2023

PHYSIOLOGY

PAPER-I

Time Allowed — 3 Hours *Full Marks — 200*

If the questions attempted are in excess of the prescribed number, only the questions attempted first up to the prescribed number shall be valued and the remaining ones ignored.

*Answers may be given either in **English** or in **Bengali** but all answers must be in one and same language.*

Group-A

Answer *any six* questions.

1. (a) What is isoelectric pH? State its significance.
   (b) Discuss briefly the glass-electrode method of pH determination.
   (c) Write name of the different blood buffer system.
   (d) Describe briefly the role of blood buffer system in maintaining blood pH. (2+3)+6+3+6=20

2. (a) What is osmosis? Why osmosis is important to the survival of cell?
   (b) What type of pressure is osmotic pressure? Describe the factors affecting osmotic pressure.
   (c) Explain briefly Van't Hoff law of osmotic pressure.
   (d) What do you mean by dialysis and ultrafiltration? (2+3)+(2+3)+6+(2+2)=20

3. (a) What is glycogenin? What does it play in glycogen metabolism?
   (b) What is anomer? State the different anomeric form of glucose.
   (c) Why glucose is called dextrose? Why sugar are most powerful reducing agent in alkaline medium?
   (d) Distinguish between the chemical structure of starch and cellulose. What is sugar acids? (2+3)+(2+3)+(2+3)+(3+2)=20

4. (a) What is 'Cahill Cycle' pathway? State its physiological importance.
   (b) What is transmethylation? Give one example.
   (c) What do you mean by essential and non-essential amino acids? Give suitable examples.
   (d) Why arginine is called semi-essential amino acid?
   (e) What is the principle of 'protein denaturation'? (3+3)+4+4+3+3=20

5. (a) Calculate the total energetics of β-oxidation reaction of one molecule of fatty acid (palmitic acid).

   (b) What are the sources of NADPH and acetyl CoA for lipogenesis?

   (c) How do phospholipid differ from triglyceride?

   (d) Distinguish between fat and wax. 6+(4+4)+4+2=20

6. (a) Explain how lanosterol is formed from squalene.

   (b) Why the pentose phosphate pathway is called hexose monophosphate shunt (HMP shunt)?

   (c) How are H_2O_2 and superoxide radicals formed in cells? How do they cause cell damage?

   (d) Describe the anabolic role of TCA cycle. 6+2+(4+2)+6=20

7. (a) Describe the rate-limiting steps of the glycolytic pathway.

   (b) How can hexose sugars enter the glycolytic pathway?

   (c) What do you mean by galactosemia? 8+8+4=20

8. (a) Describe the biosynthesis of Nitric oxide (NO) in our body.

   (b) What are the difference between glucogenic and ketogenic amino acid.

   (c) Name the ketone bodies. Describe the formation and fate of ketone bodies in human system.

   (d) What is tautomerism? Give one example. 4+4+(3+7)+2=20

9. (a) What do you understand by recombinant DNA? Write two uses of recombinant DNA technology.

   (b) Describe the inborn errors of phenylalanine and glycogen metabolism.

   (c) What is ribose sugar?

   (d) What are fibrous protein? State the differences between fibrous protein and globular protein. (3+3)+(3+3)+2+(2+4)=20

10. (a) What do you mean by protein calorie malnutrition (PCM)? State their social implications.

    (b) What do you understand by protein sparing effect of glucose?

    (c) Describe the nutritional anemias with their causes and hematological changes.

    (d) What are positive and negative nitrogen balance? (2+2)+4+(4+4)+(2+2)=20

Group-B

Answer *any four* questions.

11. (a) Discuss the role of erythropoietin on erythropoiesis.
    (b) What do you mean by turbulant and laminar flow?
    (c) What is Reynolds number? "Higher the value of Reynolds number, greater the possibility of turbulance"— Justify the statement.
    (d) What do you mean by homeostasis? Why blood cell does play the most important role in the maintenance of homeostasis? 4+4+(2+4)+(3+3)=20

12. (a) Define antibiotics. Why penicilline is the safe antibiotic for human body?
    (b) What are allergens? Name the antibody secreted during immune response in allergy.
    (c) "All immunogens are antigen but all antigens are not immunogens."— Explain why? What is epitope?
    (d) What are the difference between plasmid DNA and regular DNA?
    (e) Describe with diagram the structure of bacteriophase. (2+2)+(2+2)+(2+2)+4+4=20

13. (a) Describe the functions of plasma protein in human body. What is plasmapheresis?
    (b) What do you mean by iron overload disease?
    (c) What do you know about procoagulants and anticoagulants? State their mechanism of action.
    (d) Write down the chemical structure of hemoglobin. (4+2)+2+(4+4)+4=20

14. (a) Describe the physiological significance of PR-interval in ECG.
    (b) What do you mean by exploring electrode and indifferent electrode used to measurement of ECG?
    (c) What do you understand about slow diastolic depolarisation phase of the hearts?
    (d) Distinguish between capacitance and resistant blood vessels.
    (e) State Fick's Principle in the measurement of cardiac output. 4+4+4+4+4=20

15. (a) State the importance of spirometry in the diagnosis of respiratory disease.
    (b) What do you mean by ventilation-perfusion ratio?
    (c) What is the significance of alveolar surfactant?
    (d) Discuss the non-respiratory functions of lungs.
    (e) What is emphysema? 6+4+2+4+4=20

16. (a) Describe with suitable diagram the ultra-structure of nephron. What is podocytes?
    (b) Discuss the mechanism of reabsorption of glucose through renal tubule.
    (c) Compare and contrast the functions of internal and external urethral sphincters.
    (d) What is aquaporin? (6+2)+6+4+2=20