic.
2) Why cataracts and hepatomegaly are seen in galactosemia?
3) Write at least four differences between hexokinase and glucokinase.
4) Explain why fasting hypoglycemia and hyperuricemia are seen in type-1 glycogen storage disease.
5) Draw the Cori's cycle and write its significance.
6) Write types of vesicular transport mechanisms with suitable examples.
7) Why are premature babies prone to acute respiratory distress syndrome?
8) Calcium level in blood is increased by parathyroid hormone. Explain.
9) Iron is conserved in our body. Explain.
10) Write any four phase-II detoxification reactions with suitable examples.
11) Oral iron treatment should be supplemented with ascorbate and tocopherol. Why?

Section C

Q.4 Short Answer Questions (4 out of 5) **4x5=20**

1) Describe protein energy malnutrition.
2) Describe the liver enzyme profile with significance.
3) Describe the synthesis and clinical significance of Prostaglandins **(2+3)**

4) Describe the roles and responsibilities of a physician in the health-care system.

5) Describe the functions of NADPH.

Q.5 Clinical Cases (2 out of 2) **2x10=20**

1) A 32-year-old man from a rural area was admitted to the hospital with chief complaints and clinical features of fatigue, jaundice, and dark urine. His pertinent laboratory findings included normocytic and normochromic anemia, elevated serum unconjugated bilirubin, and decreased hemoglobin levels. When blood was analyzed, there were very low levels of Glucose-6- Phosphate Dehydrogenase (G6PD). The diagnosis of intravascular hemolysis was attributed to G6PD deficiency.

   1. In which metabolic pathway G6PD is required, describe the step on which it acts **2**

   2. Which coenzyme is required for the action of this enzyme and give two functions of an altered form of coenzyme **2**

   3. Why the deficiency of this enzyme leads to hemolysis and jaundice? **2**

   4. Which form of bilirubin do you expect to be increased in this deficiency and why it is so? **2**

   5. Do the subjects of G6PD are protected against malaria? If so, explain the mechanism. **2**

2) A 55-year-old person was brought to the hospital in a confused and semiconscious state. He had a low BP and a feeble pulse. His breath had a fruity odor. His random blood sugar was 800 mg/dl. Urine sugar was 4+ and urine ketone bodies were 3+. His blood pH was 7.1 (7.35-7.45). Plasma bicarbonate (HCO3) was 12 mmol/l (24-30 mmol/l) and carbonic acid was 1.2 mmol/l (1-2 mmol/l). It was diagnosed as diabetic ketoacidosis.

   1) What is diabetic ketoacidosis? The main problems in Diabetic ketoacidosis are hyperglycemia, hyperketonemia, and metabolic acidosis. Explain why these are observed in Diabetic ketoacidosis. **2**

2) What is the rationale behind rapid infusion of normal saline, administration of insulin and potassium, and correction of acidosis? **2**

3) What is metabolic acidosis? Write at least four causes of it. **2**

4) What are compensatory mechanisms and which organs are involved in this mechanism and why it is important **2**

5) Enlist other acid-bases disorders. **2**

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