# 2406000101030702
# EXAMINATION AUGUST 2024
# FIRST MBBS
# BIO-CHEMISTRY (PAPER - II) (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 - II) (NEW) - LEVEL 3**
   c. Subject Code No: **2406000101030702**
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:

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Student's Signature

## SECTION A

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

1. A 19-year-old male patient was suffering from Wilson's disease. His ceruloplasmin level was low and liver enzymes were elevated. Which of the following mineral is useful in the treatment?
   a) Zinc b) Copper
   c) Iron d) Molybdenum

2. Enzyme A digests proteins in the stomach (environment with a pH of 2). Enzyme B digests proteins in the small intestine (environment with a pH of 8). Which of the following is NOT true:
   a) Enzyme A would be denatured in the small intestine.
   b) Enzyme A works best in acidic conditions.
   c) Enzyme A can also work in the small intestine.
   d) Enzyme A helps in the hydrolysis of proteins

3. A newborn does well with breast feeding. Two days later, the mother brought the infant to emergency as the baby was bleeding from umbilical cord and nostrils. The most likely cause is:
   a) Deficiency of vitamin C due to a citrus poor diet during pregnancy
   b) Deficiency of vitamin K because disseminated intravascular coagulation
   c) Deficiency of vitamin K because infant intestines are sterile.
   d) Deficiency of vitamin E due to maternal malabsorption during pregnancy.

4. A 42 years old man comes to OPD with complaints of frequent bleeding nose and easy bruisability. For past 1 month. He was treated with prolong antibiotic therapy for chronic diarrhea. Which of the following laboratory finding is most likely?
   a) Elevated fibrinogen level
   b) Elevated Prothrombin time
   c) Elevated Platelet count
   d) Elevated bleeding time

5. A 40 years old male came to OPD with complaints of anorexia, listlessness and numbness of legs. Examination shows loss of sensation on legs and edema was observed. He was suspected of suffering from Beriberi. Which of the following tests will confirm the diagnosis?
   a) FIGLU excretion test
   b) Methylmalonic acid in urine
   c) Kynureninase activity
   d) Erythrocyte transketolase activity

6. A 2 years old boy was brought to OPD with complaints of rash surrounding mouth and nose and diarrhea. What supplementation should be given to the child?
   a) Vitamin C b) Zinc
   c) Folic acid d) Copper

7. Adenosine deaminase deficiency leads to severe Combined immune deficiency because of accumulated dATP inhibits which of the following enzyme?
   a) Adenosine Phosphoribosyltransferase
   b) Ribonucleotide Reductase
   c) Orotate Phosphoribosyltransferase
   d) CTP Synthetase

8. Which one of the following is the toxin-based vaccine?
   a) Polio b) Diphtheria
   c) MMR d) Rabies

9. 48-year-old man presents to your office complaining of generalized weakness and increased pain on left side of chest & both thighs. Physical examination reveals muscle strength of 4 out of 5 in all extremities as well as pain on palpation of the fifth and sixth ribs on his left side. The x-ray films reveal several healed rib fractures as well as diffuse radiolucency with thinning of the cortical bone of his femur. Which serum enzyme level will increase in this case?
   a) Acid phosphatase
   b) Alanine amino transferase
   c) Aspartate amino transferase
   d) Alkaline phosphatase

10. 1. A child with short stature, brittle bone and blue sclera is found to have mutation in collagen. Which of the following is the recurring amino acid is the most likely to be altered in mutation that distort collagen molecule?
   a) Glycine b) Lysine
   c) Proline d) Tryptophan

11. A 45 years old male suffering from diabetes mellites for 8 years. He was presented with erectile dysfunction. He was prescribed Sildenafil Citrate. What is the mechanism of action of this drug?
   a) Activates Guanylate cyclase
   b) Activates Nitric Oxide synthase
   c) Inhibits Phosphodiesterase type 5
   d) Activates Adenyl cyclase

12. A 72 years old man diagnosed with Alzheimer's disease. In this patient Amyloid precursor protein's normal alpha helical structure gets disrupted due to mutation. The following mutational change affects alpha helical structure of mutant protein.
    a) Methionine to Proline
    b) Valine to Alanine
    c) Glutamate to Aspartate
    d) Lysine to Arginine

13. A woman has been complaining of a sore throat and cough, and a sputum culture demonstrated a bacterial infection. The physician placed the woman on erythromycin. Erythromycin will be effective in eliminating the bacteria because it interferes with which one of the following processes?
    a) DNA replication
    b) Elongation of protein synthesis
    c) Initiation of protein synthesis
    d) RNA synthesis

14. A pathologist, while doing an autopsy of a patient who died from Creutzfeldt-Jakob syndrome, accidentally cut himself while examining the brain. The pathologist became very concerned for his well-being. The precipitating event in the patient's brain that led to this disease is which one of the following?
    a) Infection of the brain with a virus
    b) Proteolytic cleavage of an existing brain protein
    c) An altered secondary and tertiary structures for an existing brain protein
    d) Altered gene expression

15. 34-year-old female has a history of intermittent episodes of severe abdominal pain. She has had multiple abdominal surgeries and exploratory procedures with no abnormal findings. Her urine appears dark during an attack and gets even darker if exposed to sunlight. This patient most likely has difficulty in synthesizing which of the following?
    a) Heme
    b) Methionine
    c) Creatine Phosphate
    d) Urea

16. A 42 years old man comes to OPD with complaints of frequent bleeding nose and easy bruisability. For past 1 month. He was treated with prolong antibiotic therapy for chronic diarrhea. Which of the following laboratory finding is most likely?
    a) Elevated fibrinogen level b) Elevated bleeding time
    c) Elevated Platelet count d) Elevated Prothrombin time

17. Which one of the following occurs in the urea cycle?
    a) Carbamoyl phosphate is derived directly from glutamine and CO2.
    b) The a-amino group of arginine forms one of the two nitrogen of urea.
    c) N-acetylglutamate is a positive allosteric effector of ornithine transcarbamoylase.
    d) Ornithine directly reacts with carbamoyl phosphate to form citrulline.

18. A 40 years old female presented to the emergency center with complaints of nausea, vomiting and abdominal pain. Her pain was located in the mid epigastric area and right upper quadrant. Lab investigation shows high serum lipase levels. What is the probable diagnosis?
    a) A cute pancreatitis b) Viral hepatitis
    c) A cute gastritis d) Gall stone

19. Membrane bound and secretory forms of Immunoglobulin are created due to which of the following process?
    a) m RNA editing b) Alternative mRNA splicing
    c) Gene amplification d) Gene rearrangement

20. Which of the following is NOT True about PCR?
    a) Thermostable enzyme Taq Polymerase is.used
    b) Annealing comes after denaturation
    c) Specific primers are required
    d) The extension step is performed at 50°C temperature for 30 seconds.

## SECTION B

**Q.2 Long Answer Questions (2 out of 3) 2*10=20**

1. Describe the pathway (location, steps, energetics, and regulation) through which ammonia is finally disposed of from our body (1+2+1+2). Write a note on disorders of this pathway (4).

2. Describe gene expression regulation in prokaryotes (6). Write a note on cell cycle and its checkpoints (4).

3. Describe the general structure of immunoglobulin (2). Describe the functions and significance of immunoglobulins (5). Describe principles of vaccine development (3).

**Q.3 Short Answer Questions (10 out of 11) 10*2=20**

1. The salvage pathway is more economical than the de-novo synthesis of purine nucleotide. Explain.

2. Edema develops when the albumin level is decreased. Why?

3. Enumerate types of blotting techniques with their significance.

4. Write at least two products formed from glycine with their significance.

5. Write the biological and clinical significance of the transamination reaction.

6. What is a folate trap? Explain by drawing reactions.

7. Why night blindness may be seen in patients with post-hepatic jaundice?

8. Explain why barbiturates precipitate an attack of porphyria and why administration of glucose alleviates symptoms of porphyria.

9. Write the principle of electrophoresis. Draw a normal electrophoretogram of plasma proteins.

10. Vitamin B12 deficiency leads to neurological manifestations. Justify.

11. Write any two post-transcriptional modifications with significance.

## SECTION C

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

1. Describe mechanisms of regulation of enzyme activity.

2. Describe steps and clinical applications of DNA recombinant technology (3+2)

3. Describe at least ten tumor markers with their clinical significance.

4. Enumerate cardiac biomarkers in the order of their earliest rise in myocardial infarction. What is a flipped pattern? Describe cardiac biomarkers that are not enzymes. (1+1+3)

5. Describe the mechanisms of action of hormones.

**Q.5 Clinical Cases (2 out of 2) 2*10=20**

1. A 40 years-old male, with a history of smoking cigarettes (a pack a day), who developed a chronic progressive condition of shortness of breath and incapability of sustaining any physical activity, was referred to a respiratory physician. After a physical examination and laboratory investigations, a diagnosis of emphysema without any evidence of cancer arrived. The serum alpha-1 antitrypsin levels were very low.

    1. What is alpha-1 antitrypsin? (1)

    2. Why is it also called a protease inhibitor and what is its mechanism of action? (2)

    3. What is the effect of smoking on alpha-1 antitrypsin and why the deficiency of this protein also may lead to liver disease? (2)

4. What do you mean by positive acute phase proteins and give two examples (apart from one mentioned in the case) and their importance. (2)

5. Write any two negative acute phase proteins. (1)

6. What are the functions of haptoglobin and why do decreased levels of this protein lead to hemolyticanemia? (2)

2. A 30-year-old man has recurrent arthritic attacks. On examination signs of inflammation were present in several joints. Serum uric acid was grossly elevated, as was the urinary excretion of this compound. Further investigation revealed the deposition of urate crystals in the inflamed joints and tissues. Treatment was started with allopurinol at a daily dose of 50 mg twice a day. For 2-3 weeks, the dose was gradually increased to 400 mg per day. Ibuprofen was added to control pain and inflammation.

1. What is the biochemical reason behind the development of inflammation around the joints? (2)

2. Write two primary and two secondary causes for raised uric acid levels in our body. (2)

3. What is the rationale behind treating this patient with allopurinol? Write the mechanism of action of allopurinol. (2)

4. Alcohol precipitates an attack of Gout. Why? (2)

5. Write the normal blood level of uric acid in males and females. (2)



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