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MANIPAL ACADEMY OF HIGHER EDUCATION
MD (BIOCHEMISTRY) DEGREE EXAMINATION – JULY 2023

PAPER I

Monday, July 03, 2023

Time: 14:00 – 17:00 Hrs.

Max. Marks: 100

✍ **Answer ALL the questions.**

✍ **Long Answer Questions:**

1. Explain the principle and types of blotting techniques. (15 marks)

2. Explain lipoprotein metabolism in health and disease. (15 marks)

3. **Short answer questions:**

- 3A. Explain blood buffer systems. Show pK, and buffering capacity of bicarbonate buffer using illustration.
- 3B. Explain structure and function relationship of collagen with suitable diagrams.
- 3C. Explain the features of Singer-Nicolson model for biological membranes.
- 3D. Physiologically important nucleotides.
- 3E. Structure and functions of different types of RNA.
- 3F. Second messengers.
- 3G. Isoelectric focusing.
- 3H. Validation of diagnostic tests.
- 3I. Explain the significance of glycosaminoglycans with 4 examples.
- 3J. Biological significance of polyunsaturated fatty acids.

(7 marks × 10 = 70 marks)



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PAPER II

Tuesday, July 04, 2023

Time: 14:00 – 17:00 Hrs.

Max. Marks: 100

✍ **Answer ALL the questions.**

✍ **Long answer questions:**

1. Explain the respiratory chain and oxidative phosphorylation under - Components, complexes and functioning of the respiratory chain, Process of oxidative phosphorylation, Mechanisms of ATP synthesis and regulation, Mitochondrial transport systems and shuttles.

(15 marks)

2. Explain classification, pathogenesis, metabolic abnormalities and diagnostic criteria of diabetes mellitus.

(15 marks)

3. **Short answer questions:**

3A. Explain salvage pathway for purines.

3B. Explain biosynthesis of heme.

3C. Explain how you go about calculating energy requirements and proximate principles required for an adult weighing 50 kg on a mixed diet.

3D. Anti-oxidant defense systems.

3E. Explain diagnostic tests for evaluation of iron deficiency.

3F. Explain methyl-folate trap and diagnostic tests to demarcate between deficiencies of the vitamins involved in methyl folate trap.

3G. Explain the metabolic adaptations in the liver under well fed conditions.

3H. Explain biological significance of cholesterol in health and disease

3I. Explain the roles of TCA cycle under well fed state and starvation.

3J. Explain polyol pathway and its significance.

(7 marks × 10 = 70 marks)



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PAPER III

Wednesday, July 05, 2023

Time: 14:00 – 17:00 Hrs.

Max. Marks: 100

✍ **Answer ALL the questions.**

✍ **Long Answer Questions.**

1. Discuss the regulation of gene expression in eukaryotes. (15 marks)

2. Describe the process of protein synthesis. Add a note on post translational modifications. (15 marks)

3. **Short Answers Questions.**

- 3A. Compare and contrast DNA replication in prokaryotes and eukaryotes
- 3B. Discuss the diseases associated with abnormalities of DNA repair systems
- 3C. Discuss the process of transcription initiation in prokaryotes and eukaryote
- 3D. Explain types of mutations with examples
- 3E. Discuss the use of restriction endonucleases in molecular biology techniques
- 3F. Explain the principle and applications of Microarrays
- 3G. Discuss the application of molecular techniques in forensic investigation and medicolegal cases
- 3H. Discuss the ethical and legal issues related to medical genetics
- 3I. Describe the humoral and cell-mediated immunity
- 3J. Discuss tumor markers with examples

(7 marks × 10 = 70 marks)



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PAPER IV

Thursday, July 06, 2023

Time: 14:00 – 17:00 Hrs.

Max. Marks: 100

✍ **Answer ALL the questions.**

✍ **Long Answer Questions.**

1. Explain biochemical evaluations in hemolytic anaemia

(15 marks)

2. Explain adenohipophyseal and neurohipophyseal hormones and their biological functions.

(15 marks)

3. **Write short note on:**

3A. Explain prions and prion diseases with 2 examples

3B. Explain bone turnover markers

3C. Explain cardiac biomarkers

3D. Newborn screening

3E. Hyperbilirubinemias

3F. Automation in clinical laboratory

3G. Pre-analytical variables and measures to address them

3H. ROC curve and its importance

3I. Role of kidney in regulation of acid-base balance

3J. D- dimer – measurement and interpretation

(7 marks × 10 = 70 marks)

