Answer **All Five** Questions.

Answer each question in a **separate** book.

Marks allocated to each part of a question are shown within parenthesis.

10th October 2018

2.00 p.m - 5.00 p.m

(Three hours)

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1. A newborn who was otherwise clinically well, developed jaundice at day four of life. The baby was treated with phototherapy and was discharged on day seven.

    1.1 Explain the biochemical basis for

        1.1.1 the occurrence of jaundice in the baby. **(50 Marks)**

        1.1.2 giving phototherapy. **(25 Marks)**

    1.2 1.2.1 If jaundice was undetected and was not treated properly, name **(05 Marks)** the major complication the baby might have developed.

        1.2.2 Explain the biochemical basis for the development of the **(20 Marks)** complication stated in 1.2.1

2. Explain the biochemical rationale of the following.

    2.1 Prolonged starvation results in increased ketogenesis. **(25 Marks)**

    2.2 Familial defective apolipoprotein B_{100} results in hypercholesterolaemia. **(25 Marks)**

    2.3 Involvement of several key hormones in calcium ion homeostasis. **(25 Marks)**

    2.4 Administration of vitamin B_{12} to a patient who has undergone **(25 Marks)** gastrectomy.

3. Explain the following.

    3.1 The effects of substitution of distal histidine (58 histidine) by tyrosine in **(35 Marks)** the α-globin chain of haemoglobin.

    3.2 Molecular mechanisms involved in the action of β-adrenergics. **(35 Marks)**

    3.4 Serum alkaline phosphatase concentration is elevated in hepatobiliary **(30 Marks)** obstruction.

4. 4.1 Explain the biochemical basis of the following.

      4.1.1 Lactose intolerance in the deficiency of lactase.   *(25 Marks)*

      4.1.2 Glycaemic index has an important role in the dietary   *(30 Marks)*
           management of type 2 diabetes mellitus.

    4.2 A healthy adult male of 50 kg consumes a mixed diet of adequate energy and proteins.

        Basal metabolic rate of the individual = 25 kcal/kg/day
        Digestibility of a mixed diet = 80%
        Efficiency of conversion of dietary proteins to nitrogen = 16%

      4.2.1 Calculate the intake of proteins if the nitrogen excretion of the   *(30 Marks)*
           individual is 8 g/day.

      4.2.2 State the assumption that you made in 4.2.1   *(15 Marks)*

5. 5.1 The decomposed body of a 72-year old woman who had disappeared from her home was found after ten months. At the time of disappearance, the police investigators who have searched her house found two hairs on the clothes belonging to her and were sent for DNA analysis. A portion of femoral bone from the decomposing body was also subjected to DNA analysis.

      5.1.1 State whether the evidence collected by the investigators are   *(20 Marks)*
           sufficient for DNA analysis. Justify your answer.

      5.1.2 Explain briefly the molecular basis of the DNA profiling   *(30 Marks)*
           technique that could establish the identity of the missing woman.

    5.2 Explain the following.

      5.2.1 Mechanism of action of IgM against invading bacteria.   *(25 Marks)*

      5.2.2 Biochemical basis of estimating serum CRP concentration to   *(25 Marks)*
           monitor the treatment of certain inflammatory diseases.

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