



All India Institute of Medical Sciences, Kalyani
First Professional MBBS Examination, September 2025

Time: 3 Hrs.

Biochemistry (Paper-II)

Marks: 100

INSTRUCTIONS:

- Answer all questions.
- Illustrate your answers with well labelled diagram wherever necessary.
- Answer section B and C in a separate answer booklet.

SECTION – B (40 MARKS)

1. What is Body mass index? Explain how it helps in understanding the nutritional status. Add short notes on Kwashiorkor. (2+3+3)
2. A 24-year-old woman, who is Rh-negative, delivered her first child without complications. The baby was Rh-positive. She did not receive any medication after the first delivery. During her second pregnancy, she develops anemia, jaundice, and edema in the fetus. Ultrasound diagnosed the condition as Erythroblastosis fetalis. (2+2)
 - a. Explain the biochemistry of the medication that can be given to prevent its occurrence (especially in the second pregnancy).
 - b. Could this complication also have developed if the mother was Rh+ve and the baby Rh-negative? Explain why.
3. A 55-year-old man with a history of chronic smoking and ischemic heart disease is found to have evidence of oxidative stress and free radical-mediated tissue injury. His physician advises him to increase dietary intake of certain compounds that can neutralize free radicals and limit cellular damage. (2+2)
 - a. Name two antioxidants.
 - b. Explain the biochemical basis of the protective mechanism of these antioxidants.
4. A 35-year-old man was found in semi-conscious state near Kalyani Railway station. His shirt had vomit stains and he was smelling of alcohol. There was no injury to any body part. The Blood report shows: pH=7.2, HCO₃⁻=14mEq/L, Sodium=132mEq/L, Potassium= 3.0mEq/L, Chloride=106mEq/L. (2+2)
 - a. Calculate his Anion Gap.
 - b. Enumerate two causes of high Anion Gap metabolic acidosis.
5. Enumerate the phase two reactions of xenobiotics. Give any two examples. (2+2)
6. What is humoral Immunity? Explain in details the maturation of B lymphocytes. (1+3)
7. Define pattern recognition receptors (PRRs) with examples. What components of microbes are recognized by PRRs and how does this recognition play a role in innate immune response? (2+2)
8. A 45-year-old female presented to the rheumatology clinic with a six-month history of progressive joint pain and stiffness. Initial symptoms were located in the hands and wrists and later extended to the elbows and knees. The pain was symmetrical and accompanied by swelling and warmth in the affected joints. Morning stiffness lasted more than an hour and partially improved with movement. Recently, she reported increased fatigue and difficulties with daily activities, including teaching. Rheumatoid Factor and Anti-Cyclic Citrullinated Peptide (Anti-CCP) Antibodies were strongly positive. Disease remission was achieved following treatment with NSAIDs and Methotrexate. What is the probable diagnosis? What is the biochemical basis of this disorder? How did Methotrexate contribute to disease remission? (1+2+1)
9. A child of 3 years has been given oral polio vaccine as per Govt. health scheme. Comment on whether oral polio vaccine is live or killed type. Compare and contrast between Live and killed vaccine. (1+3)

SECTION – C (40 MARKS)

1. A 65-year-old lady was diagnosed with jaundice with a chronic history of repeated abdominal pain and passing clay-colored stools. There was no history of weight loss. Surgery was recommended for treating the cause of jaundice. (1+1+2+4)
 - a. What is the most likely diagnosis?
 - b. Which type of bilirubin is expected to be increased in this patient?
 - c. What is the biochemical basis of passing clay-colored stools?
 - d. Discuss the derangements of various commonly performed liver function tests in the serum in different types of jaundice (pre-hepatic, hepatic & post-hepatic) in a tabular form.
 2. A 30-year-old lady was clinically diagnosed as acute glomerulonephritis. Her renal function test was advised by the treating physician. Which are the major parameters of renal function test. Which parameter best reflects glomerular function and why? (2+2)
 3. What is proto-oncogene? Explain the mechanism by which it can lead to cancer. (1+3)
 4. A 50-year-old man presents with severe pain, redness, and swelling of the first metatarsophalangeal joint after a weekend of heavy alcohol intake. Laboratory tests show elevated serum uric acid levels. The treating physician suspects gout. (2+2)
 - a. Why is gouty arthritis precipitated by alcohol?
 - b. Name two medications used in the treatment of gout and explain the biochemical basis of prescribing them.
 5. Describe the regulation of gene expression for an inducible operon. (4)
 6. Discuss Restriction Fragment Length Polymorphism (RFLP). Add a note on the application of this technique in Criminal Investigations. (2+2)
 7. Describe the mechanism of action of thyroid hormone. Do these hormones need second messenger? (3+1)
 8. With a detailed diagram explain the structure of t-RNA and write a note on si-RNA. (2+2)
 9. A 5-year-old male child presented with photophobia, cutaneous photosensitivity including xerosis, and multiple hyperpigmented freckles on sun-exposed skin. Neurological assessment indicated mental retardation and sensorineural deafness. Skin histology demonstrated hyperkeratosis, increased melanin pigment, inflammatory infiltrate, and some dysplasia. What is the diagnosis? Describe the underlying biochemical defect and inheritance pattern. Summarise the biochemical mechanisms contributing to the pathogenesis. (2+2)
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