RAN-2006000101030001-S

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I[st] MBBS (Biochemistry) Examination January - 2024

Biochemistry : Paper - I

Time: 3 Hours] **[Total Marks: 100**

સૂચના : / Instructions

(1) નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fill up strictly the details of ☛ signs on your answer book

Name of the Examination:
☛ I[st] MBBS (Biochemistry)

Name of the Subject :
☛ Biochemistry : Paper - I

Subject Code No.: 2006000101030001-S

Seat No.:

Student's Signature

Section - A : MCQ (20 marks)

Instruction :

(1) All questions are compulsory.
(2) Each MCQ has only one correct answer.
(3) One mark for correct answer. No negative marking.

1. Which of the following organelle has DNA?
   a) Lysosomes b) Peroxisomes
   c) Mitochondria d) Microsomes.

2. Sodium dependent glucose transport (SGLT) is example for ;
   a) Passive diffusion b) Facilitated diffusion
   c) Primary active transport d) Secondary active transport

3. All of the following abnormalities are observed in obese person, EXCEPT :
   a) Hypoalbuminemia b) Hyperlipidemia
   c) Impaired glucose tolerance d) High insulin level

4. All of the following are substrate for gluconeogenesis, EXCEPT :
   a) Lactate b) Pyruvate
   c) Acetyl CoA d) Propionyl CoA

5. Refsum's disease is due to accumulation of following fatty acid :
   a) Phytanic acid
   b) Palmitic acid
   c) Arachidonic Acid
   d) Chaulmoogric acid

6. Infant Respiratory Distress syndrome is caused by deficiency of :
   a) Cephalin
   b) Sphingomyelin
   c) Cardiolipin
   d) Lecithin

7. Which of the following prostaglandins stimulates platelet aggregation?
   a) PGF2
   b) PGE2
   c) Prostacyclin
   d) Thromboxane A2

8. Hypercholesterolemia is seen in the following conditions, EXCEPT :
   a) Diabetes mellitus
   b) Thyrotoxicosis
   c) Nephrotic syndrome
   d) Alcoholism

9. In fasting state, there is increase in all of the following, EXCEPT :
   a) Gluconeogenesis
   b) Glycolysis
   c) Glycogenolysis
   d) Lipolysis

10. Iron absorption is increased by :
   a) Ascorbate
   b) Acidity
   c) Citrate
   d) All of the above

11. Physiological uncouplers are all, EXCEPT :
   a) Thermogenin
   b) Bilirubin
   c) Thyroxine
   d) Cholesterol

12. Negative nitrogen balance is Observed in :
   a) Pregnancy
   b) Chronic fever
   c) Convalescence
   d) Growth period

13. All are true regarding Juvenile diabetes mellitus, EXCEPT :
   a) Patients need insulin injections
   b) Ketoacidosis is common
   c) Insulin resistance is the cause
   d) Genetic susceptibility may be inherited.

14. All of the following substances are used to estimate GFR, EXCEPT :
   a) Inulin
   b) Creatinine
   c) Urea
   d) Uric acid

15. Enzymes for beta oxidation of fatty acids occur in -
    a) Nucleus
    b) Plasma membrane
    c) Mitochondria
    d) Cytosol

16. All are made from cholesterol, EXCEPT :
    a) Steroid hormones
    b) Bile salts
    c) Vitamin D
    d) Bile pigments.

17. All of the following coenzymes are required by pyruvate dehydrogenase complex, EXCEPT :
    a) Thiamine pyrophosphate (TPP)
    b) NAD
    c) Biotin
    d) FAD

18. What is true about Basal Metabolic Rate (BMR)?
    a) Increases in old age
    b) Similar for males and females
    c) Increase during exercise
    d) Lowered by thyroid hormones

19. Respiratory acidosis is observed in :
    a) Lactic acidosis
    b) Vomiting
    c) Milk-Alkali syndrome
    d) Pneumonia

20. Hemolyzed samples is not suitable for estimation of which parameter?
    a) Potassium
    b) Sodium
    c) Calcium
    d) chloride

Section - B (40 marks)

Instructions for section B & C:

1. Use blue/black ball point pen only.
2. The numbers to the right indicates full marks.
3. Draw diagrams wherever necessary

Q. 2. Long Answer Questions. (ANY TWO) **(2 × 10 = 20)**

A. What are lipoproteins? How lipoproteins are classified? Describe HDL metabolism in detail. Add a note on hyperlipoproteinemias. (1 + 2 + 3 + 4 = 10)

B. Describe metabolic alterations in diabetes mellitus. Add a note on hormonal regulation of control of blood glucose levels. (6 + 4 = 10)

C. Describe the dietary sources, absorption, daily requirement, biochemical functions and disorders of calcium metabolism. Add a note on regulation of serum calcium level. (1 + 2 + 1 + 2 + 1 + 3 = 10)

Q. 3. **Write Brief Answer / Justifications/ Biochemical basis. (ANY TEN)** **(10 × 2 = 20).**

a) What are essential fatty acids? Write down examples and sources of EFA.

b) Fats are burnt in the flame of carbohydrates.

c) Lead poisoning causes anemia - explain.

d) HDL cholesterol is called as good cholesterol.

e) Blood is collected in fluoride bulb for estimation of blood glucose level.

f) Glucose 6 phosphate dehydrogenase deficiency is a cause of hemolytic anemia.

g) Aspirin is used as an anti-inflammatory agent.

h) Premature babies are prone to suffer from acute respiratory distress syndrome.

i) What is the significance of Rapaport -Leubering cycle in RBC?

j) Why excessive alcohol intake leads to fatty liver?

k) Diarrhea causes normal anion gap acidosis. Give justification.

Section - C **(40 marks)**

Q. 4. **Short answer questions. (ANY FOUR)** **(4 × 5 = 20)**

a) Renal Function Test.

b) Detoxification reactions.

c) Complications of Diabetes mellitus.

d) Describe common barriers of effective communication.

e) Mucopolysaccharides.

Q. 5. **Clinical Cases. (ALL COMPULSORY)** **(10 × 2 = 20)**

Case 1 :

A 4 year female child was brought to pediatric OPD with edema over legs and face. She also had discoloration of hairs, skin and retarded growth. On enquiring by doctor, mother told to the doctor that child was on breast milk only for one and half years of 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 hypoalbuminaemia (low serum albumin level) and abdominal sonography showed enlarged liver (fatty liver).

1) What are different types of Protein Energy Malnutrition (PEM)? What is type of PEM in this case?

2) What are the clinical features of different type of PEM?

3) What is the cause of edema in this case?

4) What dietary advice you will suggest for this patient?

5) Why there is fatty liver in PEM?

Case 2 :

A 23-year-old male had developed fever with chills and rigors. The family physician suspected malaria and started treatment with primaquine after identification of the parasites in a blood smear. The fever subsided the next day, but the patient continued to feel weak. By the next day these symptoms aggravated and he felt fatigue, dizziness, breathlessness on slightest exertion, headache, and insomnia. Three days later, the patient noticed dark (black) colored urine. On general examination, patient had tachycardia, yellow sclera (jaundice) and marginally enlarged spleen. Following investigations were carried out.

Investigations	Patient's reports	Reference range
Hemoglobin	10.2 g%	11-14 g%
Reticulocyte count	6.3%	Up to 2%
Serum Bilirubin (Total)	8.3 mg/dl	0.1-1 mg/dl
Urine bile pigments	Absent	

Activity of glucose 6-phosphate dehydrogenase (G6PD) was found deficient, i.e. less than 10% of the normal.

1) Explain the biochemical basis of symptoms in this patient.
2) Write the reaction catalysed by G6PD enzyme.
3) Mention various functions of NADPH in our body. (Any four).
4) Mention different liver function tests.
5) Name two glycogen storage disorders with enzyme defect and features?

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Ist MBBS (Biochemistry) Examination January - 2024

Biochemistry : Paper - II

Time: 3 Hours] [Total Marks: 100

સૂચના : / Instructions

(1) નીચે દર્શાવેલ ☛ નિશાનીવાળી વિગતો ઉત્તરવહી પર અવશ્ય લખવી.
Fill up strictly the details of ☛ signs on your answer book

Name of the Examination:
☛ Ist MBBS (Biochemistry)

Name of the Subject :
☛ Biochemistry : Paper - II

Subject Code No.: 2006000101030002-S

Seat No.:

Student's Signature

Section - A : MCQ **(20 marks)**

Instructions :

1 All questions are compulsory.
2. Each MCQ has only one correct answer.
3. One mark for correct answer. No negative marking.

1. All of the following can be formed from tryptophan, EXCEPT :
   a. Niacin
   b. Serotonin
   c. Melanin
   d. Melatonin

2. Maple syrup urine disease results from the deficiency of :
   a. Branched chain a-ketoacid dehydrogenase
   b. Branched chain amino acid transaminase
   c. Homogentisate oxidase
   d. None of the above

3. Lesch-Nyhan syndrome is due to deficiency of :
   a. Xanthine oxidase
   b. Adenine Phosphoribosyl Transferase
   c. Adenylate Kinase
   d. Hypoxanthine-Guanine Phosphoribosyl Transferase (HGPRTase)

4. A vasodilating compound is produced by the decarboxylation of the amino acid :

a. Arginine
b. Aspartic acid
c. Glutamine
d. Histidine

5. Million's reaction is specific for the amino acid :

a. Tryptophan
b. Tyrosine
c. Phenylalanine
d. Arginine

6. Non steroidalanti inflammatory drugs (NSAID), such as aspirin act by inhibiting activity of the enzyme :

a. Lipoxygenase
b. Cyclooxygenase
c. Phospholipase A2
d. Lipoprotein lipase

7. In early stages of myocardial ischemia the most sensitive indicator is the measurement of the activity of:

a. SGPT
b. SGOT
c. CPK-MB
d. LDH

8. Serum acid phosphatase level increases most commonly in :

a. Metastatic carcinoma of prostate
b. Myocardial infarction
c. Wilson's disease
d. Liver diseases

9. The ion which activates salivary amylase activity is

a. Chloride
b. Bicarbonate
c. Sodium
d. Potassium

10. Each hemoglobin molecule has how many heme group(s) and globin molecule(s) :

a. 1, 2
b. 4, 4
c. 1, 4.
d. 4, 2

11. In humans, end product of purine catabolism is :

a. Uric acid
b. Urea
c. Allantoin
d. Xanthine

12. Retinoblastoma gene is a :

a. Proto-oncogene
b. Oncogene
c. Carcinogen
d. Anti oncogene

13. A sigmoidal plot of substrate concentration ([S]) verses reaction velocity (V) may indicate:
    a. Michaelis-Menten kinetics
    b. Co-operative binding
    c. Competitive inhibition
    d. Non-competitive inhibition

14. Casein, the milk protein is :
    a. Nucleoprotein
    b. Chromoprotein
    c. Phosphoprotein
    d. Glycoprotein

15. In proteins, the alpha-helix and beta-pleated sheet are examples of :
    a. Primary structure
    b. Secondary structure
    c. Tertiary structure
    d. Quaternary structure

16. In a DNA molecule the thymine concentration is 30%, the guanosine concentration will be :
    a. 10%
    b. 20%
    c. 30%
    d. 40%

17. Conversion of inosine monophosphate to xanthine monophosphate is catalysed by
    a. IMP dehydrogenase
    b. Formyl transferase
    c. Xanthine-guanine phosphoribosyl transferase
    d. Adenine phosphoribosyl transferase

18. Isoelectric pH of an amino acid is that pH at which it has a
    a. Positive charge
    b. Negative charge
    c. No net charges
    d. None of these

19. Genetic defect in sickle cell anaemia is
    a. Glutamic acid at 6^{th} position in β - Globin chain
    b. Aspartic acid at 6^{th} position in β - Globin chain
    c. Valine at 6^{th} position in β - Globin chain
    d. Glutamine at 6^{th} position in α - Globin chain

20. All the following are sulphur containing amino acids found in proteins, EXCEPT :
    a. Cysteine
    b. Cystine
    c. Methionine
    d. Threonine

(40 marks)

Section - B

Instructions for section B & C:

1. Use blue/black ball point pen only.
2. The numbers to the right indicates full marks.
3. Draw diagrams wherever necessary.

Q. 2. Long Answer Questions. (ANY TWO). *(2 × 10 = 20)*

A. Explain eukaryotic DNA organization. Add a note on eukaryotic cell cycle. Describe the role of various eukaryotic DNA polymerases. Discuss various drugs affecting DNA replication (3+2+2+3).

B. Describe the metabolism of tyrosine. Write the biologically important compounds derived and metabolic disorders of tyrosine metabolism. (3+5+2).

C. Name the active form of Vitamin D, how it is formed in the body? Explain its Metabolic functions, deficiency manifestation and RDA (2+2+3+3).

Q. 3. Write Brief Answer / Justifications/ Biochemical basis. (ANY TEN) *(10 × 2 = 20)*

a) Vitamin C deficiency causes gum bleeding. Explain its biochemical basis.
b) Significance of Chaperones & Prion Protein.
c) What is gene ther. ...?
d) Application of Southern Blotting Techniques
e) Explain suicide inhibition of enzyme with example.
f) Alpha-1 antitrypsin causes emphysema.
g) Excess intake of fat soluble vitamin may be toxic-Justify
h) Biochemical markers of myocardial infarction
i) Enlist any 4 tumor markers along with cancers associated with them.
j) Ethanol is used in the treatment of methanol poisoning
k) ELISA: Principle and applications.

Section - C

(40 marks)

Q. 4. Short answer questions. (ANY FOUR) *(4 × 5 = 20)*

a) Important products synthesised from Glycine.
b) Plasma proteins: classification and functions.
c) Diagnostic and therapeutic applications of enzymes (3+2).
d) Purine salvages pathway and disorders of Purine metabolism.
e) Procedure and clinical applications of PCR.

Clinical Cases. (ALL COMPULSORY) (10 × 2 = 20)

Case 1 : -

A 7 months old boy was admitted to the paediatric ward of Hospital, in the coma. The infant had been normal at birth, but over the past 2 months his condition had deteriorated as he became lethargic and unable to control the movements of his head. His weight was below average and his head circumference was very small. His urine contained high levels of methylmalonic acid and serum levels of vitamin B_{12} were 20 pg/ml (normal range: 150-1000 pg/ml). His mother indicated that she was a pure vegetarian and had not consumed any animal products including eggs and milk for the last 8 years. She was on oral antibiotics off and on for the last few months due to recurrent attacks of gastroenteritis. This child was exclusively breast fed. His condition was improved dramatically after he was administered a 1 mg/day dose of vitamin B_{12} for 4 days.

1) What are the sources and RDA value for vitamin B_{12}?
2) What are the coenzymes forms of vitamin B_{12}?
3) Mention the reactions where coenzyme form of B_{12} is required.
4) Is it necessary to employ the combined supplementation of B_{12} and folate in the treatment of Megaloblastic anemia? Why?
5) Absorption, Transport & storage of vitamin B_{12}.

Case 2 :

A 3 year old male child was brought to the paediatric clinic with a history of sore throat and cough about a week back. On examination there was swelling over his face (more during morning) and generalized pitting edema all over the lower limbs.

Blood and urine samples were collected.

Urinary Findings: Dipstick test indicated proteinuria (+++)

Urine proteins: 4570 mg/day

Fasting Plasma Glucose: 86 mg/dl

Plasma proteins: 5.0 g/dl and Plasma Albumin: 2.7 g/dl

Plasma Cholesterol: 342 mg/dl; Triglycerides: 329 mg/dl

Provisional diagnosis of Nephrotic syndrome was made. Child was treated by antibiotics and IV fluids. Later on glucocorticoid was also given.

1. Discusses about Electrophoresis finding in this case.
2. Mention the normal ranges of all parameters tested.
3. Why his serum albumin level is low?
4. Write functions of albumin (any four).
5. What is microalbuminurea? Name the laboratory test to check proteinurea.
