All India Institute of Medical Sciences, Kalyani
1st Professional MBBS Examination 2021
Biochemistry (Paper-I)

Time: 3 Hrs. **Marks: 100**

- Answer all questions and draw well labeled diagrams wherever necessary
- Answer Section A and B is separate answer booklets and write answer in sequence

SECTION-A (50 Marks)

1. A 40-year old woman who was newly diagnosed with type-2 diabetes mellitus was found to have hyperlipoproteinemia. As an adjunct to diet and exercise she was advised Atorvastatin medication.
   a. What is the type of hyperlipoproteinemia seen in diabetes mellitus and the biochemical basis underlying such change? [3]
   b. What is the mechanism of action of Atorvastatin? [2]
   c. Why HDL/LDL ratio is important to monitor? [3]
   d. What is Lp(a) and the significance of estimating this parameter in this patient? [2]

2. Explain with figure the mechanism of secondary active transport. Describe two pathways where such transport occurs in our body. [3+2=5]
3. Explain with oxygen dissociation curves the suitability of hemoglobin and myoglobin to their physiological roles [2.5+2.5=5]
4. Describe the chemiosmotic hypothesis of ATP synthesis. Why is the amount of ATP generated different for NADH and $FADH_2$? [3+2=5]
5. Explain the mechanism of fatty liver in alcoholics. What is lipotrophic factor? Cite an example. [3+1+1=5]
6. How is energy derived from anaerobic glycolysis? Explain the clinical significance of anaerobic glycolysis. [1+4=5]
7. Describe the urea cycle. Explain the clinical significance of urea formation. [3+2=5]

8. 24 yr old women complaints of acute abdominal pain for last 24 hrs. Her ultrasound and blood reports are normal except for hypoglycaemia. She is being treated with hemin infusion.
   a. What could be the probable diagnosis in this case and enzyme defect? [1]
   b. Which intermediate is expected to be excreted more in urine? [1]
   c. Explain how hemin infusion helps to treat this condition. [1]
   d. Does the hypoglycemia have any relevance in this case? [1]
   e. Why does the intake of barbiturates precipitate an attack of porphyria? [1]

9. Identify the enzyme deficiency for the following pictures. [1×5=5]
   a) Low lactic acid in blood after exercise
   b) Hemolytic anaemia after primaquine treatment
   c) Presence of Homogentisic acid in urine
   d) Total bilirubin 3 mg with 95% unconjugated and normal liver enzymes on routine check-up
   e) Chronic blistering and scarring of skin on exposure to sunlight with high accumulation of uroporphyrin

SECTION–B (50 Marks)

1. Describe the absorption, function and deficiency manifestations of Iron. Explain how iron metabolism is regulated. [5+5=10]

2. Identify the associated vitamin deficiency for the following picture. [1×5=5]

   a. In OPD, 60-year-old chronic smoker and alcoholic man on examination revealed memory disorientation, stomatitis, glossitis, diarrhea, and exfoliative dermatitis with some vesicles on erythematous bases on photo exposed sites such as his hands.
   b. In ophthalmic OPD, 40-year-old presents with progressive keratinization of the cornea.
   c. A patient presented with pale skin, sunken eyes, sore gums, muscle pain, loose teeth, and corkscrew-shaped hair.
   d. 50-year-old woman with H/O terminal ileum removal presented with extreme paleness, Hb: 9 g/dL and MCV is higher than normal
   e. A patient presented with hemorrhage, anemia and prolonged clotting time.

3. Name an enzyme marker currently being used to aid the in the diagnosis of following condition [1×5=5]
   a. Acute myocardial infarction
   b. Alcoholic liver disease
   c. Paget disease
   d. Pancreatitis
   e. Prostatic tumor

4. Write short notes: [2×2.5=5]

   a. Regulation of body water
   b. Hypoalbuminemia causes edema

5. Describe the different plasma proteins found in the electrophoresis. Name a condition where gamma region may be showing higher than normal intensity. [4+1=5]
6. Briefly explain the regulation of calcitriol levels in the body. Name the different types of rickets and defects associated with them. [3+2=5]
7. Mention the mineral associated with the following conditions and explain the clinical features.
   a. Wilson's Disease [2 ×2.5=5]
   b. Acrodermatitis enteropathica

8. Explain the following: [2×2.5=5]

   a. Km value is changed in competitive inhibition of enzyme.
   b. Hexokinase has higher affinity for glucose than glucokinase

9. A 30 yrs old patient reports with an intense thirst with a strong craving for ice water. He passes large amounts of urine (8-10 L per day). Urine glucose not elevated. Urine osmolality was very low, but after vasopressin injection, it improved.

   a. Name the clinical condition he is suffering from. [2]
   b. How do you explain the improvement in urine osmolality with vasopressin injection? [2]
   c. Where is the defect in this condition? [1]