



UNIVERSITY OF CALCUTTA

Notification No. CSR/98/2025

It is notified for information of all concerned that in terms of the provisions of Section 54 of the Calcutta University Act, 1979, (as amended), and, in the exercise of his powers under 9(6) of the said Act, the Vice-Chancellor has, by an order dated 12.12.2025, approved the Model Questions for semester-1,3 & 5 of Physiology (4-year Honours & Honours with Research and 3-year MDC), Courses of Studies under CCF, as laid down in the accompanying pamphlets.

These Model Questions have been framed under the new revised syllabus of Physiology, as published in the University notification no. CSR/57/2025, dt.27.08.2025 under CCF.

These questions are only Model Questions. They may not feature in the University examinations exactly in the form included in the Model Questions.

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30.12.2025

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Registrar

Model Questions for Newly Revised Syllabus in Physiology (CSR-57)

(Major, Minor & MDC)

Disclaimer

The questions provided are sample illustrations only. Students are encouraged to explore all relevant topics aligned with the prescribed syllabus for a comprehensive understanding.

Semester I Major

Paper: DSCC-1

(Introductory Physiology: Human Body Organisation, Body Fluids and Biophysics)

Unit-I: Cell 1

Group A -Short definitive type (2 marks each)

1. What is the role of centrioles in cell division?
2. State one significance of the G1 checkpoint in the cell cycle.
3. Name two microtubule-associated motor proteins.
4. What is the significance of crossing over in meiosis?
5. Why are enzymes of lysosomes called acid hydrolases?
6. What is the significance of nuclear pore complexes in eukaryotic nucleus?
7. What is autophagy?
8. What is treadmilling of actin?
9. Which cytoskeletal component is primarily involved in vesicle trafficking from Golgi?
10. State two major differences between mitosis and meiosis.

Group B - Short Answer type Questions (5 marks each)

Write short notes on

1. Structure and functions of the nuclear envelope.
2. Significances of cell cycle checkpoints.
3. Apoptosis vs necrosis.
4. Role of dynein and kinesin motors in microtubule transport.
5. Structure and functional significance of mitochondrial DNA.
6. Role of cytoskeleton in cell motility.
7. What is synapsis?

Group C- Descriptive type. (8 marks each)

1. a) What is the structure of the nuclear pore complex?
b) Explain the structure and functions of lysosomes. (3+5)
2. a) Mention any three features that support the endosymbiotic origin of mitochondria.
b) Explain the structure and functions of peroxisomes. (3+5)
3. a) Why is meiosis known as reductional cell division?
b) Discuss the stages of Meiosis-I with neat labelled diagram.
c) Mention two functions of mitosis in the human body. (2+4 +2)
4. a) Describe the ultrastructure of microtubules with a neat diagram.
b) Mention the role of actin filaments in endocytosis and exocytosis. (4+4)
5. a) Mention the different types of endoplasmic reticulum. State their respective functions.
b) What are the key components of GERL system? (2+4) +2

Unit-II: Cell 2

Group A -Short definitive type (2 marks each)

1. What is membrane asymmetry?
2. What is the difference between symport and antiport?
3. What is the junctional complex? Name any two components.
4. What is meant by a leaky channel? Give an example.

5. Define primary active transport. Give example.
6. What are CAMs? Give an example.
7. Which vesicular transport process is termed "cell drinking"?
8. What do you mean by transcytosis?
9. What is lipid raft?
10. What is the difference between tight and anchoring junctions?
11. State two applications of liposome.
12. What is the function of the cadherin?

Group B - Short Answer Type Questions (5 marks each)

Write a short note on

1. Difference between voltage-gated and ligand-gated ion channels.
2. Micelles and their biological importance.
3. Factors affecting membrane fluidity.
4. Applications of liposome.
5. Structure and function of gap junction.
6. Primary and secondary active transport.
7. Composition and functions of extracellular matrix.

Group C- Descriptive type. (8 marks each)

1. (a) Explain the organization of plasma membranes according to the fluid mosaic model.
(b) Explain how fatty acid saturation influences the fluidity of lipid bilayers? (5+3)
2. (a) Define facilitated diffusion. How does it differ from simple diffusion?
(b) Differentiate between carrier ionophores and channel-forming ionophores (2+4)
3. (a) Define a liposome. Describe its basic structural organization.
(b) What is the difference between receptor-mediated endocytosis and pinocytosis? (1+4) +3
4. (a) What are the types of cell adhesion molecules (CAMs)? Mention their biological functions.
(b) How do exosomes differ from secretory vesicles? (2+4) +2

Unit-III: Tissues & Outline of Human Anatomy

Group A -Short definitive type (2 marks each)

1. What is a basement membrane?
2. State the location and function of pseudostratified epithelium.
3. Name the tissue that connects muscles to bones. Mention its function.
4. Mention the location and functions of transitional epithelium.
5. Why is areolar tissue called a "packing tissue"?
6. Which anatomical plane divides the body into equal right and left halves?
7. Define muscle belly with an example.
8. Name the origin and insertion of the biceps brachii.
9. Why is the latissimus dorsi called the "swimmer's muscle"?
10. Which muscle is called the 'peripheral heart' and why?
11. Name the agonist and antagonist muscle of elbow joint.
12. Name a muscle that has convergent fascicle orientation.
13. Which muscle forms the calf bulge?
14. Name the tendon which connects the calf muscles to the heel.
15. Name two muscles preferred for intramuscular injection in adults.
16. Define fixator. Give an example.

Group B - Short Answer Type Questions (5 marks each)

1. Difference between elastic cartilage and hyaline cartilage.
2. Anatomical position and functions of calf muscles.
3. Thoracic cavity and its subdivisions.
4. Difference between brown and white adipose tissue.
5. Anatomical position and function of pectoralis major and minor.
6. Curvature of vertebral column with a line diagram.

Group C- Descriptive type. (8 marks each)

1. (a) Describe the histological features and physiological functions of different types of cartilages.
(b) State the functional importance of transitional epithelium. (6+2)
2. (a) Describe the structural components of areolar tissue.
(b) Discuss the components of the Haversian system with a suitable diagram. (4+4)
3. (a) Describe the sagittal, coronal, and transverse anatomical planes with labelled diagrams.
(b) Differentiate between agonists and antagonists with one functional example of each. (4+4)
4. (a) Draw a labelled diagram of nine abdominal regions mentioning the lines used to demarcate them.
(b) Define pleura and name its two layers.
(c) Which ribs are called 'floating ribs' and why? (4+2+2)
5. (a) Describe the different fascicle orientations with examples.
(b) Name the muscles which belong to the hamstring group. What is the primary role of the hamstring muscles? 4 + (2+2)
6. (a) Define omentum. Name the organs attached to the greater and lesser omentum.
(b) Name the major bones forming the neurocranium. (2+4) +2

Unit-IV: Haematology and Body Fluids**Group A -Short definitive type (2 marks each)**

1. State the difference between plasma and serum.
2. Name the two main collecting ducts of the lymphatic system.
3. State any two functions of synovial fluid.
4. State the differences between red and yellow bone marrow.
5. What is spectrin? Mention its function.
6. State the difference between adult (HbA) and foetal haemoglobin (HbF)?
7. Define thrombopoiesis.
8. What are the advantages of the biconcave shape of RBC?
9. How does methemoglobin differ from normal hemoglobin?
10. What is thrombopoietin? Mention its function.
11. Name two natural anticoagulants
12. Name two vitamins essential for normal erythropoiesis.

Group B - Short Answer Type Questions (5 marks each)

Write short notes on-

1. Composition and functions of Lymph.
2. Principle and applications of plasmapheresis.
3. Structure of heme molecule with suitable diagram.
4. Role of iron-ferritin-transferrin system in erythropoiesis.
5. Phagocytic functions of neutrophils and monocytes.
6. Fibrinolytic system and its importance.
7. Bombay Blood group.

Group C- Descriptive type. (8 marks each)

- (a) What is the difference between medullary and extramedullary erythropoiesis?
(b) Discuss the sequential stages of erythropoiesis. (2+4)
- (a) Explain the effect of hypoxia on red blood cell formation.
(b) What is the common myeloid progenitor (CMP)?
(c) Give an outline of the sequence of neutrophil maturation. 3+ (1+4)
- (a) Discuss the steps of biosynthesis of heme.
(b) Elucidate the steps of heme catabolism producing bilirubin. (4+4)
- (a) Explain the intrinsic pathway of blood coagulation
(b) Discuss the role of vitamin K and calcium in blood coagulation. (4+2+2)
- (a) Explain the biochemical basis of ABO blood group antigens.
(b) Which chromosome encodes Rh-antigens?
(c) What is Rh-null blood? (6+1+1)

Unit-V: Biophysical Principles**Group A -Short definitive type (2 marks each)**

- Mention Van't Hoff's laws of osmotic pressure.
- State Fick's first law of diffusion and mention one physiological example.
- Distinguish between isotonic and iso-osmotic solution.
- Define osmolarity and tonicity with suitable examples.
- What do you mean by ionization constant of water?
- What happens to a red blood cell when placed in hypotonic, isotonic, and hypertonic solution?
- What is meant by the half-life of a radioisotope?
- Name one radioisotope used for thyroid function studies.
- Define zeta potential.
- What is an acid-base indicator? Give an example.
- Give example of an intracellular and an extracellular buffer.
- State the First and Second Law of Thermodynamics.

Group B - Short Answer Type Questions (5 marks each)

- Biological applications of diffusion
- Determination of pH by glass electrode method.
- Gibbs Donnan membrane equilibrium and its physiological significance.
- Dialysis
- Difference between lyophilic and lyophobic colloid.
- Living body as a thermodynamic system.

Group C- Descriptive type. (8 marks each)

- (a) Define surface tension. Name two factors influencing surface tension.
(b) Briefly discuss the physiological significance of surface tension in alveoli. (2+2) +4
- (a) What is viscosity? Discuss the factors that contribute to blood viscosity.
(b) Describe the 'salting in' and 'salting out' properties of colloids. (1+3) +4
- (a) Derive Henderson -Hasselbach equation for buffer system and explain its significance.
(b) What are the components of the bicarbonate buffer system? Explain its role in maintaining blood pH. 4+(1+3)
- (a) Discuss the electrical properties of colloids.
(b) What is the Brownian movement?
(c) Mention one diagnostic and one therapeutic use of radioisotopes in medicine. (4+2+2)
- (a) Define entropy and enthalpy.
(b) What do you mean by Gibbs Free energy? How is standard free energy change (ΔG^0) related to the equilibrium constant (K) of a reaction? (2+2) + (2+2)

Paper SEC-I

Clinical Haematology, Ergonomics, and Histology

Unit I: Microscopy

Group A -Short definitive type (2 marks each)

1. Write Abbe's law.
2. What is numerical aperture of a microscope?
3. Define the term 'working distance' in the context of microscopy.
4. What is the role of a condenser in a compound microscope?
5. Define magnification.
6. Differentiate between brightfield and darkfield microscopy.
7. Mention one use each of upright and inverted fluorescence microscopes.
8. Mention one advantage and one disadvantage of a compound microscope.
9. What is the function of a polarizer in a polarizing microscope?
10. Define confocal microscopy.
11. Write one difference between SEM and TEM.
12. Mention one biological application of scanning electron microscopy.
13. What is TIRF microscopy? What is its main use?

Group B- Descriptive type. (8 marks each)

1. (a) Define resolution. Explain Abbe's law.
(b) Explain how magnification, contrast, and numerical aperture contribute to image quality. (3+5)
2. (a) Describe the principle and alignment steps of Köhler illumination.
(b) Discuss how Köhler illumination improves image contrast and uniformity. (4+4)
3. a) Compare brightfield, darkfield, and differential interference contrast (DIC) microscopy in terms of principle and application.
(b) Mention one advantage and one limitation of each technique. (5+3)
4. (a) Explain the principle, construction, and working of a compound microscope.
(b) List its advantages and disadvantages. (5+3)
5. (a) Discuss the principle of phase contrast microscopy.
(b) Explain how phase contrast microscopy enhances visualization of transparent specimens. (4+4)
6. (a) Describe the principle and construction of a fluorescence microscope.
(b) Write two major applications of fluorescence microscopy. (6+2)
7. (a) Explain the working principle of a polarizing microscope.
(b) Mention its advantages and biological applications. (4+4)
8. (a) Discuss the principle of a confocal laser scanning microscope.
(b) Write one advantages and one limitation of confocal microscopy. (6+2)
9. (a) Explain the principle of Total Internal Reflection Fluorescence (TIRF) microscopy.
(b) State its advantages in live-cell imaging. (6+2)
10. (a) Describe the construction and working of a Scanning Electron Microscope (SEM).
(b) Compare SEM and TEM in terms of image formation, resolution, and application. (5+3)
11. (a) Explain the principle, components, and image formation process of a Transmission Electron Microscope (TEM).
(b) Mention two limitations and two biological uses of TEM. (6+2)

Unit II: Histological Techniques

Group A -Short definitive type (2 marks each)

1. Name two physical and two chemical fixatives with examples.
2. What is the objective of fixation?
3. Mention two factors influencing the choice of fixatives.
4. What is the role of formalin in tissue fixation?

5. Define fixation artifact. Give an example.
6. What is decalcification and why is it done?
7. Mention two common agents used for decalcification.
8. What is dehydration? Name any two dehydrating agents.
9. Why is clearing necessary after dehydration?
10. Name two commonly used clearing agents .
11. What is embedding? Mention two media used for embedding.
12. Define microtome. Name any two types.
13. Write one use each of a rotary and rocking microtome.
14. What is a cryostat microtome used for?
15. What is a step section? How does it differ from a serial section?
16. Define a dye. Mention two examples of natural dyes.
17. Differentiate between acidic and basic dyes with examples.
18. What are mordants? Give one example.
19. What is a staining artifact? Give one cause.

Group B- Descriptive type. (8 marks each)

1. (a) Define fixation. State its objectives.
(b) Classify fixatives with suitable examples.
(c) Mention the choice of fixatives depending on tissue type. (3+3+2)
2. (a) Describe the chemical fixatives used in histological techniques.
(b) Explain how fixation artifacts arise and how they can be prevented. (4+4)
3. (a) Discuss the principle and importance of decalcification.
(b) Describe the methods and agents used for decalcification. (4+4)
4. (a) Explain the process of dehydration and its significance in tissue processing.
(b) Describe the role and selection criteria for clearing agents. (4+4)
5. (a) Explain embedding of tissues in paraffin wax and resin.
(b) Mention the advantages and limitations of paraffin embedding.
(c) What do you mean by paraffin impregnation? (4+2+2)
6. (a) State the principle and construction of rotary and rocking microtomes.
(b) Explain the working principle of cryostat and ultramicrotome. (4+4)
7. (a) Define and differentiate between thin, step, and serial sections.
(b) Outline the preparation and importance of serial sectioning in histology. (3+5)
8. (a) Classify dyes based on their chemical nature (acidic, basic, neutral, amphoteric). Give examples
(b) Mention two natural and two synthetic dyes used in histology.
(c) Discuss the role of mordants and accentuators. (4+2+2)
9. (a) Explain the differences between progressive and regressive staining.
(b) Write notes on vital and supravital staining. (4+4)
10. a) Describe the principle and procedure of hematoxylin and eosin (H&E) staining.
(b) Mention its advantages and limitations. (5+3)
11. (a) Explain the principle and application of Romanowski stains.
(b) Write the steps involved in the Leishman staining technique. (4+4)
12. (a) Discuss the principles and procedures of histochemical stains – Sudan III/IV/Black and PAS reaction.
(b) Mention two common staining artifacts and their causes. (5+3)

Unit III: Clinical Haematology-I

Group A -Short definitive type (2 marks each)

1. What is a haemocytometer? Mention its main use.
2. Name the different parts of a Neubauer's haemocytometer.
3. What is the function of the triple lines in the central square of a haemocytometer?

4. State the normal range of total RBC count in adult males and females.
5. Write the normal total leukocyte count.
6. Mention the normal platelet count in human blood. What is the average diameter of a platelet?
7. What is differential count? Why is it done?
8. Define Arneth count.
9. What is meant by a "shift to the left" in Arneth count?
10. Define PCV and mention its normal value.
11. What is MCV? Write its formula.
12. Define MCH and MCHC with their normal values.
13. What is ESR?
14. Mention two clinical conditions where ESR is increased.
15. Define polycythemia and leukocytosis.
16. What is leukopenia? Name one condition where it occurs.
17. What is thrombocytopenia and why is it clinically significant?
18. What is a complete hemogram?
19. State the principle of the Coulter counter used in automated haematology analyzers.
20. What is emergency granulopoiesis?

Group B- Descriptive type. (8 marks each)

1. (a) Describe the construction of a Neubauer's haemocytometer.
(b) Write the steps of RBC counting and the formula used for calculation. (4+4)
2. (a) Explain the method of total leukocyte count using a haemocytometer.
(b) Discuss the significance of variations in WBC count. (5+3)
3. (a) Describe the procedure for differential leukocyte count using a stained blood smear.
(b) Explain the principle and clinical interpretation of Arneth count. (4+4)
4. (a) Write the principle and procedure of platelet counting using a haemocytometer.
(b) Discuss the causes and significance of thrombocytopenia. (4+4)
5. (a) Define PCV and describe the microhematocrit method for its determination.
(b) Explain the importance of PCV in clinical diagnosis. (4+4)
6. (a) Define and derive the formulae for RBC indices – MCV, MCH, and MCHC.
(b) Discuss the significance of these indices in anemia diagnosis. (6+2)
7. (a) Explain the principle and method of determining ESR by Westergren's method.
(b) Mention the physiological and pathological factors affecting ESR. (5+3)
8. (a) Explain the concept of a complete hemogram.
(b) List the parameters included in an automated complete blood count (CBC). (3+5)
9. (a) Explain the working of an automated haematological analyzer based on the Coulter principle.
(b) Compare the Coulter method with optical (laser-based) analysis. (4+4)
10. (a) Describe the technique of bone marrow aspiration and its clinical indications.
(b) Explain the principles of Giemsa staining for bone marrow samples. (5+3)
11. (a) Define polycythemia. Explain its types and causes.
(b) Define leukocytosis and leukopenia. (4+4)
12. (a) What is emergency granulopoiesis? Describe the conditions under which it occurs.
(b) Discuss the physiological and clinical significance of this process. (4+4)

Unit IV: Clinical Haematology-II

Group A -Short definitive type (2 marks each)

1. Define anemia.
2. State two criteria used for the diagnosis of anemia.
3. Classify anemia based on etiology.
4. What is microcytic hypochromic anemia? Give one cause.

5. What is G6PD deficiency? Mention one clinical consequence of it.
7. State the role of G6PD in red blood cells.
8. Define anisocytosis and poikilocytosis.
10. Mention one hereditary disease in which (i) sickle-shaped RBCs and (ii) spherocytes are found.
11. What is thalassemia? Name its two main types.
12. Define glycated hemoglobin (HbA1c) and state its normal range.
13. What is the clinical significance of HbA1c?
14. Define leukemia. Mention its two major types.
15. What is lymphoma?
16. Define purpura. Mention one cause.
17. What is bleeding time? Mention one method of determination.
18. Define clotting time and mention one factor influencing it.
19. What is disseminated intravascular coagulation (DIC)?
20. Define D-dimer and state its diagnostic importance.

Group B- Descriptive type. (8 marks each)

1. (a) Define anemia. Describe its classification based on morphology and etiology.
(b) Write the diagnostic criteria of anemia. (5+3)
2. (a) Discuss the common causes, laboratory findings, and management of iron deficiency anemia.
(b) What is megaloblastic anemia. (6+2)
3. (a) Describe the biochemical basis and consequences of G6PD deficiency.
(b) Explain the pathophysiology and clinical features of pyruvate kinase deficiency. (4+4)
4. (a) Explain the terms anisocytosis and poikilocytosis with examples.
(b) Describe the morphological classification of abnormal RBCs in different anaemia. (4+4)
5. (a) Explain the pathophysiology of sickle-cell anemia.
(b) Describe the types, genetic basis, and clinical features of thalassemia. (4+4)
6. (a) Define glycated hemoglobin. Describe its formation and clinical relevance in diabetes mellitus.
(b) Mention its diagnostic advantages over fasting blood glucose. (5+3)
7. (a) Classify leukemia. Describe the haematological findings in acute and chronic leukemia.
(b) Write short note on the differences between leukemia and lymphoma. (5+3)
8. (a) Classify purpura and mention the causes of thrombocytopenic purpura.
(b) Discuss the clinical features of purpura. (6+2)
9. (a) Define and explain the methods for determination of bleeding time and clotting time.
(b) Discuss their clinical importance in bleeding disorders. (4+4)
10. (a) Explain the etiology and pathogenesis of Disseminated Intravascular Coagulation (DIC).
(b) Write short note on Vitamin K deficiency bleeding. (4+4)
11. (a) Compare and contrast Haemophilia and Von Willebrand Disease in terms of cause, inheritance, and clinical features.
(b) Explain the concept of hypercoagulability and its clinical significance. (5+3)
12. (a) Define fibrinogen degradation products and D-dimer.
(b) Explain their diagnostic value in thrombotic disorders.
(c) Describe the mechanism of action of thrombolytic agents (e.g., streptokinase, urokinase, tissue plasminogen activator). (3+2+3)

Unit V: Blood Groups and Blood Transfusion

Group A -Short definitive type (2 marks each)

1. Who discovered the ABO blood group system?
2. What are agglutinogens and agglutinins?
3. Name the antigen and antibody present in blood group AB.
4. What is the Bombay blood group?
5. What is the Rh factor? Why is it clinically important?
6. Define Rh incompatibility.

7. Name any two minor blood group systems.
8. What is the clinical significance of the Kell blood group system?
9. What is cross-matching?
10. What is a blood bank? Mention one of its key functions.
11. State two criteria for a healthy blood donor.
12. What is cryoprecipitate. What is it used for?
13. Mention the ideal storage condition for whole blood.
14. What is the shelf life of packed RBCs at 4°C?
15. Mention two important precautions to be followed during blood transfusion.
16. What is autologous blood transfusion?
17. What are volume expanders? Give one example.
18. Define erythroblastosis fetalis.

Group C- Descriptive type. (8 marks each)

1. (a) Explain the principle of the ABO blood group system and its inheritance pattern.
(b) Write short note on agglutination and its significance. (5+3)
2. (a) Describe the genetic and biochemical basis of the Bombay blood group.
(b) Discuss the role of the D antigen in Rh blood group system. (4+4)
(b) Describe the laboratory method for Rh typing and its interpretation. (4)
3. (a) Write short note on Kell, Duffy, and MN blood group systems mentioning their clinical relevance in blood transfusion practice. (3+3+2)
4. (a) What is the importance of cross-matching in transfusion safety?
(b) Describe the procedure of major and minor cross-matching. (3+5)
5. (a) Explain the concept of a modern blood bank.
(b) Write short note on donor selection criteria. (5+3)
6. (a) Describe the types of apheresis – RBC, plasma, platelet, and leukapheresis.
(b) Mention their therapeutic uses. (4+4)
7. Explain the use of cryoprecipitate.
(b) Describe the storage conditions and shelf life of different blood components. (2+6)
8. (a) Discuss the indications and precautions of blood transfusion.
(b) What are the immediate and delayed hazards of blood transfusion? (4+4)
9. (a) What is complement therapy? Discuss its principle and clinical applications.
(b) Write short note on artificial oxygen carriers.
(b) Mention one example of an approved complement-targeting drug. (4+3+1)
10. (a) Explain the mechanism, prevention, and treatment of erythroblastosis fetalis.
(b) Discuss the role of anti-D immunoglobulin in its prevention. (6+2)

Semester III Major

Paper: DSCC-3

(Digestive System, Nutrition and Dietetics)

Unit-I: Digestive system-I

Group A -Short definitive type (2 marks each)

1. What is ptyalin? Mention its source.
2. What is the function of a goblet cell in gastrointestinal tract?
3. Name two immune cells found in GALT.
4. State the location and function of Brunner's gland.
5. Name the enzymes secreted by the pancreas.
6. Define MALT.
7. Name the specialized cells of crypts of Lieberkühn.
8. Mention the type of epithelium present in the lining of the oesophagus and stomach.
9. Which hormone stimulates gallbladder contraction?
10. What is a portal triad?
11. Which salivary gland is purely serous in secretion?
12. Which salivary glands have demilunes?

Group B - Short Answer Type Questions (5 marks each)

Write short notes on

1. Histology of the liver lobule
2. Gastric mucosal barrier and its importance
3. Composition and functions of bile.
4. Role of GALT and MALT in gut immunity.
5. Composition and function of saliva.

Group C- Descriptive type. (8 marks each)

1. (a) What are the different cells found in gastric glands? Name their secretory products.
(b) Briefly discuss the mechanism of gastric HCL secretion. (2+2+4)
2. (a) Name the digestive enzymes secreted by the pancreas.
(b) Discuss the regulation of secretion of pancreatic juice. (3+5)
3. (a) Why is mesentery considered as a distinct organ? Mention its importance.
(b) Describe the composition of intestinal juice (succus entericus). (1+3+4)
4. (a) Compare the histology and secretory composition of submandibular and sublingual glands.
(b) What is the role of microvilli on the enterocytes? (6+2)
5. (a) Discuss the neural and hormonal control of gastric juice secretion,
(b) What is the function of Ampulla of Vater? (6+2)

Unit II: Digestive System-II

Group A -Short definitive type (2 marks each)

1. What is the deglutition reflex?
2. How is pepsinogen activated in stomach?
3. What is eubiosis and dysbiosis?
4. Define peristalsis.
5. What is the main cause of gastric reflux?
6. What triggers defecation reflex?
7. Which intestinal movement mixes chyme with digestive enzymes?
8. Name the neural plexus responsible for regulating intestinal movements.
9. Name the primary component of gallstones.
10. What is lactose intolerance?
11. Why does alkaline tide occur during gastric secretion?

12. Where is the vomiting centre located in brain?
13. State the full form of GER. Mention any two common symptoms.
14. What is hemolytic jaundice?

Group B - Short Answer Type Questions (5 marks each)

Write short notes on

1. Enterohepatic circulation
2. Basal electrical rhythm (BER).
3. Role of bile salts in fat digestion
4. Gut-brain axis.
5. Peptic ulcer.
6. Jaundice.

Group C- Descriptive type. (8 marks each)

1. (a) Discuss in brief the digestion of carbohydrates in the GI tract.
(b) What is the role of peptidases in intestinal brush border? (5+3)
2. (a) Explain the mechanism and physiological significance of peristalsis in the small intestine.
(b) Where is the vomiting centre located in the brain? (6+2)
3. (a) Discuss the process of protein digestion in GI tract
(b) Mention the physiological significance of pendular and segmental contraction. (5+3)
4. (a) Explain the process of 'glucose absorption from GI tract.
(b) Which salivary enzyme acts on carbohydrates? (6+2)
5. (a) Explain the composition of the gut microbiome. Mention its physiological role.
(b) What are the causes of irritable bowel syndrome (IBS)? (6+2)

Unit III: Fundamentals of Human Nutrition

Group A -Short definitive type (2 marks each)

1. What are simple and complex carbohydrates? Give one example of each.
2. Define limiting amino acids. Give an example from cereals or pulses.
3. What is meant by net protein utilization (NPU)? State the formula for calculating NPU.
4. What does PDCAAS stand for? Name one food with a PDCAAS value of 1.0.
5. Define visible and invisible fats with one example of each
6. Name two omega-3 fatty acids and their common dietary sources.
7. Why is the SDA of protein higher than that of carbohydrate and fat?
8. Define RQ.
9. Why do carbohydrates, protein and fat have different RQ values?
10. What is the protein sparing effect of glucose?
11. What is the digestibility coefficient?
12. What are the main components of Total Energy Expenditure (TEE)
13. State the normal range of Physical Activity Level (PAL) for a sedentary adult.
14. Define Calorific value of food. State its unit.
15. Mention an equation used to predict BMR (e.g., Harris-Benedict, Mifflin-St Jeor).

Group B - Short Answer Type Questions (5 marks each)

Write short notes on:

1. Dietary fibres and their physiological importance.
2. Glycaemic index of food.
3. Protein efficiency ratio (PER)
4. Biological value of proteins.
5. Health implications of trans fats
6. Positive and negative nitrogen balance

Group C- Descriptive type. (8 marks each)

1. (a) What is B.M.R? State the factors affecting BMR
(b) Explain the methods for calculating TEE in humans. (1+4+3)
2. (a) What is the recommended ratio of omega-6 to omega-3 fatty acids in a balanced diet?
(b) Explain the metabolic and nutritional significance of the omega-6/omega-3 balance in the human diet. (4+4)
3. (a) How is the 'gross energy' of food different from 'metabolic energy'? What are the Atwater general factors for carbohydrates, proteins, and fats?
(b) Mention the principle of the bomb calorimeter used in determining energy content of food. (2+2) +4
4. (a) Define essential fatty acids (EFA) and explain why they are called "essential."?
(b) Describe how carbohydrates and fats act as protein spacers. (2+2 +4)
5. (a) Discuss the role of MUFA and PUFA in maintaining cardiovascular health.
(b) Discuss the concept of supplementary action of proteins. (5+3)

Unit IV: Micronutrients**Group A -Short definitive type (2 marks each)**

1. Define prebiotics and give one dietary source of it.
2. Mention the coenzyme form of thiamine and mention one of its functions.
3. Name two vitamins synthesized by gut microbes.
4. Define bioavailability of nutrients. Mention two major factors affecting it.
5. What is hypervitaminosis? Mention a symptom of hypervitaminosis D.
6. Name two lactobacillus strains commonly used as probiotics.
7. Define synbiotics and state any two of their benefits.
8. Mention two enzymes dependent on zinc.
9. Name one nutrient-nutrient interaction that inhibits calcium absorption.
10. Why does consumption of raw egg cause biotin deficiency?
11. What is the main storage form of iron in the body?
12. Why vit-C deficiency leads to anemia?
13. Name two minerals that show antagonistic interactions during absorption.
14. Define postbiotics. Give examples.
15. Name one selenium-containing enzyme with antioxidant function.

Group B - Short Answer Type Questions (5 marks each)

Write short notes on

1. Role of fluoride in dental health
2. Zinc-copper interaction and its physiological consequences.
3. Nutritional benefits of Prebiotics
4. Antioxidant roles of vitamins C, and E.
5. Source and functions of Biotin.
6. Role of dietary carotenoids as antioxidants.
7. Metabolic functions of niacin.

Group C- Descriptive type. (8 marks each)

1. (a) Discuss the sources, and functions of vitamin A highlighting its role in vision and epithelial maintenance.
(b) Name the two flavin coenzymes derived from riboflavin.
(c) Which vitamin deficiency causes pellagra? (5+2+1)
2. (a) Discuss the absorption, transport, and storage of iron in the human body.
(b) State two functions of vitamin D in calcium homeostasis. (6+2)
3. (a) Define probiotics. Discuss their mechanisms of action in maintaining gut health.
(b) How phytates affect mineral absorption? (2+4)+2
4. (a) Describe the interaction between calcium and iron in dietary absorption and metabolism.

- (b) What are the neurological symptoms of vitamin B1 deficiency? (5+3)
5. (a) Name the dietary sources and physiological significance of flavonoids in humans.
(b) Name any two disorders associated with iodine deficiency. Why is iodine essential for brain development during foetal and early postnatal life? (4+1+3)

Unit V: Dietetics

Group A - Short definitive type (2 marks each)

1. Define RDA as per the latest ICMR guidelines.
2. State the difference between RDA and EAR.
3. What is the purpose of a food guide pyramid?
4. Define TUL. Give examples of two nutrients for which exceeding the TUL may cause toxicity.
5. Why is RDA usually higher than EAR?
6. Name two limitations of the '24-hour recall' dietary assessment method.
7. What is a Food Frequency Questionnaire (FFQ)? When is it more useful than 24-hour recall?
8. State two advantages of using a dietary exchange list in diet planning.
9. Name two essential amino acids commonly found in pulses.
10. Name two nutrients used in food fortification.
11. Mention one fat-soluble and one water-soluble vitamin present in milk.
12. Name two omega-3 fatty acids commonly found in fish.
13. Name two nutrients for which RDA changes significantly with age.
14. Name the primary nutrient of banana and spinach.
15. State the primary difference between plant protein (pulses) and animal protein (egg/fish).

Group B - Short Answer Type Questions (5 marks each)

Write short notes on

1. Role of the food guide pyramid in nutritional education.
2. Nutritional value of egg,
3. Starvation and its metabolic phases.
4. Formulation of a balanced diet for a lactating mother.
5. Importance of TUL in preventing nutrient toxicity,
6. Physiological consequence of obesity.
7. Personalized nutrition and its importance.

Group C- Descriptive type. (8 marks each)

1. Define a balanced diet. Discuss the important nutritional considerations while planning a diet for a pregnant woman. (2+6)
2. (a) What are dietary reference intakes? Discuss the importance of EAR and EER in assessing population nutrient needs.
(b) State the limitations of RDA. (1+4+3)
3. (a) Formulate a sample balanced diet chart for a growing child considering ICMR recommendations.
(b) What are functional foods? Explain with examples. (5+1+2)
4. (a) Explain the concept of food fortification. Describe the iodine, and vitamin A fortification programmes of India.
(b) State two physiological significances of root vegetables. (2+4+2)

Paper: DSCC-4

(Metabolism)

Unit 1: Metabolism 1

Group A - Short definitive type (2 marks each)

1. What is meant by amphibolic nature of the TCA cycle?
2. What is Cori cycle? State its significance.

3. Mention two metabolic fates of pyruvate.
4. State the metabolic significance of the Pentose Phosphate Pathway.
5. Differentiate between glycogenesis and glycogenolysis.
6. What is glycogenin?
7. Give example of an anaplerotic reaction.
8. What are the non-carbohydrate sources of gluconeogenesis?
9. Write briefly about the step of TCA cycle where substrate-level phosphorylation occurs.
10. What is UDPG?
11. What is the significance of phosphorylation of glucose at the beginning of glycolysis?
12. Why is oxidation of glucose via the TCA cycle more efficient than anaerobic glycolysis?
13. Name the rate-limiting enzymes of glycolysis.
14. Mention the locations of glycogen reserves of the body.

Group B - Short Answer Type Questions (5 marks each)

Write short notes on:

1. Aerobic vs. anaerobic fate of pyruvate.
2. Cori cycle.
3. Anaplerotic reactions
4. Glycogenolysis
5. Pyruvate dehydrogenase complex
6. Role of 2,3-bisphosphoglycerate in RBC function

Group C- Descriptive type. (8 marks each)

1. (a) Describe the energetics of glycolysis.
(b) Explain how glycolysis can proceed in the absence of oxygen in muscle tissue.
(5+3=8)
2. (a) Describe the Pyruvate Dehydrogenase complex and the reaction catalysed by it.
(b) Discuss how ATP/ADP and NADH/NAD⁺ ratios influence the rate of the TCA cycle.
(5+3=8)
3. a. Why is the phosphofructokinase-1 (PFK-1) step regarded as the key regulatory step in glycolysis?
b. Why is hexokinase inhibited by its own product while glucokinase is not?
c. Describe how fructose enters the glycolytic pathway. (3+3+2=8)
4. a. Why is the PPP particularly active in the liver, lactating mammary gland, and adrenal cortex?
b. How can the intermediates of PPP re-enter glycolysis?
c. Compare the oxidative and non-oxidative phases of PPP in terms of purpose and products.
(2+2+4=8)
5. a. Name the key bypass reactions of gluconeogenesis and explain their significance.
b. Why is gluconeogenesis not a simple reversal of glycolysis?
c. Name three gluconeogenic substrates. (5+2+1=8)
6. a. Describe the process of glycogen synthesis.
b. Why is glycogen synthesis more active in the fed state?
c. Compare glycogen synthesis and glycogenolysis in terms of energy requirement.
(5+1+2=8)

Unit-II Metabolism II

Group A -Short definitive type (2 marks each)

1. What are the fates of acetyl-CoA in lipid metabolism?
2. What is the significance of HMG-CoA reductase?
3. Mention the names of two additional enzymes for the β -oxidation of unsaturated fatty acids.

4. Why does phosphatidylcholine deficiency lead to fatty liver?
5. State the end-product/s of β -oxidation of palmitic acid/odd carbon fatty acids.
6. Explain the metabolic significance of ketone bodies.
7. What is the role of carnitine in fatty acid metabolism?
8. What is the fate of acetyl-CoA produced from β -oxidation during fasting?
9. Explain the role of NADPH in fatty acid and cholesterol synthesis.
10. Name the site (organelle and tissue) where β -oxidation of fatty acids occurs.
11. Why does a high-carbohydrate diet increase fat storage even when dietary fat intake is low?
12. Define de novo lipogenesis, mentioning the tissues it occurs most actively.

Group B - Short Answer Type Questions (5 marks each)

1. Ketone body synthesis
2. Carnitine shuttle
3. Biosynthesis of monounsaturated fatty acid
4. Ketoacidosis
5. β -oxidation of saturated vs unsaturated fatty acids.
6. Structural organisation of FAS complex.
7. Glyceroneogenesis

Group C- Descriptive type. (8 marks each)

1. a. Give an outline of the biosynthesis of cholesterol/fatty acid.
b. In which cellular compartment/s does cholesterol /fatty acid biosynthesis occur?
c. Name the rate limiting step. (6+1+1=8)
2. a. Where does β -oxidation occur in a cell?
b. Discuss the steps of β -oxidation, mentioning the type of reaction at each step.
c. Why does a deficiency of carnitine lead to muscle weakness? (1+5+2=8)
3. a. Compare the energy yield of the complete oxidation of glucose and palmitic acid.
b. Which of these two is the preferred source of energy, and why? (6+2=8)
4. a. Describe the biosynthesis of phosphatidylcholine.
b. How is phosphatidylcholine formed from phosphatidylethanolamine?

c. Where does the synthesis of phosphatidylcholine occur? (6+1+1=8)
5. a. Describe the synthesis of triglycerides.
b. In which tissues is triglyceride synthesis most active?
c. Why can the adipose tissue not use free glycerol directly for TAG synthesis? (5+2+1=8)
6. a. Differentiate between ketosis and ketoacidosis.
b. What is the advantage of ketone body formation during starvation?
c. What gives the characteristic "fruity" odour in diabetic ketoacidosis?
d. Discuss the utilisation of ketone bodies as a source of energy. (3+2+1+2=8)

Unit III: Metabolism III

Group A -Short definitive type (2 marks each)

1. Define glucogenic and ketogenic amino acids with one example each.
2. What is trans deamination?
3. Name the enzymes involved in oxidative deamination and transamination.
4. State the energy yield from one complete turn of the urea cycle.
5. What is a one-carbon pool? Mention one donor and one acceptor.
6. Name one important methyl group donor in transmethylation.
7. Name the end product of tryptophan metabolism.
8. Differentiate between oxidative and non-oxidative deamination.

9. Why is ammonia toxic to the brain?
10. Name the coenzyme common to all transaminases and mention its vitamin source.
11. What are the main end products of phenylalanine metabolism?
12. Name a proteinogenic and a non-proteinogenic amino acid intermediate of the urea cycle.
13. Name the cellular compartments where CPS I and CPS II operate and state one major difference in their nitrogen source.

Group B - Short Answer Type Questions (5 marks each)

Write short notes on:

1. Amino acid pool
2. Transdeamination
3. Urea cycle and its energetics
4. One-carbon metabolism and its biological significance
5. Metabolism of methionine and its relation to transmethylation
6. Metabolism of glycine and its significance
7. De novo and salvage pathways of purine biosynthesis
8. Catabolism of purines and pyrimidines

Group C- Descriptive type. (8 marks each)

1. Describe the urea cycle. State the significance of urea formation in humans. (5 + 3)
2. Explain oxidative deamination and transamination. How are these two reactions functionally linked in amino acid catabolism? (5 + 3)
3. Outline the metabolism of tryptophan. Mention the significance of its end products. (5 + 3)
4. Discuss one-carbon metabolism and its significance in amino acid and nucleotide synthesis. (4 + 4)
5. Discuss the de novo synthesis of purine nucleotides. Mention the sources of atoms of the purine ring. (5 + 3)
6. Outline the degradation pathway of purine and pyrimidine nucleotides naming the key enzymes and the end products. (4+4).
7. Describe the de novo biosynthesis of pyrimidine nucleotides, mentioning the sequence of reactions and enzymes involved. Differentiate between de novo and salvage pathways of pyrimidine nucleotide synthesis. (5+3)

Unit IV: Biological Oxidation, Oxidative stress & antioxidants

Group A -Short definitive type (2 marks each)

1. Define redox potential.
2. What is substrate-level phosphorylation?
3. Name any two inhibitors of the electron transport chain.
4. What is the role of coenzyme Q in ETC?
5. Define oxidative phosphorylation.
6. Mention one example each of an inhibitor and uncoupler of Oxidative phosphorylation.
7. What are reactive oxygen species (ROS)?
8. Define an antioxidant and give one example.
9. What is the chemiosmotic hypothesis?
10. Why mitochondria are called the “powerhouses” of the cell?
11. Name two major reactive oxygen species (ROS) and mention their sources.
12. What is the significance of redox potential in the electron transport chain?
13. Mention one physiological and one pathological source of reactive oxygen species (ROS).

Group B - Short Answer Type Questions (5 marks each)

Write short notes on:

1. Redox potential and its biological significance
2. Oxidative phosphorylation
3. Chemiosmotic hypothesis
4. Inhibitors and uncouplers of ETC
5. High-energy compounds
6. Oxidative stress and oxidative damage
7. Free radicals: types and sources
8. Antioxidants and their role in the defence mechanism

Group C- Descriptive type. (8 marks each)

1. Describe the organization and function of the electron transport chain. Discuss its role in ATP synthesis. (5 + 3)
2. Explain the chemiosmotic hypothesis of oxidative phosphorylation. Mention the effect of one inhibitor and one uncoupler of oxidative phosphorylation. (5 + 3)
3. Describe the generation of free radicals in biological systems. Differentiate between free radicals and non-radical oxidants with examples. (5 + 3)
4. Discuss the generation of free radicals and oxidative stress. Add a note on antioxidants. (5 + 3)
5. Explain substrate-level and oxidative phosphorylation with suitable examples. (4 + 4)
6. What are the biological consequences of oxidative damage to cell membranes and DNA? Discuss the mechanism of action of two enzymatic and two non-enzymatic antioxidants. (3 + 5)
7. Describe how the structure of the mitochondrion helps in linking electron transport with ATP synthesis. What will happen to oxygen consumption and ATP production if the mitochondrial membrane is broken? Explain. (5+3)

Unit V: Common metabolic disorders

Group A -Short definitive type (2 marks each)

1. Name two glycogen storage diseases with enzyme defects.
2. What causes phenylketonuria?
3. What is the characteristic odour of urine in Maple Syrup Urine Disease?
4. Define dyslipidaemia.
5. What is gout?
6. Name two lysosomal storage diseases.
7. What is Wilson's disease?
8. Distinguish between hemochromatosis and Wilson's disease.
9. Why does hyperuricemia occur in gout?
11. Why does hypoglycemia occur in Von Gierke's disease even though liver glycogen content is increased?
12. Name the deficient enzyme and the major organ affected in Pompe's disease.
13. What is the metabolic defect in Phenylketonuria (PKU) ?
14. Why does the urine of a patient with Maple Syrup Urine Disease have a characteristic odour?
15. What are the main diagnostic criteria of Metabolic Syndrome?

Group B - Short Answer Type Questions (5 marks each)

Write short notes on:

1. Von Gierke's disease
2. Pompe's disease
3. Phenylketonuria

4. Maple syrup urine disease
5. Lysosomal storage disorders
6. Gout and hyperuricemia
7. Metabolic syndrome (MetS)

Group C- Descriptive type. (8 marks each)

1. Describe the etiology and biochemical basis of glycogen storage diseases with examples. (5 + 3)
2. Explain the biochemical defects and clinical features of phenylketonuria and maple syrup urine disease. (4 + 4)
3. Discuss the biochemical basis of gout. Add a note on its relation to purine metabolism. (5 + 3)
4. Explain the metabolic and clinical features of Metabolic Syndrome. Discuss its relation to oxidative stress. (5 + 3)
5. Write notes on hemochromatosis and Wilson's disease highlighting their metal metabolism abnormalities. (4 + 4)

Paper: SEC-3

(Tools and Techniques in Community Physiology)

Unit I: Epidemiology

Group A -Short definitive type (2 marks each)

1. Define epidemiology.
2. Mention two applications of epidemiology in public health.
3. What is the difference between incidence and prevalence?
4. Define primary data with one example.
5. Define secondary data with one example.
6. What is a cross-sectional study?
7. Define longitudinal study and give one example.
8. What is a cohort study?
10. What is a rate in epidemiology? Give one example.
11. Define ratio and proportion in epidemiological terms.
12. Define crude birth rate.
13. Define crude death rate.
14. What is infant mortality rate (IMR)?
15. Define maternal mortality rate (MMR).
16. What is under-five mortality rate?
17. Define life expectancy.
18. What is growth monitoring?
19. What is the purpose of growth charts?
20. Define endemic, epidemic, and pandemic diseases.

Group B- Descriptive type. (8 marks each)

1. (a) Define epidemiology and describe its aims and scope.
(b) Discuss its applications in understanding disease trends and prevention. (4+4)
2. (a) Differentiate between primary and secondary data in epidemiological studies.
(b) Discuss the advantages and limitations of each data source. (3+5)
3. (a) Describe the design, advantages, and limitations of cross-sectional/case-control studies.
(b) Compare them with longitudinal studies. (4+4)
4. (a) Explain the concept, methodology, and significance of cohort studies.
(b) Distinguish between prospective and retrospective cohorts with examples. (5+3)
5. (a) Explain the epidemiological concepts of rates, ratios, and proportions with suitable examples.

- (b) Describe their importance in assessing community health. (5+3)
6. (a) Define crude birth rate and crude death rate and explain how they are calculated.
(b) Discuss their role in determining population health status. (4+4)
7. (a) Define and describe infant, child, and maternal mortality rates.
(b) Discuss the factors affecting these rates in India. (5+3)
8. (a) Explain the concept and importance of under-five mortality rate and life expectancy.
(b) Discuss their role as indicators of socioeconomic development. (4+4)
9. (a) Describe the methods of growth monitoring and interpretation of growth charts.
(b) Explain their importance in paediatric health care. (5+3)
10. (a) Define and explain the terms endemic, epidemic, and pandemic with suitable examples.
(b) Discuss the role of epidemiological surveillance in disease control. (6+2)
11. (a) Describe the concept of disease epidemiology.
(b) Explain the stages of disease occurrence and control strategies. (3+5)
12. (a) Explain how epidemiological data help in public health policy formulation.
(b) Write short note on disability-adjusted life year (DALY). (5+3)

Unit 2: Community nutrition

Group A -Short definitive type (2 marks each)

1. What are the major nutritional requirements during adolescence?
2. Mention two common nutritional deficiencies in adolescents.
3. State two physiological changes during adolescence that affect nutrient needs.
4. What are the key nutritional concerns in the geriatric population?
5. Mention two factors influencing nutrient absorption in elderly individuals.
6. Define diet therapy.
7. What is a therapeutic diet? Give one example.
8. Mention two principles of diet therapy.
9. Classify therapeutic diets based on nutrient modification.
10. What is meant by texture-modified diet? Give one example.
11. What are the dietary management principles for obesity?
12. Name two dietary changes recommended for diabetes mellitus.
13. Mention two dietary guidelines for hypertensive patients.
14. Define nutritional anaemia.
15. Mention two dietary sources of iron suitable for anaemic individuals.
16. What is a gluten-free diet? Mention one condition where it is used.
17. What is lactose intolerance? Name an enzyme deficient in this condition.
18. What are the main principles of a renal diet?
19. What is the DASH diet and what is its purpose?
20. Define keto diet and mention one physiological effect of ketosis.

Group B- Descriptive type. (8 marks each):

1. (a) Describe the nutritional requirements and dietary guidelines for adolescents.
(b) Discuss the role of balanced diet in promoting adolescent health. (5+3)
2. (a) Explain the physiological and metabolic changes during ageing that influence nutrition.
(b) Describe dietary management and supplementation strategies for the geriatric population. (4+4)
3. (a) Define diet therapy and state its objectives.
(b) Classify therapeutic diets based on nutrient restriction, modification, and texture. (3+5)
4. (a) Discuss the principles of planning therapeutic diets for hospitalized patients.
(b) Explain how food texture and consistency are modified in therapeutic diets. (4+4)
5. (a) Describe the nutritional concerns, and causes of obesity.
(b) Write short note on calorie restriction and behavior modification in obesity management. (4+4)

6. (a) Explain the dietary management of diabetes mellitus.
(b) Describe the role of glycaemic index in diabetic diet planning. (5+3)
7. (a) Discuss the pathophysiological basis and dietary management of hypertension.
(b) Write short note on the DASH diet. (5+3)
8. (a) Define nutritional anaemia and describe its types.
(b) Discuss dietary strategies for prevention and management of nutritional anaemias. (4+4)
9. (a) Explain the principles, foods allowed, and restricted items in a gluten-free diet.
(b) Describe the dietary management of lactose intolerance. (4+4)
10. (a) Write the composition, principles, and indications for a renal diet.
(b) Mention foods restricted in renal failure and their physiological rationale. (5+3)
11. (a) Explain the biochemical principles of the ketogenic (keto) diet.
(b) Discuss its therapeutic applications and possible side effects. (4+4)
12. (a) Write short notes on the following special diets:
(i) Autoimmune Protocol Diet and (ii) Renal diet (4+4)

Unit 3: Anthropometry & Its Application

Group A -Short definitive type (2 marks each)

1. Define anthropometry.
2. Name the three main types of anthropometries.
3. What is static anthropometry? Give one example.
4. What is dynamic anthropometry? Give one example.
5. What is Newtonian anthropometry?
6. Mention two applications of anthropometry in human physiology.
7. What are standard postures in anthropometric measurement?
8. Define the term "body dimension" in anthropometry.
9. What is stature?
10. What do you mean by "sitting height"?
11. Define "mid-upper arm circumference (MUAC)."
12. Define BMI and give its formula.
13. What is waist-hip ratio (WHR)?
14. State the significance of skinfold thickness indicate.
15. Define "weight-for-age". Mention its clinical importance.
16. What is meant by "height-for-age"?
17. Define stunting and wasting.
18. What are the normal ranges for BMI in adult male and female?
19. Define "head circumference" and mention its clinical importance.
20. Mention any two uses of anthropometry in assessing nutritional status.

Group B- Descriptive type. (8 marks each)

1. (a) Define anthropometry and discuss its objectives.
(b) Classify anthropometry with examples. (5+3)
2. (a) Explain the principles and importance of standard postures in anthropometric measurements.
(b) Describe the precautions to be taken while taking anthropometric measurements. (4)+4
3. Discuss the role of static and dynamic anthropometry in ergonomics and physiological research. (4+4)
4. (a) Define the following anthropometric measures- height, length, girth, and skinfold thickness.
(b) Explain how these dimensions are used to assess body build. (4+4)
5. (a) What do you mean by segmental anthropometry?
(b) Discuss their applications in growth assessment and ergonomic design. (3+5)
6. (a) Explain the principles and procedures for measurement of body weight and height.
(b) Describe the significance of weight-for-age and height-for-age indices. (4+4)

7. (a) Define and explain "weight-for-height" index.
(b) Discuss its role in identifying wasting and stunting in children. (3+5)
8. (a) Explain the procedure and interpretation of mid-upper arm circumference (MUAC) measurement.
(b) Discuss its advantages and limitations as a screening tool for malnutrition. (4+4)
9. (a) Describe the principles, measurement, and classification of BMI.
(b) Mention the physiological significance and drawbacks of BMI in adults and children. (5+3)
10. (a) Define waist-hip ratio (WHR) and describe its measurement.
(b) Discuss the significance of WHR in assessing central obesity and health risks. (4+4)
11. (a) Describe the procedure for measurement of skinfold thickness at different sites.
(b) Explain how skinfold thickness is used to estimate body fat percentage. (5+3)
12. (a) Define ponderal index. State its significance and drawbacks.
(b) Explain how anthropometric indicators are used to monitor child growth and nutritional status. (4+4)

Unit 4: Biostatistics-I

Group A -Short definitive type (2 marks each)

1. Define biostatistics.
2. Mention two applications of biostatistics in physiology.
3. What are qualitative variables? Give one example.
4. Differentiate between qualitative and quantitative variables.
5. Define population and sample.
6. What is a sampling technique?
7. Name any two common methods of sampling.
8. Define class interval in data organization.
9. What is meant by class limit?
10. What is a frequency distribution table?
11. Name two graphical methods of data presentation.
12. What is a pie diagram and when is it used?
13. Define mean and median.
14. Define mode. State its significance.
15. Distinguish between range and interquartile range.
16. Define standard deviation and coefficient of variance.
17. What is meant by standard error of the mean?
18. Define z-score.
19. What is meant by degrees of freedom?
20. Define percentile rank.
21. What do you mean by confidence interval?

Group B- Descriptive type. (8 marks each)

1. (a) Define biostatistics and describe its scope in biological research.
(b) Discuss any five important applications of biostatistics in physiology or public health. (3+5)
2. (a) Classify variables with suitable examples.
(b) Explain the difference between qualitative and quantitative variables in the context of biological data. (4+4)
3. (a) Define population and sample with examples.
(b) Give a brief description of the following sampling techniques: random, stratified, and systematic sampling. (2+6)
4. (a) Discuss the importance of data organization in biostatistics.
(b) Define class, class limit, and class interval. Explain with an example how a frequency distribution table is prepared. (2+2+4)

5. (a) What are the graphical methods of presenting data? State the significance of graphical representation of data.
(b) Explain the construction and uses of bar diagram/ pie chart/ histogram. (2+2+4)
6. (a) Explain the merits and demerits of each measure of central tendency.
(b) Define quantiles and give 2 examples. (6+2)
7. (a) Differentiate between range, variance, and standard deviation.
(b) Explain the significance of measures of dispersion in biological data interpretation. (4+4)
8. (a) Define quartile deviation and interquartile range.
(b) Explain percentile ranks and percent coefficient of variation with examples. (3+5)
9. (a) Define standard error of the mean.
(b) Discuss its relationship with sample size and standard deviation.
(c) Explain the importance of confidence interval in biostatistical analysis. (3+2+3)
10. (a) What is a standard-score?
(b) State the formula for z-score and explain its use in standardizing data.
(c) Discuss its importance in comparing data from different distributions. (2+3+3)
11. (a) Define degrees of freedom.
(b) Explain its significance.
(c) Discuss how degrees of freedom change with sample size. (2+3+3)
12. (a) Write short notes on the following:
(i) Frequency polygon (3) and (ii) Confidence interval
(b) Discuss the importance of biostatistics in interpreting experimental data in physiology. (3+3+2)

Unit 5: Public Hygiene and First Aid

Group A -Short definitive type (2 marks each)

1. Define food safety.
2. Define water potability.
3. Mention two major sources of potable water.
4. Name two common water-borne diseases.
5. State two symptoms of cholera.
6. Name the causative organism of amoebiasis.
7. What is the mode of transmission of hepatitis A?
8. Name any two preventive measures for rotavirus diarrhoea.
9. Define hygiene.
10. Differentiate between personal hygiene and community hygiene.
11. What is culinary hygiene?
12. Mention two microbial standards used for assessing food safety.
13. Define solid waste management.
14. What is incineration?
15. Define composting.
16. What is meant by "activated sludge process"?
17. Name two steps involved in primary treatment of sewage.
18. Define first aid.
19. Mention the contents of a standard first aid kit.
20. State two important steps in CPR.

Group C- Descriptive type. (8 marks each)

1. (a) Define food and water safety and describe their importance in community health.
(b) Discuss the sources of potable water and factors determining water quality. (3+5)
2. (a) What are the common causes of water-borne infections?
(b) Describe the causative organism, symptoms, mode of transmission, and prevention of cholera and bacillary dysentery. (2+6)

3. (a) Write short notes on: (i) Hepatitis A ; (ii) Rotavirus diarrhoea
(b) Compare bacterial and viral causes of food and water-borne diseases with examples. (2+2+4)
4. (a) Explain the etiology, symptoms, and prevention of amoebiasis and salmonellosis.
(b) Discuss the public health importance of food hygiene in preventing these diseases. (5+3)
5. (a) Define hygiene. Classify hygiene with examples.
(b) Describe the importance of personal, community, and medical hygiene in disease prevention. (1+2+5)
6. (a) Define microbial standards for food and water.
(b) Explain how these standards are used to assess the safety of drinking water and consumable food items. (3+5)
7. (a) Define and describe the basic methods of solid waste disposal: burning, incineration, pyrolysis, and landfilling.
(b) Explain composting and vermiculture as eco-friendly waste management techniques. (5+3)
8. (a) Discuss the principles and steps involved in primary, secondary, and tertiary treatment of sewage.
(b) Describe the trickling filter method and its advantages. (5+3)
9. (a) Define first aid and discuss its importance in emergency situations.
(b) Explain the classification and management of wounds. (1+2+5)
10. (a) What are the different types of burns?
(b) Describe the methods for assessment of burn severity and outline first aid management for burn victims. (2+6)
11. (a) Write the steps involved in cardiopulmonary resuscitation (CPR).
(b) Discuss first aid measures in cases of drowning. (5+3)
12. (a) Outline first aid measures for poisoning caused by: (i) Snake bite (ii) Insect bites or stings
(b) Describe the general principles of first aid in poisoning cases. (2+2+4)

Semester V Major

Paper: DSCC-9

(Special Senses, Biomedical Techniques, Aviation and Space Physiology)

Unit-I: Fundamentals of Special Senses and Chemical senses

Group A -Short definitive type (2 marks each)

1. Mention the characteristics of special senses.
2. What are olfactory rods?
3. State the function of periglomerular short axons.
4. Mention two salient features of olfactory receptor cells.
5. What do you mean by olfactory fatigue?
6. What is hyposmia?
7. Mention the function of tufted cells in the olfactory pathway.
8. What is the olfactory tubercle?
9. Name the fifth taste sense.
10. What is familial dysautonomia?
11. What are anosmia and hyposmia?

Group B - Short Answer Type Questions (5 marks each)

1. Write a short note on olfactory adaptation.
2. Write a short note on olfactory coding.
3. How do we sense salt/bitter/sweet/sour taste?
4. Write down a short note on gustatory adaptation.
5. Write a short note on: Gustatory coding

Group C- Descriptive type. (8 marks each)

1. Differentiate between general and special senses. Describe the structure of an olfactory receptor. 3+5
2. Outline the olfactory pathway. What do you understand by microsmatic and microsmatic olfactory senses? Give suitable examples. 5+(2+1)
3. How do we sense different odoriferous substances? Name one inhibitory neurotransmitter secreted in the olfactory pathway. Mention its site of secretion. 6+1+1
4. Mention unique features of olfaction. Give a comparative account of different gustatory papillae. 3+5
5. Outline the neural pathway that carries taste sensations from receptors to the centre. What is after taste? 6+2

Unit II: Audition**Group A -Short definitive type (2 marks each)**

1. Define the pitch of a sound.
2. Name the auditory ossicles.
3. What is the tympanic membrane?
4. Why is the Eustachian tube also called the pharyngotympanic tube?
5. State the function of the Eustachian tube.
6. What is a helicotrema?
7. Name the two components of the labyrinth.
8. What is the secondary tympanic membrane?
9. What is reticular lamina?
10. What is the assumption of the duplex theory of pitch discrimination?
11. Compare endolymph and perilymph.

Group B - Short Answer Type Questions (5 marks each)

1. Name the two skeletal muscles of the middle ear. Mention their functions. 2+3
2. What are Reissner's and basilar membranes? State their functions. 2+3
3. Write a short note on endolymphatic potential 5
4. State the characteristics of the cochlear microphonic potential. State its clinical significance. 3+2
5. The tympanic membrane acts as a pressure receiver...'Justify the statement. What is the Volley principle? 3+2
6. Briefly describe the proposed mechanisms of impedance matching in ear.
7. Illustrate the neurophysiological basis of intensity discrimination in ear. 5
8. Write a short note on deafness 5
9. Describe the factors determining sound localization. 5
10. Write a short note on audiometry. 5

Group C- Descriptive type. (8 marks each)

1. Outline the neural pathway that carries the auditory sensation from the periphery to the centre. 6
2. Give a brief account of the mechanism of stimulation of hair cells. Name the components of vestibules. 6+2
3. Give an account of the factors affecting the pitch of a sound wave. What is presbycusis? 5+3
4. Give a brief illustration of the mechanism of pitch discrimination. How do you calculate decibels? 5+3
5. State the functions of endolymph and perilymph. What is the tectorial membrane? State the function of phalangeal cells and Deiter's cells. 2+2+2+2

Unit III: Vision

Group A -Short definitive type (2 marks each)

1. What is fovea centralis?
2. State any two functions of the vitreous humor.
3. Why is retinal detachment so damaging to the receptor cells?
4. What is Wernicke's papillary reflex?
5. What is glaucoma?
6. What do you understand by macular sparing?
7. What is visual agnosia?
8. What is presbyopia?
9. What do you mean by cataract?
10. What is the Purkinje shift?

Group B - Short Answer Type Questions (5 marks each)

1. Write down a short note on crystalline lens. 5
2. Name the major types of movement of eyeball. State the function of the frontal eye field. 2+3
3. Describe the route of circulation of the aqueous humor. 5
4. Trace out the visual pathways. 5
5. Write a short note on visual acuity/papillary light reflex/Argyll-Robertson pupil/accommodation/the critical fusion frequency/Ferry-Porter law. 5
6. Write down a short note on astigmatism. 5
7. Write a short note on light adaptation/dark adaptation/colour blindness. 5
8. Describe the opponent theories of colour vision. 5

Group C- Descriptive type. (8 marks each)

1. What are the major functions of the sphincter papillae and the dilator papillae? What are the electrical changes in the retina on exposure to light? 2+6
2. What are photopic, scotopic, and mesopic visions? State any two functions of the iris. 2+2+2+2
3. What are the drawbacks of the trichromatic theory of colour vision? What are the corresponding points? What is the sensitivity range of vision? 4+2+2
4. Briefly describe the histology of the retina with a labelled diagram. What do you mean by the paradoxical adaptation? 4+2+2
5. How does phototransduction occur in the retina? What is the blood-aqueous barrier? Mention the composition of the aqueous humor. 4+2+2
6. What are myopia and hypermetropia? What are spherical and chromatic aberrations? (2+2)+(2+2)
7. Give an account of the effects of lesions of the visual pathways. What do you understand by 'half visual centre'? 6+2
8. Describe the photochemical changes in the retina that occur on exposure to light. Mention the locations of the visuo-psychic area and the occipital eye field. 6+2

Unit IV: Biomedical techniques

Group A -Short definitive type (2 marks each)

1. What is the difference between soft and hard X-rays?
2. How do you remove the artifacts in the EEG?
3. State the role of the ground electrode in the recording of EEG.
4. Mention two clinical applications of EEG
1. What are the limitations of the ERG?
2. What is an electromyogram used to diagnose?

3. What signal is detected by the EMG?
4. What is the frequency range of EMG?
5. What are the sources of noise in EMG?
6. What is the input impedance of EMG?
7. How much radiation is in a CT scan?
8. Mention two risks of a CT scan.
9. Name the types of MRI.
10. What is black on MRI?
11. What is echo time in an MRI?

Group B - Short Answer Type Questions (5 marks each)

1. What are the advantages of the use of X-rays in health care practices? What are the roles of the collimator and monochromator? What is the best position to sleep with an artificial pacemaker? 2+2+1
2. State the advantages and disadvantages of EEG. Mention the common applications of the ERG. 3+2
3. What happens when EMG is negative? What is the F response in EMG? Mention the factors affecting the recording of EMG. 2+1+2
4. Mention the applications of USG. What is the voltage of an EMG? 3+2
5. What is the C wave in the ERG? State its clinical relevance. What is an artificial pacemaker used for? 2+2+1

Group C- Descriptive type. (8 marks each)

1. Describe major applications of X-rays in health care practices. State the basic principle of a dialyzer. State the disadvantages of a dialyzer. 4+2+2
2. What to avoid with an artificial pacemaker? Do you prefer a blood thinner with an artificial pacemaker? Justify your answer. State the basic principle of USG. 3+2+3
3. What liquid is used in USG? State the advantage of MRI over CT scan. State the common applications of a CT scan. What is a dialyzer? 1+2+3+2
4. State the principle of CT scans. What are the common signs a patient's artificial pacemaker needs replacing? How can the risks of X-rays be reduced?
5. Mention any two disadvantages of the use of X-rays in health science. State the basic principle of EMG. What is the most common complication after permanent pacemaker placement? 2+3+3

Unit V: Aviation and Space Physiology

Group A -Short definitive type (2 marks each)

1. In which layer of the atmosphere do aircraft fly?
2. Define linear acceleration and deceleration in the context of aviation.
3. What is meant by the physiological deficient zone in the atmosphere?
4. What g force causes blackout in an aviator?
5. State the cause of red out during negative acceleration.
6. What is the full form of GLOC?
7. Define TUC. At what altitude does the TUC typically fall below 1 minute?
8. State two factors that influence TUC at a given altitude.
9. Who was the first human to travel to space, and in which year?
10. Who was the first human to walk on the moon? and in which year?
11. What is microgravity? Where can it be felt?
12. Mention any two sources of space radiation that astronauts are exposed to.
13. What does EVA stand for in space?
14. What is the recommended daily protein intake for astronauts?
15. What do you mean by cardiovascular deconditioning in astronauts?

Group B - Short Answer Type Questions (5 marks each)

Write short notes on

1. Acceleration in different body axes (Gx, Gy, and Gz)
2. Space motion sickness (SMS)
3. Altitude induced decompression sickness.
4. Effects of microgravity on the digestive system.
5. Nutritional challenges in space missions.
6. Spatial disorientation in aviation.
7. Jet lag.

Group C- Descriptive type. (8 marks each)

1. Describe the physical and physiological zones of the atmosphere. 4+4
2. Describe the effects of vertical linear acceleration and deceleration on the human body. 4+4
3. What do you mean by cosmic radiation? Discuss the acute and chronic effects of cosmic radiation on humans during space missions. 2 +6
4. Discuss the physiological basis of bone demineralization due to long term microgravity exposure. Discuss the effects of microgravity on the cardiovascular system. 4+4
5. Briefly discuss the strategies associated with space nutrition. Why is space farming important for the nutrition of astronauts? 4+4
6. Why is post-mission rehabilitation important for astronauts? Discuss the components of post-mission rehabilitation. 2+6
7. What are the characteristics of space food? Why are high-sodium foods avoided in diets during spaceflight? 5+3

Paper: DSCC-10

(Higher Functions of Brain, Neuroendocrinology, Neurodegeneration and Chronobiology)

Unit-I: Higher functions of brain**Group A -Short definitive type (2 marks each)**

1. What is the delayed conditioned reflex?
2. What is agraphia?
3. What is dyslexia/amnesia/insomnia/sleep apnoea?
4. Mention the anatomical location of the basal forebrain sleep zone.
5. What do you understand by the intracortical transfer of memory?
6. What is the significance of the theta wave?
7. Why is explicit memory also called declarative memory?

Group B - Short Answer Type Questions (5 marks each)

1. Briefly describe the types of declarative memory.
2. Write a short note on Consolidation of Memory.
3. State the key characteristics of REM sleep waves.
4. Write a short note on operant conditioning.
5. Write a short note on synaptic plasticity.
6. Write a short note on motor speech centers/aphasia/narcolepsy.
7. Give a brief account of behavioural and ECG changes during different phases of sleep. .

Group C- Descriptive type. (8 marks each)

1. What do you understand by 'working memory'? Differentiate between explicit memory and implicit memory. What is the déjà vu phenomenon? 3+3+2
2. What is senile dementia? What are the categorical and representational hemispheres in the context of speech? What is retrograde amnesia? 2+(2+2)+2
3. Discuss the neural mechanism of control of the sleep-wakefulness cycle. What is dysarthria? 6+2
4. What are positive and negative reinforcement? Why is the REM sleep also called paradoxical sleep? What is the ponto-geniculo-occipital spike? 2+2+2+2
5. Describe the mechanism of generation of synchronization during NREM. Describe the physiological basis of the genesis of REM sleep. 4+4

Unit II: Neuroendocrinology**Group A -Short definitive type (2 marks each)**

1. What is neuroendocrinology?
1. What are Hering bodies?
2. What is positive feedback regulation of hormone secretion? give one example.
3. State the difference between hypothalamo-hypophyseal portal system and hypothalamo-hypophyseal nerve tract.
4. Why are ADH and oxytocin called neurohormones?
5. State the difference between magnocellular and parvocellular neurosecretory cells.
6. State the differences between neural vs. endocrine signalling in terms of specificity and duration.
7. What do you mean by circumventricular organs?
8. State the modern definition of neurosecretion. Give two examples.
9. Give one example of non-neuronal supporting cells in hypothalamus. State its function.
10. Distinguish between periventricular hypothalamus and paraventricular nucleus of hypothalamus.
11. Which portion of the neurohypophysis is critical to the normal function of anterior pituitary and why?
12. What is sub-commissural organ? State its function.
13. What do you mean by neuroendocrine axis?

Group B - Short Answer Type Questions (5 marks each)

1. Write a short note on types and classes of feedback regulation in neuroendocrinology with example
2. Hypothalamus is a neuroendocrine organ – justify the statement
3. Write a short note on types and distribution of hypothalamic neurosecretory cells
4. Write short note on blood-supply, structure and functions of median eminence
5. Write a short note on location and functions of OVLT and area postrema
6. Write short note on tubero-infundibular dopaminergic (TIDA) system and prolactin secretion.

Group C- Descriptive type. (8 marks each)

1. Describe the role of somatostatin on neuroendocrine regulation of growth hormone secretion. mention a few biologic actions of somatostatin outside the CNS. 5+3
2. Describe the pituitary and extra-pituitary functions of CRH with special reference to mechanism of action. Where are CRH-secreting neurones located in the CNS? 6+2
3. State the number and location of GnRH neurons. State its role on the regulation of reproductive axis mentioning the importance of its pulsatile release. 2+6
4. Describe the chemistry of GHRH and its receptor. State its pituitary and extra-pituitary effects with special reference to its mechanism of action. 3+5
5. Discuss the anatomic characteristics of hypothalamic-pituitary unit. How do endocrine rhythms influence hypophysiotropic hormone release? 4+4
6. Discuss how the different hypothalamic nuclei being the higher centres for autonomic nervous system contribute to endocrine control? What do you mean by GnRH pulse generator? 6+2

Unit III: Neurodegenerative disorder

Group A -Short definitive type (2 marks each)

1. What are amyloid beta plaques?
2. State the functions of tau protein in the brain.
3. What is amyloidosis?
4. Mention any two symptoms of Amyotrophic Lateral Sclerosis.
5. Name the types of Multiple sclerosis.
6. Mention any two biomarkers of Alzheimer's disease.
7. Name two tests for diagnosis of multiple sclerosis.
8. What is the role of alpha-synuclein in Parkinson's disease?
9. Name two brain regions predominantly affected in Alzheimer's disease.
10. What is the genetic cause of Huntington's disease?
11. State any two functions of mitochondria that are disrupted in neurodegenerative diseases.
12. Mention two oxidative stress markers elevated in neurodegenerative disorders.

Group B - Short Answer Type Questions (5 marks each)

Write short note on: Lewy body/Tau tangles/Mutant Huntingtin protein

1. Briefly describe how synuclein protein is associated with the development and progression of Huntington's disease.
2. Write a short note on Lateral Sclerosis.
3. Write a short note on misfolded prion proteins associated with neurodegeneration.
4. Give an account of the role of mitochondria in neurodegeneration.
5. Describe the structural and functional brain changes associated with normal aging and how they differ from neurodegeneration.
6. Describe the role of genetic and environmental risk factors in the pathogenesis of Parkinson's disease (include mutations of SNCA, LRRK2, PARKIN, toxin exposure, and mitochondrial impairment).
7. Briefly discuss the interrelationship between oxidative stress, neuroinflammation, and neuronal death in neurodegenerative disorders. (include ROS generation, microglial activation, cytokine release, and mitochondrial dysfunction).

Group C- Descriptive type. (8 marks each)

1. Describe the clinical features, brain area affected, risk factors of Alzheimer's disease. 2+2+4
2. Outline the preventive measures for Huntington's disease and Multiple sclerosis. 4+4
3. Describe the roles of oxidative stress and inflammation in neurodegeneration. Discuss the role of mitochondrial dysfunction and protein misfolding in the pathogenesis of neurodegenerative disorders. 4+4
4. Describe the cognitive changes associated with Huntington's disease and Alzheimer's disease. 4+4
5. Explain the pathological roles of amyloid-beta plaques and tau tangles in the development of Alzheimer's disease. 4+4
6. Describe the neuropathological features and clinical manifestations of Parkinson's disease. 4+4
7. Explain the interrelationship between normal brain aging and neurodegeneration. 3+5

Unit IV: Chronobiology

Group A -Short definitive type (2 marks each)

1. Define ultradian rhythm. Give one example.
2. Define infradian rhythm. Give one example.
3. How long is a free-running circadian rhythm?
4. Differentiate between central and peripheral clocks.
5. Name two circadian rhythm sleep-wake disorders.

6. What is free running time?
7. How do you calculate the free-running period?
8. What are the diagnostic criteria for circadian rhythm sleep disorders?
9. What is the diurnal variation of potassium?

Why is melatonin considered the time-keeping hormone?

Group B - Short Answer Type Questions (5 marks each)

1. Describe the key features of a free-running rhythm.
2. Write a short note on the zeitgebers.
4. Why is the suprachiasmatic nucleus considered the master clock for the diurnal rhythm? Describe the diurnal variations of body temperature. 2+3
5. Write a short note on/timekeeping genes/chronotype/jet lag/shift work.
6. Describe the structural organization and neurotransmitter systems of the suprachiasmatic nucleus (SCN) involved in circadian rhythm regulation. (GABA, vasopressin, VIP, and their role in neuronal synchronization.).
7. Explain the role of the retino-hypothalamic tract and melanopsin-containing retinal ganglion cells in the entrainment of circadian rhythms. (photic input, SCN activation, and synchronization of internal clocks.)
8. Describe the endocrine biorhythms of cortisol, melatonin, and prolactin and their physiological significance. (Highlight secretion patterns, peak times, and associated functions.).
9. Explain the concept of peripheral clocks and their synchronization with the central pacemaker. (role of clock genes and tissue-specific rhythmicity in organs like the liver, heart, and kidney.).

Group C- Descriptive type. (8 marks each)

1. Differentiate between the circadian rhythm and the diurnal rhythm. Give a brief account of cortisol biorhythm. 3+5
2. Give a brief account of the mechanism of synchronization in the body's internal clocks. Is melanopsin related to melatonin? Justify your answer. 6+2
3. Describe the role of the pineal gland in the control of diurnal rhythms. Why can't man regulate his body temperature when he sleeps? 6+2
4. What is entrainment? What do you understand by desynchronization of circadian rhythm? 2+6
5. Mention the criteria for a rhythm to be considered as a circadian rhythm. What disrupts the diurnal rhythms? Mention the locations of peripheral clocks. Why does prolactin increase at night? 3+1+2+2
6. Discuss the relationship between sleep-wake cycle, melatonin secretion, and body temperature rhythm. 3 + 3 + 2
7. Explain the neural and molecular mechanisms underlying circadian rhythm generation in mammals. 4 + 4

Unit V: Stress Physiology

Group A -Short definitive type (2 marks each)

1. What is Hans Selye's theory?
2. Mention any two effects of acute stress on metabolism.
3. What is the situational theory of stress?
4. Mention one short-term and one long-term effect of stress on the musculoskeletal system.
5. What is the Lazarus stress theory?
6. Mention two limitations of the GAS model of stress.
7. Do reactive nitrogen species cause oxidative stress? Justify your answer.
8. Define prooxidants. Give one example.

Group B - Short Answer Type Questions (5 marks each)

1. Write a short note on general adaptation syndrome.
2. Give a brief account of the effects of stress on the cardiorespiratory/immune system in our body.
3. Write a short note on NADPH oxidase/myeloperoxidase
4. Describe the mechanism of lipid peroxidation.
5. Discuss the role of melatonin as an endogenous antioxidant.
6. Write a brief note on the effects of stress on endocrine systems.

Group C- Descriptive type. (8 marks each)

1. Describe the rapid and delayed actions of the Sympatho-adrenal medullary axis in coping stress. 4+4
2. Give a brief account of the role of the antioxidant enzyme system in coping oxidative stress. Mention the name of any one marker of lipid peroxidation. Differentiate stress and stressors with suitable examples. 5+1+2
3. Describe the role of the hypothalamic-pituitary-adrenal axis in coping with stress. What is the Folkman theory of stress? 6+2
4. Describe the roles of vitamin E and vitamin C in combating oxidative stress. 4+4
5. Illustrate the physiological role of glutathione in coping with oxidative stress. What are the symptoms of hypothalamic-pituitary-adrenal axis dysfunction? 6+2

Paper: DSCC-11*(Endocrinology)***Unit-I: Endocrine system I****Group A -Short definitive type (2 marks each)**

1. Write two differences between dwarfism and cretinism.
2. What is retino hypothalamic tract?
3. What is pars tuberalis?
4. Compare acromegaly and gigantism.
5. What are the key enzymes regulating melatonin synthesis?
6. How does anxiety increase ACTH release from anterior pituitary?
7. What is CLIP?
8. Why GH is referred to as a diabetogenic hormone?
9. How does SIADH result in hyponatremia?
10. What do you mean by panhypopituitarism?
11. What is hyperprolactinemia?
12. What is positive feedback regulation of hormone secretion? Give one example.
13. Mention some extrathyroidal actions of TSH.
14. How does a single releasing hormone GnRH regulate secretion of two gonadotropins FSH and LH?

Group B - Short Answer Type Questions (5 marks each)

Write short notes:

1. Proopiomelanocortin (POMC)
2. Different types and modes of feedback regulation of hormone secretion
3. Regulation of ADH secretion: volume change vs. change in osmolality
4. Comparison of GH action: fed state vs. fasting state
5. Regulation of PRL secretion
6. Regulation of GH-IGF-I axis
7. Diabetes insipidus

Group C- Descriptive type. (8 marks each)

1. Describe the histological structure of anterior pituitary with a labelled diagram. Discuss the mechanism of ACTH action on stimulation of adreno-cortical steroidogenesis. 3+5
2. State briefly the biosynthesis of melatonin. How the secretion of melatonin is regulated? 4+4
3. Describe the histological structure of pineal gland with a labelled diagram. State the functions of melatonin with special reference to its mechanism of action. 3+5
4. Discuss the role of GH in cellular metabolism with special reference to its mechanism of action. Write about Jak-dependent and jak-independent mechanism of GH signalling. 5+3
5. State the functions of prolactin with special reference to its mechanism of action. How is its regulation distinct from other anterior pituitary hormones? 6+2
6. Describe with schematic diagram the production of any one posterior pituitary hormone in terms of synthesis, processing and secretion. What do you mean by milk let-down reflex? 5+3
7. State the functions of ADH with special reference to its mechanism of action. Mention the functions of oxytocin. 5+3
8. Describe the role of GH-IGF-I axis on bone and organ growth. Discuss the role of oxytocin on child-birth. 4+4

Unit II: Endocrine system II**Group A -Short definitive type (2 marks each)**

1. What is thyroid storm?
2. What is Wolf-Chaikoff effect?
3. What is the importance of parafollicular cells?
4. What is euthyroidic goitre?
5. What do you mean by LATS?
6. What is parathyroid hormone related peptide (PTHrP)?
7. What is secondary iodide pool?
8. State the role of NIS in thyroid hormone synthesis.
9. What do you mean by calcitropic hormones? Why are they so called?
10. State the role of Ca-SR in parathyroid hormone secretion.
11. What is non-toxic goitre?
12. What do you mean by myxoedema?

Group B - Short Answer Type Questions (5 marks each)

1. Goitre can be found in hypo-, hyper- and eu-thyroidic conditions – justify
2. T₃ is more potent than T₄ – justify the statement
3. Write a short note on thyroid peroxidase (TPO)
4. Give a comparative account of Hashimoto's thyroiditis and Grave's disease
5. Write a short note on the role of FGF-23 (fibroblast growth factor-23) in phosphate homeostasis
6. State the physiological functions of calcitonin

Group-C (8 marks)

1. Describe the histological structure of thyroid gland with a labelled diagram. Describe the steps involved in the biosynthesis of thyroid hormones with special reference to the enzymes and their location. 3+5
2. State the role of thyroid hormone on growth and metabolism. Mention about the transport of thyroid hormone. 6+2
3. Explain the regulation of secretion and functioning of thyroid hormone. How is thyroid hormone metabolized in the body? 6+2
4. Describe the biological effects of thyroid hormone. Mention the conditions arising out of altered secretion of thyroid hormone. 5+3

- Describe the role of parathyroid hormone on regulation of calcium homeostasis. How does hyposecretion of parathyroid hormone lead to tetany? 6+2
- Describe the histological structure of parathyroid gland with a labelled diagram. Describe the regulation of synthesis and secretion of parathyroid hormone. 3+5
- Describe the pharmacological actions of calcitonin on bone mineral metabolism. In spite of bone resorptive function of parathyroid hormone why low dose of it is used for the treatment of osteoporosis? 5+3

Unit III: Endocrine system III

Group A -Short definitive type (2 marks each)

- What do you mean by catecholamines?
- What is Cushing's syndrome?
- What do you mean by pheochromocytoma?
- What are APUD cells?
- Name the neuroendocrine cells of adrenal medulla? Why are they called 'neuroendocrine'?
- What is aldosterone escape?
- Name the disease associated with primary adrenocortical insufficiency. State its symptoms.
- What do you mean by congenital adrenal hyperplasia?
- How catecholamines can cause vasoconstriction in some blood vessels while causing vasodilation in others?
- How do glucocorticoids regulate catecholamine synthesis and secretion?
- Why cortisol is called a stress hormone?
- What do you mean by adrenal androgens?

Group B - Short Answer Type Questions (5 marks each)

Write short notes on:

- Hypothalamo-hypophyseal-adrenal axis
- Catabolism of adrenal medullary hormones in the body
- Renin-angiotensin-aldosterone axis and aldosterone regulation
- Functions and regulation of hormones of zona reticularis
- Regulation of secretion of adrenal medullary hormones
- Acute stress response (like fight or flight) of catecholamines

Group C- Descriptive type. (8 marks each)

- Describe the histological structure of adrenal gland with a labelled diagram. Describe the biosynthesis of adrenal medullary hormones with special reference to the key regulatory enzymes. 3+5
- Give a comparative account of steroid hormone biosynthesis in Adreno-cortical zona glomerulosa and fasciculata with special reference to the enzymes and final products. What is extra neural uptake of catecholamines? 6+2
- Describe the role of glucocorticoids on metabolism, immune system and inflammatory reactions. What do you mean by 'permissive' action of cortisol? 6+2
- Give a comparative account of the effects of epinephrine and norepinephrine on different organ-systems mentioning the receptor types present at the target site.
- Describe the role of aldosterone on mineral metabolism. Briefly discuss the intracellular mechanism of aldosterone on target cell. 5+3
- Briefly discuss the metabolic effects of adrenal medullary hormones on liver and adipose tissue. Apart from catecholamines name a few other bio-active compounds released from the adrenal medullary chromaffin cells. 6+2

Unit IV: Endocrine system IV

Group A -Short definitive type (2 marks each)

- i. Is IGF-I identical to insulin? Justify.
- ii. What is hyperinsulinism?
- iii. Why ketosis develops in diabetes mellitus?
- iv. Why is insulin considered an anabolic hormone? Explain.
- v. Why does chronic hyperglycemia lead to beta-cell dysfunction?
- vi. Name two hormones secreted by adipose tissue and mention one function of each.
- vii. What is the role of leptin in appetite regulation?
- viii. How does adiponectin influence insulin sensitivity?
2. 9.Mention the clinical significance of the C-peptide.
 - i. What are incretin hormones? Give an example.
 - ii. Why are obese individuals prone to developing leptin resistance?
 - iii. What is juvenile diabetes? State its cause.
- iv. Under what conditions is a low insulin-glucagon ratio maintained?
3. 14.What is OGTT?
4. What do you mean by diabetic ketoacidosis?

Group B - Short Answer Type Questions (5 marks each)

1. Briefly explain the mechanism of insulin release from beta cells in response to high blood glucose.
2. Compare and contrast the pathophysiological features of type 1 and type 2 diabetes mellitus with reference to pancreatic endocrine function, insulin secretion, and insulin sensitivity.
3. How does glucagon contribute to glucose homeostasis during fasting?
4. Outline the diagnostic criteria for diabetes mellitus. How do these criteria reflect underlying dysfunctions in endocrine pancreatic activity?
5. Briefly describe the cellular actions of GLP-1 on insulin secretion.
6. Discuss the regulation of glucagon secretion from pancreatic alpha cells.
7. "Insulin is known as an antidiabetic and antiketogenic hormone." - Justify.
8. Mention the major underlying causes of obesity-induced T2DM.

Group C- Descriptive type. (8 marks each)

1. Describe the role of somatostatin in regulating pancreatic hormone secretion. Explain how insulin and glucagon maintain glucose homeostasis in the body. 3+5
2. Describe the histoarchitecture of pancreatic islets with a labelled diagram. Name the hormones and their source cells of islets. Describe the structure of insulin receptor. 3+2+3
3. Describe the hormonal interplay between insulin, glucagon, and somatostatin in regulating blood glucose levels. How is this balance disrupted in diabetes mellitus? 5+3
 1. 4. Discuss the molecular mechanism of insulin signalling via the PI3K-Akt pathway and explain how defects in this pathway lead to insulin resistance in type 2 DM. 5+3
 2. 5. Elaborate the endocrine functions of adipose tissue, focusing on key adipokines and their roles in energy metabolism, insulin sensitivity, and inflammation. 8
 3. 6. Discuss the hormonal mechanisms involved in appetite regulation and how their dysregulation contributes to obesity and metabolic disorders. 5+3
 4. Discuss the functions of glucagon mentioning its mechanism of action. What hormones are produced from the posttranslational processing of pre-proglucagon? 6+2

Unit V: Endocrine system V

Group A -Short definitive type (2 marks each)

1. State the source and function of motilin.
2. Which hormones exert a tropic action in the GI tract?
3. What is Osteoprotegerin (OPG)?
4. Name two myokines released from muscles.
5. State the source of NGF and state its function.
6. Mention two important factors for stimulation of renin secretion.
7. What do you mean by 'entero-endocrine cells'? Give two examples.
8. Why is the term "gastrointestinal hormones" a misnomer?
9. Write the sources and function of Ghrelin.
10. What is myostatin? State its function.
11. Name any two hepatokines. State one function each of them.
12. What do you mean by urodilatin? State its function.

Group B - Short Answer Type Questions (5 marks each)

- 1) Discuss the role of the heart as an endocrine organ.
- 2) Briefly elucidate the mechanism of action of natriuretic peptides.
- 3) How is gastrin secretion regulated from the G-cells of the stomach?
- 4) Describe the histological structure and endocrine function of the thymus gland.
- 5) Discuss the role of osteokines in osteoclast differentiation & bone resorption.
- 6) How does the kidney influence the formation of different blood cells?
- 7) Discuss the function and regulation of secretion of secretin in the GI tract.
- 8) What is CCK? How is its secretion stimulated in a positive feed-forward manner?

Group C- Descriptive type. (8 marks each)

- 1) Name at least two members of secretin family of gastrointestinal hormones. Describe the functions and mechanism of action of secretin on pancreatic and bile duct.
2+6
- 2) Discuss the role of CTGF in fibrogenesis and tissue repair. State the role of PDGF in tissue fibrosis.
4+4
- 3) How does the kidney regulate blood pressure and fluid balance through RAAS? Apart from natriuretic peptides, name two other factors released from heart.
6+2
- 4) State the functions of gastrin mentioning mechanism of action. Mention the exercise induced endocrine functions of myokines. 5+3
- 5) Classify gastro-intestinal hormones. What do you mean by 'Zollinger Ellison syndrome'?
6+2

Paper: DSCC-12

(Reproductive Physiology and Developmental Biology)

Unit-I: Reproduction-I

Group A -Short definitive type (2 marks each)

- 1) What is cryptorchidism?
- 2) What is 'mini-puberty of infancy'?
- 3) What do you mean by blood-testes-barrier?
- 4) Mention the source and one important function of Androgen Binding protein (ABP).
- 5) What is acrosome? Write one function of it.
- 6) What do you mean by 'epididymal maturation of sperm'?
- 7) What is oligoasthenoterratozoospermia (OAT)?

- 8) What is peritubular myoid cell?
- 9) What is rete testis?
- 10) Give the definitions of: adrenarche, thelarche, spermatarche, menarche.
- 11) State the difference between infertility and impotence.
- 12) What is benign prostatic hyperplasia?
- 13) Why the term 'andropause' is misnomer?
- 14) How does abuse of androgen cause infertility in males?

15) Group B - Short Answer Type Questions (5 marks each)

- 1) Pubertal changes in male and female
- 2) Physiological changes after menopause
- 3) Comparative account of accessory sex organs and secondary sex characters
- 4) Structure and functions of Sertoli cell
- 5) Spermiogenesis
- 6) Histological structure of testis
- 7) Source, functions and regulation of secretion of inhibin in male and female
- 8) Physiological changes associated with male climacteric.

Group C- Descriptive type. (8 marks each)

- 1) Describe the structure of spermatozoon with the help of suitable diagram. Mention the functions of different parts of it. 5+3
- 2) Describe the neuro-endocrine mechanism, essential for attainment of puberty. What is pubarche? 6+2
- 3) Outline the steps in spermatogenesis of man and discuss the role of hormones in initiation and maintenance of the process. 5+3
- 4) Describe the critical effects of testosterone on spermatogenesis with special reference to its mode of action? What are androgens? 6+2
- 5) Describe the components of male reproductive tract with suitable diagram. Mention the role of seminal vesicle and prostate. 6+2
- 6) What is hypothalamo-pituitary-testicular axis? Describe the role of GnRH in regulating testicular function. What are the constituents of seminal fluid? 2+4+2

Unit II: Reproduction II:

Group A -Short definitive type (2 marks each)

- 1) What do you mean by follicle selection?
- 1) What is reflex ovulation?
- 2) What do you mean by 'two cell two gonadotropin' theory?
- 3) What do you mean by corpus albicans?
- 4) What is oogenesis?
- 5) What do you mean by antrum formation?
- 6) Name the hormones secreted by the corpus luteum and state their primary functions.
- 7) State the difference between oestrous cycle and human menstrual cycle.
- 8) Name the stages of follicular development in the ovary.
- 9) What is dysmenorrhoea and how is it classified?
- 10) Mention one diagnostic criterion for PCOS.
- 11) What is the difference between primary and secondary amenorrhea?
- 12) Name two symptoms commonly associated with endometriosis.
- 13) What is the significance of LH/FSH ratio in diagnosing PCOS?

Group B - Short Answer Type Questions (5 marks each)

- 1) Histological structure of ovary
- 2) Oestrous cycle
- 3) Stages of ovarian follicular development and the hormonal changes associated with each stage.
- 4) Feedback mechanisms involved in the hypothalamic-pituitary-ovarian axis.
- 5) Molecular mechanism of ovulation.
- 6) Hormonal imbalances and metabolic features associated with PCOS.
- 7) Comparison of dysmenorrhoea and endometriosis in terms of symptoms, pathogenesis, and treatment strategies.

Group C- Descriptive type. (8 marks each)

1. Discuss the formation, regression and function of the corpus luteum with special reference to its role in the menstrual cycle and early pregnancy. 3+2+3
2. Explain the hormonal regulation of the menstrual cycle, highlighting the roles of FSH, LH, estrogen, and progesterone. 8
3. Describe the ovarian and uterine changes during different phases of menstrual cycle. Describe the impact of abnormal menstrual cycles on reproductive health. 6+2
4. What do you mean by 'Corpus luteum of pregnancy'? Discuss the morphological changes of ovulatory follicle with labelled diagram. 2+6
5. Describe the pathophysiology, clinical features, and diagnostic criteria of polycystic ovary syndrome (PCOS). How does it affect fertility? 6+2

Unit III: Reproduction-III**Group A -Short definitive type (2 marks each)**

- 1) What is lactation amenorrhoea?
- 1) What is endometrial receptivity?
- 2) What do you mean by polyspermy?
- 3) Why placenta is called a temporary endocrine gland?
- 4) What do you mean by zona pellucida proteins?
- 5) Mention the source and functions of relaxin.
- 6) What is implantation?
- 7) Name the hormones primarily involved in the parturition process.
- 8) What is the cortical reaction? State its significance.
- 9) Name two hormones secreted by the placenta.
- 10) What is the role of syncytiotrophoblast in implantation?
- 11) What is the significance of membrane fusion during fertilization?
- 12) What is the role of hCG in early pregnancy?
- 13) Define parturition.

Group B - Short Answer Type Questions (5 marks each)

- 1) Describe the process of sperm capacitation and its importance in successful fertilization.
- 1) Explain the sequence of events from acrosomal reaction to membrane fusion during fertilization.
- 2) Discuss the structural adaptations of the placenta that support foetal development.
- 3) Describe the stages of early embryogenesis leading up to implantation.
- 4) Explain the pathophysiology of two pregnancy-related disorders: gestational diabetes and preeclampsia.
- 5) Write a short note on pregnancy tests

Group C- Descriptive type. (8 marks each)

- 1) Explain the structure and functions of the placenta, emphasizing its endocrine role and contribution to foetal development. 3+5

- 1) Elaborate on the systemic physiological changes that occur during pregnancy including cardiovascular, renal, immunological, nervous, gastrointestinal and metabolic adaptations. 8
- 2) Describe the process of fertilization. State its biological significance. 5+3
- 3) Describe the development of the mammary gland at different phase of life in female with suitable diagram. What is milk let-down reflex? 6+2
- 4) Discuss the hormonal and neural regulation of parturition. including the role of prostaglandins and other neuro-endocrine factors. 5+3=8
- 5) Describe the endocrine changes in pregnancy with special reference to the role of hormones in the maintenance of pregnancy. Describe the hormonal regulation of lactation.

Unit IV: Developmental biology

Group A -Short definitive type (2 marks each)

- 1) Distinguish between totipotency and pluripotency.
- 2) What is morula?
- 1) Distinguish between adult and embryonic stem cells.
- 2) What do you mean by induced pluripotency?
- 3) Which group of animals shows spiral holoblastic cleavage?
- 4) What do you mean by 'stereoblastulae'?
- 5) State the importance of Sonic hedgehog in tissue differentiation.
- 6) Which cells of a mammalian embryonic blastocyst are pluripotent?
- 7) What are the trophoblast and inner cell mass (ICM) of an embryo?
- 8) What do you mean by ectopic pregnancy?
- 9) What is rotational cleavage?
- 10) What are morphogens?
- 11) Mention two important characteristics of stem cells

Group B - Short Answer Type Questions (5 marks each)

- 1) State the properties and therapeutic application of stem cells.
- 1) Write a short note on Blastulation.
- 2) Differentiate between spiral holoblastic and rotational holoblastic cleavage.
- 3) How does a holoblastic cleavage differ from a meroblastic cleavage?
- 4) Describe the process of mammalian implantation.
- 5) Briefly explain the process of cavitation in the formation of the blastocoel

Group C- Descriptive type. (8 marks each)

- 1) Which lineage of cells/tissue is specified by Wnt Signalling? How does the Wnt protein regulate cell renewal and differentiation by controlling the nuclear localization of the protein β -catenin? 2+6
- 1) Which cells of a vertebrate eye are formed by Notch proteins? Describe the Notch-Delta signalling mechanism in the regulation of cell fate. 2+6
- 2) Describe the process of formation of the three germ layers from a mammalian blastocyst through gastrulation. 8
- 3) Distinguish between - adult and embryonic stem cells. State the differences between gastrula and blastula. 4+4
- 4) Describe the cleavage stages post fertilization leading to formation of morula with suitable diagrams. What is the difference between pluripotent and multipotent stem cells.

Unit V: Developmental Biology

Group A -Short definitive type (2 marks each)

- 1) What is ductus arteriosus? State its significance.
- 1) What is Jost paradigm of sexual differentiation?
- 2) What do you mean by 'bipotential gonad'?
- 3) State the difference between gonadal sex and phenotypic sex.
- 4) What is cerebral palsy?
- 5) What is annulus ovalis?
- 6) What is transverse sinus of pericardium?
- 7) What do you mean by rotation of stomach?
- 8) Define osteoid. State its function.
- 9) What is fusion of epiphysis?

Group B - Short Answer Type Questions (5 marks each)

- 1) Peculiarities of foetal circulation and changes after birth
- 2) Comparison of development of male and female reproductive system in terms of onset and progression of meiosis
- 3) Teratogens
- 4) Embryonic age and development of female genital system
- 5) Primordial germ cells
- 6) Congenital heart disease
- 7) Spina bifida
- 8) Genetic causes of autism spectral disorders and its symptoms

Group C- Descriptive type. (8 marks each)

- 1) Describe the embryological development of septum in heart with suitable labelled diagram. What is fossa ovalis? 6+2
- 1) Describe the embryonic development of urinary bladder and urethra with suitable diagram. 4+4
- 2) Name the parts of the primitive gut. Describe the development of individual parts of the alimentary canal with suitable diagram. 2+6
- 3) Give a comparative account of intramembranous and endochondral ossification with suitable diagrams. 4+4
- 4) Describe the role of genetic and other factors on the embryonic differentiation of male genital system from primitive bipotential gonad. What is uro-genital sinus? 6+2
- 5) Briefly discuss the development of ovary from undifferentiated gonad. State the difference between mesonephric and paramesonephric duct. 6+2
- 6) Give a comparative account of development of male and female external genitalia with suitable diagram. 4+4

Semester I Minor/MDC

PAPER: MDC CC-I/ MN-1/ MDC-Mn-1

(Introductory Physiology: Human Body Organisation, Body Fluids and Biophysics)

Unit - I Cell I

Group A- Short definitive type (2 marks each)

1. What is the primary function of the cell nucleus?
2. What is the role of nuclear pores?
3. What is the main function of mitochondria?
4. What is the name of the inner folds of the mitochondrial membrane?
5. Who discovered the Golgi apparatus?

6. What is the main function of the Golgi complex?
7. What is the function of ribosomes?
8. What are the two subunits of a eukaryotic ribosome?
9. What is the function of lysosomes?
10. Which kind of enzymes are present in lysosomes?
11. Which cytoskeletal protein forms microtubules?
12. What is the main function of actin filaments?
13. Which model explains the structure of the plasma membrane?
14. What is the main function of tight junctions?
15. What are desmosomes?
16. What is simple diffusion?
17. What is the difference between uniport and symport?
18. What type of transport requires ATP directly?
19. What is secondary active transport?

Group B -Short Answer Type Questions (5 marks)

1. Describe the ultrastructure of a eukaryotic nucleus with the help of a labelled diagram.
2. Describe the structure and functions of smooth and rough endoplasmic reticulum.
3. Describe the structure and functions of lysosomes.
4. Write a short note on peroxisomes and their functions.
5. Write a short note on microtubules.
6. Describe the structure of the plasma membrane based on the fluid mosaic model.
7. What is membrane asymmetry? Explain with examples.
8. Describe the structure and function of gap junctions.
9. Compare passive and active transport mechanisms.
10. Describe facilitated diffusion with examples.
11. Explain the mechanism of primary active transport using the Na^+/K^+ -ATPase pump
12. Differentiate between gated and non-gated ion channels.

Group C- Descriptive type. (8 marks each)

- 1) (a) Describe the electron microscopic structure and functions of the mitochondria. (6)
(b) Define cristae and state their significance in mitochondria. (2)
- 2) (a) Explain the structure and functions of the Golgi apparatus. (3+3)
(b) What are ribosomes? Mention their types and functions. (2)
- 3) (a) What are integral membrane proteins, state its importance. (2)
(b) Discuss the different types of cell junctions. — tight junctions, gap junctions, and anchoring junctions. (2+2+2)
- 4) (a) What is an ionophore? Give one example. (2)
(b) Explain the mechanisms of carrier-mediated transport (6)

Unit - II Cell- II

Group A- Short definitive type (2 marks each)

1. Who is known as the Father of Genetics?
2. What is a gene?
3. What is meant by genotype?
4. What is a monohybrid cross?
5. What is a recessive allele?
6. State Mendel's First Law.
7. State Mendel's Second Law.
8. What are telomeres?
9. What is a karyotype?

10. How many base pairs of DNA wrap around one nucleosome core?
11. Name the histone protein that links nucleosomes.
12. Approximately how many genes are present in the human genome?
13. What is the approximate size of the human genome in base pairs?
14. What is the main difference between nuclear DNA and mitochondrial DNA?
15. What occurs during the S phase?
16. What is the function of the G1 phase?
17. What is the significance of meiosis?
18. During which stage of meiosis does crossing over occur?

Unit - II Cell 2 (5 marks)

1. Explain Mendel's experiments on monohybrid inheritance with suitable examples.
2. Write a short note on Mendel's dihybrid cross and the phenotypic ratio obtained.
3. Describe the ultrastructure of a eukaryotic chromosome.
4. What is karyotyping? Describe its procedure and applications.
5. Write a brief note on the human genome.
6. Differentiate between nuclear DNA and mitochondrial DNA.
7. Explain the unique features and significance of mitochondrial DNA.
8. Describe the different phases of the eukaryotic cell cycle.
9. Describe the stages of meiosis and explain its biological importance.

Unit 2: Cell 2

- 1) (a) Explain Mendel's laws of inheritance with suitable examples. (6)
(b) What is incomplete dominance? Give one example. (2)
- 2) (a) Describe the classification of chromosomes and explain DNA packaging into nucleosomes and higher-order chromatin organization. (6)
(b) Differentiate between euchromatin and heterochromatin. (2)
- 3) (a) Discuss the events of the cell cycle and describe the phases of mitosis with labelled diagrams. (6)
(b) What is crossing over? Mention its importance. (2)
- 4) (a) Write short note on linkage and recombination, describing their mechanisms and biological importance. (6)
(b) State the significance of mitosis. (2)

Unit - III Tissues and outline of Human Anatomy

Group A- Short definitive type (2 marks each)

1. What is epithelial tissue?
2. Name the type of epithelial tissue found in the lining of blood vessels.
3. Where is stratified squamous epithelium found?
4. What is the characteristic feature of transitional epithelium?
5. Which type of epithelial tissue forms the epidermis of the skin?
6. Which connective tissue stores fat?
7. What type of connective tissue connects muscles to bones?
8. Which type of cartilage is found in the external ear?
9. Which type of muscle tissue is multinucleated?
10. What is the function of intercalated discs?
11. What is an agonist muscle? Give example
12. What are the basic structural and functional units of nervous tissue?
13. What is myelin sheath made up of?
14. Which cells form the myelin sheath?
15. Name two glial cells.
16. State the function of glial cells.

Unit – III Outline of Tissues and Human anatomy (5 marks)

1. Write a short note on the types of epithelial tissue with examples.
2. Explain the functions of epithelial tissue with suitable examples.
3. Write short notes on adipose tissue and its significance.
4. Explain the structure and functions of blood as a connective tissue.
5. Differentiate between skeletal, smooth, and cardiac muscle (any two).
6. Write a short note on the structure and functions of a neuron.
7. Write short notes on neuroglial cells and their roles.

Unit III: Tissues and outline of Human anatomy

1. (a) Describe the histological features and physiological functions of different types of cartilages. 4+4
2. (a) Describe the structural components of areolar tissue. 6
(b) what is intercalated disc? 2
3. (a) Describe the sagittal, coronal, and transverse anatomical planes with labelled diagrams. 6
(b) Differentiate between agonists and antagonists with one functional example of each. 2
4. (a) Describe the structure and functions of areolar tissue. 6
(b) Which cells form the myelin sheath? 2

Unit - IV Haematology and Body fluids

Group A- Short definitive type (2 marks each)

1. What is the function of lymph in the body?
2. What is the average volume of blood in an adult human?
3. What is the main difference between plasma and serum?
4. Which plasma protein is responsible for maintaining osmotic pressure?
5. What is the role of fibrinogen?
6. What is plasmapheresis?
7. What is the average lifespan of a red blood cell?
8. What is the normal RBC count in adult males?
9. Which WBCs are involved in allergic reactions?
10. What is the normal platelet count in blood? Name one disease which reduces platelet count
11. Name the hormone that regulates erythropoiesis.
12. What is thrombopoiesis?
13. What is the main difference between adult and foetal hemoglobin?
14. What is methemoglobin?
15. What is polycythemia?
16. Name two blood cells that show phagocytosis.

Unit – IV: Haematology and body fluids (5 marks)

1. Write short note on the components and functions of plasma proteins.
2. Short note on plasmapheresis.
3. Describe the structure and functions of red blood cells (RBCs).
4. Describe the structure and role of platelets in haemostasis.
5. Describe the process and factors regulating erythropoiesis.
6. Describe the structure and function of hemoglobin.
7. Describe the intrinsic pathway involved in blood coagulation.

Unit IV: Haematology and body fluids

- 1) (a) State the composition and functions of lymph. (3+3)
(b) How does lymph differ from tissue fluid? (2)
- 2) (a) Explain the structure of haemoglobin. (6)
(b) Name two natural anticoagulants. (2)
- 3) (a) Describe the factors of blood coagulation.
(b) What is fibrinolysis? Mention its physiological importance. (2)

Unit - V Biophysics

Group A- Short definitive type (2 marks each)

1. State Fick's first law of diffusion.
2. Differentiate between simple diffusion and facilitated diffusion with examples.
3. Define osmosis.
4. State Van't Hoff's law of osmotic pressure
5. What is the difference between osmolarity and tonicity?
6. What happens to a red blood cell in a hypotonic solution?
7. Define surface tension.
8. Mention one physiological importance of viscosity.
9. What is a colloid?
10. What are lyophilic and lyophobic colloids?
11. What is Gibbs-Donnan equilibrium?
12. Define pH.
13. Mention two physiologically important buffers.
14. What is an acid-base indicator? Give example.
15. Define half-life of a radioactive element.
16. Name two radioisotopes used in medical diagnosis.

Unit - V Biophysical principle (5 marks)

1. Write a short note on the biological applications of diffusion.
2. Discuss the biological applications of surface tension.
3. Classify colloids.
4. Describe Brownian movement and Tyndall effect in colloidal systems.
5. Write a short note on Gibbs-Donnan effect.
6. What is a buffer? Describe its role in maintaining pH balance.

Unit V: Biophysical Principles

- 1) (a) Explain Fick's laws of diffusion and discuss their biological applications. (6)
(b) What is capillary rise and how is it related to surface tension? (2)
- 2) (a) Explain the Henderson-Hasselbalch equation and discuss its applications in buffer systems. (6)
(a) Name any two common physiological buffers. (2)
- 3) (a) Differentiate between dialysis and ultrafiltration (4)
(b) Explain the principle and clinical applications of dialysis. (4)

PAPER: MDC-SEC

(Clinical haematology, therapeutic nutrition, public hygiene, basic lab. techniques and food adulterants)

Unit I: Clinical Haematology and Haematological Techniques

Group A -Short definitive type (2 marks each)

1. What is the difference between bleeding time and clotting time?
2. State the clinical significance of PCV.
3. Define ESR and state its normal value.
4. What is the importance of glycated haemoglobin (HbA1c)?
5. What is the Bombay blood group?
6. Define leukocytosis.
7. Explain with reason- what problem may arise if the blood of A⁺ person is donated to A⁻ person?
8. What is the function of a blood bank?

Group B - Short Answer Type Questions (5 marks each)

1. Describe the precautionary measures to be taken during blood transfusion.
2. Explain the pathophysiology of sickle-cell anaemia.
3. Write short note on differential count of WBC.
4. Explain the genetic basis of the Rh blood group system.
5. Discuss the clinical significance of MCH and MCHC in diagnosing anaemia.

Group C- Descriptive type. (8 marks each)

1. Describe in detail the components of a complete hemogram and their clinical significance.
2. Discuss the causes, symptoms, and prevention of erythroblastosis fetalis related to Rh incompatibility.
3. Discuss in detail various haematological disorders like polycythaemia, thrombocytopenia, and haemophilia.
4. Explain the pathophysiology and diagnostic approach to thalassemia.

Unit II: Therapeutic Nutrition

Group A -Short definitive type (2 marks each)

1. Mention two methods to assess nutritional status.
2. What is waist-hip ratio and what does it indicate?
3. Mention two nutritional concerns in obesity.
4. What is a soft diet?
5. Mention two dietary managements in hypertension.
6. What is Type-II diabetes mellitus?
7. Write two dietary sources of iron.
8. What is the importance of diet therapy?

Group B - Short Answer Type Questions (5 marks each)

1. Discuss the role of nutrition education in promoting therapeutic nutrition.
2. Explain the classification of therapeutic diets based on nutrients.
3. Discuss the dietary management of nutritional anaemia.
4. Explain the importance of balanced nutrition in adolescence.
5. What is BMI? Describe the relation between BMI and health risks.

Group C- Descriptive type. (8 marks each)

1. Explain different anthropometric parameters and their importance in assessing nutritional status.
2. Discuss the role of diet therapy in the management of chronic diseases.
3. Explain in detail the dietary management of diabetes mellitus and obesity.

4. Describe the nutritional requirements and dietary planning for children/ elderly persons.

Unit III: Public Hygiene and First Aid

Group A -Short definitive type (2 marks each)

1. State two sources of water contamination.
2. What is community hygiene?
3. Name two foodborne diseases.
4. What are microbial standards for potable water?
5. Write two importance of first aid.
6. Define CPR.
7. Mention two contents of a first aid kit.
8. What is sewage disposal?

Group B - Short Answer Type Questions (5 marks each)

1. Discuss the causative agent, symptoms, and prevention of cholera.
2. Describe the steps of Ideal hand washing method.
3. Discuss the symptoms and prevention of hepatitis A.
4. Discuss the role of public hygiene in disease prevention.
5. Discuss first aid management in insect and snake bites.

Group C- Descriptive type. (8 marks each)

1. Mention the causative factor of one waterborne and one foodborne infection. Discuss their symptoms and control.
2. Explain in detail the management and prevention of burns and wounds.
3. Describe the steps of CPR and discuss the importance of emergency CPR in life-saving.
4. Describe briefly on sewage and waste disposal and their impact on health.

Unit IV: Basic Laboratory Instrumentation and Techniques

Group A -Short definitive type (2 marks each)

1. Define numerical aperture.
2. What is the formula to calculate Magnification in a compound microscope?
3. Mention two importance of centrifugation in clinical laboratories.
4. Name two types of centrifuges.
5. What is agarose gel electrophoresis?
6. Write two applications of colorimetry.
7. Define supernatant.
8. Write two advantages of a compound microscope.

Group B - Short Answer Type Questions (5 marks each)

1. Write short note on centrifugation technique.
2. Describe the optical parts of a compound microscope.
3. Describe the principle of colorimetry and its applications in biochemistry.
4. Compare the technique of chromatography and electrophoresis based on their principles and uses.
5. Discuss the concepts of resolution, magnification, and numerical aperture and explain how they are inter-related in microscopy.

Group C- Descriptive type. (8 marks each)

1. Describe in detail the working principles of a compound microscope. Mention its uses.
2. Discuss the principles, method and applications of paper chromatography.
3. Describe the principle, method and uses of Agarose gel electrophoresis.
4. Explain the role of laboratory techniques in clinical diagnostics.

Unit V: Food Additives and Adulterants

Group A -Short definitive type (2 marks each)

1. Give two examples of natural food additives.
2. Mention two common adulterants in milk.
3. What is chicory used to adulterate?
4. Name two adulterants found in spices.
5. Mention two tests for food adulteration.
6. What is the role of FSSAI in food testing?
7. Name two adulterants in ghee.
8. What is feed-grade urea used for?

Group B - Short Answer Type Questions (5 marks each)

1. Discuss common adulterants in cereals and pulses.
2. Explain the health hazards of metanil yellow and rhodamine B.
3. Write short note on aluminium foil and dioxin toxicity.
4. Describe the role of FSSAI in detecting and preventing food adulteration.
5. Explain the uses and risks of monosodium glutamate.

Group C- Descriptive type. (8 marks each)

1. Define food additives. Describe in detail the classification, examples, and functions of food additives.
2. Discuss the methods of rapid adulteration detection tests in different food samples recommended by FSSAI.
3. Explain the health impacts of metallic and chemical adulterants.
4. Explain the pathophysiological effect of saccharin. Discuss the importance of consumer awareness in preventing food adulteration.

Semester III Minor/MDC

PAPER: MDC CC3/MN-3/MDC-Mn-3

(Digestive System, Nutrition, Dietetics and Metabolism)

Unit I: Digestion

Group A -Short definitive type (2 marks each)

1. What is deglutition reflex?
2. What are the different types of movements found in the alimentary canal?
3. What do you mean by gastric reflux?
4. Give one example each of probiotic and prebiotic.
5. What are enterokinase? State its function.
6. What is ptyalin? Mention its source.
7. What is the location and function of Brunner's gland?
8. State the location and function of Meissner's plexus.
9. Name two bile salts.
10. Write down the differences in composition between liver bile and gall bladder bile.
11. What is succus entericus?
12. What is gastric reflux?

Group B - Short Answer Type Questions (5 marks each)

1. Write a short note on 'Enterohepatic circulation'.
2. Write a short note on probiotics and prebiotics.
3. Write short notes on any two of the following disorders of GI tract:
 - a. Peptic ulcer

- b. Jaundice
- c. Gallstones
- d. Constipation
4. Mention the names of the bile acids and mention their functions.
5. Name the different protein digesting enzymes of GI tract mentioning their locations and functions.
6. What do you mean by peristalsis and antiperistalsis? Mention their functions.

Group C- Descriptive type. (8 marks each)

1. Describe the process of digestion and absorption of fat. 8
2. Describe the process of carbohydrate digestion and absorption in the GI tract.
3. Discuss the process of protein digestion in GI tract. What is Peyer's patch? Mention its function. 6+2
4. Discuss the mechanism of absorption of amino acids in GI tract. Explain the physiological basis of gall stone formation. 5+3
5. Write down the composition of gastric juice and its functions. Discuss in brief the histological characteristics of liver. 5+3
6. Discuss the different phases of gastric juice secretion. What do you mean by post prandial alkaline tide? 6+2

Unit II: Nutrition

Group A -Short definitive type (2 marks each)

1. Name the essential amino acids and fatty acids.
2. Define biological value of proteins.
3. Define protein efficiency ratio.
4. Define net protein utilization.
5. How do carbohydrates and fats act as protein spacers in the body?
6. Name the vitamin that prevents scurvy. Mention two sources.
7. What is provitamin D3?
8. Mention one deficiency symptom of vitamin A & K.
9. Mention one deficiency symptom of thiamine and riboflavin.
10. State the importance of dietary fibers.
11. Name one fat-soluble and one water-soluble vitamin.
12. What is the chemical name of vitamin B2 and Vitamin K?
13. Mention one plant source and one animal source of vitamin A.
14. Why does Vit-C deficiency lead to anaemia?
15. Mention one physiological function each of retinol and cyanocobalamin.
16. Name one macro and one microelement essential for human health.
17. Which mineral is essential for the formation of bones and teeth?
18. Which mineral deficiency causes goiter?

Group B - Short Answer Type Questions (5 marks each)

1. State the role of iodine in human physiology.
2. Write a short note on dietary fibres and its significance.
3. Write a short note on visible and invisible fats in nutrition.
4. Describe the physiological functions of iron and calcium.
5. Write short notes on (a) scurvy and (b) beriberi.
6. Write the chemical name of vitamin D. Mention two of its biological functions. Explain the physiological importance of folic acid.
7. State the physiological role and deficiency symptoms of vitamin A.
8. State the biological functions of sodium and potassium.
9. Discuss briefly about nitrogen balance. Name one essential amino acid.

Group C- Descriptive type. (8 marks each)

1. Define: biological value of proteins, net protein utilization, protein efficiency ratio, protein spacers 2X4
2. What do you understand by MUFA and PUFA. Give one example of each mentioning food sources. What is trans fat and what is its significance in nutrition? 6+2
3. Write down one animal and one plant source and one deficiency symptom of the followings: iron, calcium, sodium, iodine. 2X4
4. Write down one animal and one plant source and one deficiency symptom of the following vitamins: Vitamin A, vitamin C, vitamin E, riboflavin. 2X4
5. What do you mean by glycaemic index? Give example of one low glycaemic index food. What are essential amino acids? Give examples of any two of them. Name two essential fatty acids. 3+3+2

Unit Iii Dietetics**Group A -Short definitive type (2 marks each)**

1. Define respiratory quotient.
2. Define basal metabolic rate.
3. Define specific dynamic action.
4. What should be the ratio of carbohydrate, protein, and fat in our diet?
5. What do you mean by RDA? What the RDA values of protein for a sedentary male and female?
6. Define adult consumption unit.

Group B - Short Answer Type Questions (5 marks each)

1. What is RQ? State its normal value. Write down its significance.
2. What do you mean by SDA of food? Discuss its significance.
3. State the principle of formulation of a balanced diet for a sedentary adult male and female.
4. Briefly discuss the factors that determine the calorie requirements of a human.
5. Define calorific value and physiological fuel value of food. State the calorific and physiological fuel values of carbohydrate, protein, and fat.

Group C- Descriptive type. (8 marks each)

1. State the compositions and nutritional values of rice, pulses, milk, and fish (Rohu).
2. Define BMR. Give its normal value for an adult male and female. Discuss the factors controlling BMR.
3. Describe any two methods of diet survey. Mention the merits and demerits of them.
4. What is the dietary requirement of protein for an adult man and woman? State the principle of formulation of a balanced diet for a pregnant woman.
5. What do you mean by a balanced diet? State the principle of formulation of a balanced diet for a lactating woman.
6. State the compositions and nutritional values of wheat, potatoes, egg and chicken..

UNIT IV. Metabolism I**Group A -Short definitive type (2 marks each)**

1. What is glycolysis? Where does it take place?
2. Why is the Krebs cycle called the TCA cycle?
3. State two differences between hexokinase and glucokinase.
4. Mention one rate-limiting step of glycolysis. Name the enzyme catalyzing it.
5. Why is the citric acid cycle said to be amphibolic in nature?
6. What is glycogenesis?
7. Define gluconeogenesis.
8. What are the two important byproducts of the HMP shunt?
9. Mention the names of two key enzymes involved in the non-oxidative phase of the pentose phosphate pathway.
10. In which part of the cell is the electron transport chain (ETC) located? What is the final electron acceptor in ETC?
11. What is redox potential?
12. What are the end products of Glycolysis?

Group B - Short Answer Type Questions (5 marks each)

1. Explain the energy yield of the TCA cycle per acetyl-CoA molecule.
2. What is glycogenin? State its role in glycogen synthesis.
3. Write down the key regulatory steps of glycolysis.
4. Discuss the physiological importance of gluconeogenesis.
5. Give a brief account of the reactions involved in the oxidative phase of the pentose phosphate pathway.
6. Discuss the physiological importance of the pentose phosphate pathway.
7. Describe the chemiosmotic theory of ATP synthesis.

Group C- Descriptive type. (8 marks each)

1. Illustrate the major steps involved in glycolysis using a schematic diagram.
2. Describe the four major protein complexes of the ETC.
3. Describe the metabolic process by which pyruvate is converted to glucose via gluconeogenesis.
4. Write down the differences between oxidative phosphorylation and substrate level phosphorylation. Which one is the pacemaker enzyme of glycolysis pathway? Why is it called the pacemaker enzyme?
5. How many ATPs are produced from complete oxidation of one molecule of glucose? Name the biochemical step of the TCA cycle where substrate-level phosphorylation takes place. Write a short note on amphibolic roles of TCA cycle. Why is the Krebs cycle called the TCA cycle? Where does it take place in the cell?

UNIT V: Metabolism II: Lipid and protein

Group A -Short definitive type (2 marks each)

1. Why is the process of fatty acid beta oxidation named as such?
2. Write down the name of the multi-enzyme system involved in fatty acid biosynthesis.
3. Name the ketone bodies. What is the major site of ketone body synthesis?
4. What is carnitine?
5. What do you mean by the term ketosis and ketonuria?
6. What is the role of acetyl-CoA carboxylase in fatty acid synthesis?
7. Mention two metabolic conditions that lead to increased ketone body production.
8. What do you mean by the term 'amino acid pool'?
9. What do you mean by oxidative deamination? Give an example.
10. What is non-oxidative deamination? Give an example.
11. Which organ of our body is involved in the urea cycle? Which cofactor is required for transamination?
12. What is the significance of the urea cycle?
13. Can an amino acid be both glucogenic and ketogenic? Cite an example.

Group B - Short Answer Type Questions (5 marks each)

1. Describe with a suitable diagram the functional organization of the fatty acid synthase.
2. What are glucogenic and ketogenic amino acids? Give examples. Can an amino acid be both glucogenic and ketogenic? Cite an example.
3. Calculate the net ATP yield from the complete beta-oxidation of a 16-carbon fatty acid. State the name of the cellular organelle where beta oxidation takes place.
4. Explain the biochemical pathway of ketogenesis in the liver, mentioning the key enzymes involved.
5. State the difference between oxidative and non-oxidative deamination.
6. Mention two important amino acid decarboxylation reactions.
7. Describe the role of pyridoxal phosphate (PLP) in transamination reactions.
8. Explain the following terms: Ketogenesis, ketosis, Ketonemia, ketonuria.

Group C- Descriptive type. (8 marks each)

1. Explain the sequential steps of the urea cycle specifying the key enzymes involved.
2. Outline the pathway of β -oxidation of a saturated fatty acid.
3. Outline the key steps of phosphatidylcholine synthesis from phosphatidic acid.
4. What do you mean by oxidative deamination? Give an example. What is non-oxidative deamination? Give an example. What is the significance of the urea cycle?
5. Describe with a suitable diagram the functional organization of the fatty acid synthase. Calculate the net ATP yield from the complete beta-oxidation of a 16-carbon fatty acid.
6. Name the ketone bodies. What is the major site of ketone body synthesis? Explain the biochemical pathway of ketogenesis in the liver, mentioning the key enzymes involved.

Semester V Minor/MDC

Paper: MDC CC4/ MN-4/ MDC-Mn-4

(Cardiovascular, Respiratory, Nerve-Muscle and Renal Physiology)

Unit I : Cardiovascular Physiology

Group A -Short definitive type (2 marks each)

- 1) Mention four important properties of cardiac muscle.
- 2) Define cardiac output.
- 3) What is Fick principle?
- 4) Define blood pressure.
- 5) What is ECG?
- 6) What is Bainbridge reflex?
- 7) What do you mean by tachycardia and bradycardia?
- 8) What is myocardial infarction?
- 9) What is the difference between heart rate and pulse rate?
- 10) Name two vasomotor centres.

Group B - Short Answer Type Questions (5 marks each)

- 1) Cardiac cycle
- 2) Factor affecting cardiac output
- 3) blood pressure measurement
- 4) Electrocardiographic leads
- 5) Cardiac reflexes
- 6) Peculiarities of coronary circulation
- 7) Electrocardiography
- 8) Vasomotors centre

Group C- Descriptive type. (8 marks each)

1. Describe the origin and propagation of cardiac impulses. What is Stannius ligature? 6+2
2. Describe the principle of measurement of cardiac output using Fick's principle. What is cardiac index? 6 +2
3. Describe the principle and procedure of blood pressure measurement. State the full form of MABP. 3+4+ +1
4. Discuss the factors affecting blood pressure. Describe the mechanism of regulation of normal blood pressure. 4+4
5. (a) Discuss how baro-receptors and chemo-receptors regulate heart rate. 4+4
b) Describe the innervation of heart with a labelled diagram. What is Starling's law of heart? 6+2

Unit II: Respiratory Physiology

Group A -Short definitive type (2 marks each)

- 1) What do you mean by airway?
- 2) What is Bohr effect?
- 3) What is Haldane effect?
- 4) What is COPD?
- 5) Define physiological dead space.
- 6) What is FRC?
- 7) Name the primary respiratory muscles.
- 8) Write two histological characters of lung.
- 9) What is Cheyne Stokes breathing?
- 10) What is sleep apnoea?

Questions for 5 marks (Short Notes/ Answer):

- 1) Lung surfactant
- 2) Peculiarities of pulmonary circulation
- 3) 3.Work of breathing
- 4) Hypoxia
- 5) Oxy-haemoglobin dissociation curve
- 6) Cyanosis
- 7) Respiratory centres
- 8) Chemical regulation of respiration

Group C- Descriptive type. (8 marks each)

1. Describe the role of respiratory muscle in breathing mechanism. What is residual volume? 6+2
2. Describe the mechanism of transport of oxygen in blood from lungs to tissue cells. What is vital capacity? 6+2
3. Describe the mechanism of transport of CO₂ in blood from tissue cells to lungs. What do you mean by asthma? 6+2
4. Describe the neural control of respiration. State the difference between residual volume and functional residual capacity. 6+2
5. Describe the chemical regulation of respiration. What do you mean by accessory respiratory muscles? 6+2
6. Discuss the factors affecting oxygen dissociation curve. State the difference between asthma and COPD. 5+3

Unit III: Nerve Physiology

Group A -Short definitive type (2 marks each)

- 1) What is motor unit?
- 2) What is all or none law?
- 3) What is refractory period?
- 4) What do you mean by 'indefatigability of nerve fibre'?
- 5) What is chronaxie ?
- 6) What is rheobase?
- 7) What is resting membrane potential?
- 8) What do you mean by saltatory conduction?
- 9) Name the different types of synapses.
- 10) What do you mean by EPP and MEPP?

Group B - Short Answer Type Questions (5 marks each)

- 1) Neuroglia
- 2) Classification of nerve fibres on the basis of impulse propagation velocity

- 3) Origin of resting membrane potential
- 4) Action potential
- 5) Neurotransmitters
- 6) Neuromuscular junction
- 7) EPSP and IPSP

Group C- Descriptive type. (8 marks each)

- 1) Describe the structure of a synapse with a suitable diagram. What is synapse en passant? 6+2
- 2) Describe the structure of neuro-muscular junction with a suitable diagram. What is refractory period? 6+2
- 3) Describe the ionic basis of action potential. What is the difference between CNS and PNS? 6+2
- 4) Describe the mechanism of synaptic transmission with labelled diagram. 6+2
- 5) Describe the mechanism of propagation of nerve impulse across the myelinated and non-myelinated nerve fibres. 6
- 6) Describe the degenerative changes of a nerve fibre. What do you mean by regeneration of nerve fibre? 5+3

Unit IV: Muscle Physiology

Group A -Short definitive type (2 marks each)

- 1) What is summation property of skeletal muscle?
- 2) What is single unit smooth muscle?
- 3) What are the differences between red and white muscles?
- 4) What is beneficial effect property of skeletal muscle?
- 5) What is refractory period?
- 6) What is tetanus?
- 7) Define isometric and isotonic muscle contractions.
- 8) State any two histological differences between skeletal muscle and smooth muscle.
- 9) What do you mean by multi-unit smooth muscle?
- 10) Why cross striations are found in skeletal muscles?

Questions for 5 marks (Short Answer Type Questions) :

1. Differentiate Isometric and isotonic contraction
2. Excitation-contraction coupling
3. Comparative structure of skeletal, cardiac and smooth muscle
4. Sarcotubular system
5. Electrical changes during muscle contraction
6. Agonist and antagonist muscle groups

Group C- Descriptive type. (8 marks each)

1. Describe the electron microscopic structure of skeletal muscle with a labelled diagram. What is endomysium? 6+2
2. Describe the important properties of skeletal muscle. What is myofibril? 6+2
3. Describe the mechanism of skeletal muscle contraction with suitable diagram. 8
4. Describe the histological structure of smooth muscle with suitable diagram? What is mechanical junction? 6+2
5. Describe the chemical changes found during skeletal muscle contraction. Mention the events of skeletal muscle relaxation. 5+3
6. Describe the changes in myofilament during skeletal muscle contraction with diagram. What do you mean by relaxing protein? 6+2.

Unit V: Renal Physiology

Group A -Short definitive type (2 marks each)

1. Give two histological characters of kidney.
2. Name the cells of JG apparatus.
3. What is peritubular capillary?
4. Name two normal and two abnormal constituents of urine.
5. What is diabetes insipidus?
6. What is micturition reflex?
7. What is renal dialysis?
8. What is podocyte?
9. Name the types of nephrons and their location inside the kidney.
10. What do you mean by glomerular filtration rate?

Group B - Short Answer Type Questions (5 marks each)

1. Structure and function of JG apparatus
2. Peculiarities of renal circulations
3. Factors affecting glomerular filtration rate
4. Non-excretory functions of kidney
5. Autoregulation of renal blood flow
6. Renal reabsorption of glucose

Group C- Descriptive type. (8 marks each)

1. Describe the role of renal tubules in urine formation. What is glucosuria? 6+2
2. Describe the role of counter current multiplier mechanism in hypertonic urine formation. 6
3. Describe the role of kidney in regulation of acid-base balance. Name any two acids secreted by in the urine. 6+2
4. Describe the innervation of urinary bladder with a labelled diagram. What do you mean by 'nerves of filling'? 6+2
5. Describe the role of counter-current exchanger system in the maintenance of medullary osmotic gradient. What is vasa recta? 7+1
6. Describe the role of Malpighian corpuscles in urine formation. What is trigone? 6+2

PAPER: MDC CC6/MDC-Mn-5

(Special Senses, Endocrine and Reproductive Physiology)

Unit I: Special Sense-I

Group A -Short definitive type (2 marks each)

1. What is Weber-Fechner Law?
2. State Steven's Power law?
5. What is circumvallate papillae?
6. What is filiform papillae?
8. What is foliate papillae?
9. What is dysgeusia?
10. What is ageusia?
11. What is hypogeusia?
12. What is hyposmia?
13. What is conductive hearing loss?
14. What is sensorineural hearing loss?
15. What is perilymph?

16. What is endolymph?
17. Name three ear ossicles.
18. What is after taste?
19. What is umami sensation?

Group B - Short Answer Type Questions (5 marks each)

1. With a neat diagram describe the histological structure of olfactory epithelium.
2. Describe the structure of taste bud with a neat diagram.
3. Write a short note on types of hearing loss
4. Describe the structure of Organ of Corti
5. Discuss the role of middle ear in hearing

Group C- Descriptive type. (8 marks each)

1. Briefly describe the neural pathway for taste sensation (gustation). 6
2. Describe the structure of olfactory receptor. What is anosmia? 6+2
3. How signal transduction occur from olfactory receptor neurons? Dis 6+2
4. Describe the mechanism of hearing. 6

Unit II: Special Sense-II

Group A -Short definitive type (2 marks each)

1. What is the function of choroid in eye?
2. What is the function of iris in eye?
3. What is cataract?
4. What is glaucoma?
5. What is protanopia?
6. What is deuteranopia?
7. What is tritanopia?
8. Define scotopic vision.
9. What is photopic vision?
10. What is macula lutea/ fovea centralis?
11. What is transducin?
12. What is rhodopsin?
13. What is hypermetropia? How can it be corrected?
14. What is the function of aqueous humor?
15. What is the function of vitreous humor?
16. What is astigmatism?
17. What is Presbyopia?
18. What is near point?
19. What is far point?

Group B - Short Answer Type Questions (5 marks each)

1. Write a short note on colour blindness.
2. Briefly describe the process of visual accommodation.
3. What is positive and negative after image
4. Describe the light induced changes in rhodopsin molecule during vision.
5. Describe the components of visual pathway with a neat diagram.
6. What is visual acuity? How can we determine it?

Group C- Descriptive type. (8 marks each)

1. Discuss the mechanism of photo transduction in eye. What is myopia? How can it be corrected? 6+1+1
2. Describe the histological structure of retina with a labelled diagram? 9
3. State the mechanism of colour vision in human eye? What is Ishihara chart? 6+2

Unit III: Endocrinology-I

Group A -Short definitive type (2 marks each)

1. What do you mean by cell signalling?
2. What are the different types of cell surface receptors?
3. What is ion channel coupled receptor?
4. What do you mean by enzyme-coupled receptors? Give one example.
5. Name the fundamental steps of cell signalling.
6. What is a second messenger?
7. What is G protein?
8. Mention two properties of second messenger.
9. What is the function of protein kinase in cell signalling?
10. What is a G-protein-coupled receptor?
11. Classify hormone according to chemical nature.
12. Name two gaseous signalling molecule.
13. What is CREB?
14. What is hypothalamic hypophyseal tract?
15. What is Hypothalamo hypophyseal portal system?
16. What are hypothalamic releasing hormones?
17. Name the hormones secreted from thyroid gland.
18. Name the hormones secreted from posterior pituitary.
19. What is cretinism?
20. What is Grave's disease?
21. What is non-toxic goitre?
22. What is exophthalmic goitre?
23. What is Hashimoto's thyroiditis?
24. State two functions of prolactin.

Group B - Short Answer Type Questions (5 marks each)

- 1) What are the functions of G protein in signal transduction? 5
- 2) Describe the IP₃-DAG signalling pathway. 5
- 3) Write short notes on second messenger. 5
- 4) Describe the structure and mechanism of G-protein-coupled receptors (GPCRs) with a labelled diagram. 5
- 5) What are enzyme-linked receptors? Explain their mechanism using the receptor tyrosine kinase as an example. (2+3) 5
- 6) Discuss the role of calcium ions (Ca²⁺) as intracellular messengers in signal transduction. 5
- 7) Describe the G protein phospholipase C pathway. 5
- 8) Give a brief account of cAMP and cGMP as second messengers. 5
- 9) Briefly discuss the roles of adenylyl cyclase and guanylyl cyclase in cell signaling. 5
- 10) Discuss the significance of nitric oxide as signaling molecule. 5
- 11) Write short notes on hypersecretion of thyroid gland. 5
- 12) Write short notes on negative feedback regulation of hormone action. 5
- 13) What happens due to hypo secretion and hyper secretion of GH. 5
- 14) Mention the functions of thyroid hormone. 5

Group C- Descriptive type. (8 marks each)

- 1) Briefly discuss the G protein -adenylyl cyclase signalling pathway. Name two signalling molecules activating this pathway. 6+2
- 2) Classify hormones according to their chemical nature. Give example for each. What is the function of adenylyl cyclase in signal transduction? 3+5
- 3) Describe the histological structure of anterior pituitary. Name the hormones secreted from anterior pituitary. 5+3

- 4) Describe the structure and mechanism of G-protein-coupled receptors (GPCRs) with a labelled diagram. How does cAMP act as a second messenger? 5+3
- 5) What is the role of parathyroid hormone in calcium homeostasis? What is tetany? Mention the source of Calcitonin hormone. 5+2+1
- 6) Mention the functions of oxytocin and vasopressin. What is diabetes insipidus? 6+2

Unit IV: Endocrinology-II

Group A -Short definitive type (2 marks each)

1. Name the three layers of adrenal cortex.
2. Name the hormones secreted from adrenal cortex.
3. Name the hormones secreted from adrenal medulla.
4. What are catecholamines?
5. Name two hormones secreted from kidney.
6. What is hyperinsulinism?
7. What is glycosuria?
8. State one function for renin and erythropoietin each.
9. What is Addison's disease?
10. What is Cushing's syndrome?
11. Give examples of two neurohormones.
12. Mention source and two functions of Gastrin.
13. Mention source and two functions of Secretin.
14. What is type II diabetes mellitus?
15. What are emergency hormones?
16. Mention the source and function of glucagon.

Group B - Short Answer Type Questions (5 marks each)

1. State the source and physiological functions of melatonin. 1+4
2. Describe the histological structure of pancreatic islet and mention the hormones released from it. 5
3. Write a short note on diabetes mellitus. 5
4. With a neat diagram describe the histological structure of adrenal gland. 5
5. What are the disorders due to abnormal secretion of GH? What is endemic goitre? 4+1
6. What is the chemical nature of adrenal cortical hormones? Mention two functions for both cortisol and aldosterone. 1+2+2

Group C- Descriptive type. (8 marks each)

1. What are the names of the thyroid hormones? What happens due to hypo and hyperfunction of thyroid gland? 2+6
2. State the origin, source and functions of three gastrointestinal hormones. Which renal cells release renin? Where is CCK PZ secreted from? 6+1+1
3. Discuss the function of Somatotrophic hormone in growth and metabolism. 6
4. What are the functions of insulin on carbohydrate, protein and fat metabolism? 6

Unit V: Reproductive Physiology

Group A -Short definitive type (2 marks each)

1. Define puberty
2. What is menarche?
3. What is menopause?
4. What is LH surge?
5. Name two hormones secreted from placenta.
6. What is galactokinesis?

7. What is galactopoiesis?
8. What is lactational amenorrhea?
9. What is the zona pellucida?
10. What is folliculogenesis?
11. What is spermiogenesis?
12. What is amenorrhea?
13. State two functions of Sertoli cell.
14. What is corpus luteum?
15. What are the functions of corpus luteum?
16. What is HCG?
17. What is blood testis barrier?
18. What are the hormones secreted from testis?
19. State two functions of testosterone.
20. What is corpus albicans?
21. What is oligomenorrhea?
22. What do you mean by sperm capacitation?

Group B - Short Answer Type Questions (5 marks each)

1. Write a short note on male secondary sexual character.
2. What are the functions of placenta?
3. Write a short note on oogenesis
4. Discuss the role of different hormones in lactation
5. What is the fate of corpus luteum if no fertilization occur
6. What are the physiological functions of estrogen
7. Write a short note on parturition
8. With a labelled diagram describe the histological structure of testis. What is the function of seminal vesicles? (4+1)

Group C- Descriptive type. (8 marks each)

1. Describe the uterine changes occurring during different stages of menstrual cycle. 8
2. What are the ovarian changes occurring during different stages of menstrual cycle? 8
3. Describe the structure of sperm with a neat labelled diagram. Name the accessory glands in male reproductive system. 5+3
4. Discuss role of different hormone in maintaining of pregnancy. 6
5. Describe the different phases of spermatogenesis with a schematic diagram. What is spermeation? 6+2
6. Discuss the hormonal changes during menstrual cycle. What is oligomenorrhea? 7+1

PAPER: MDC CC 7

(Histology, Clinical Biochemistry, Molecular Biology, Evolution and Biostatistics)

(Paper- MDC-CC7)

Unit I: Histological techniques

Group A -Short definitive type (2 marks each)

1. Write two uses of a rotary microtome.
2. What is a vital stain? Give an example.
3. State one example of an acidic and a basic dye.
4. Name two commonly used mordants of the Haematoxylin stain.
5. Differentiate between the progressive and regressive staining methods.
6. What portions of a cell/tissue are stained by an acidic and basic dye?
7. What is the function of a clearing agent? Give an example.
8. Write one principle of staining by a vital stain.
9. Write the chemical components of a Leishman stain.

10. Mention two applications of silver nitrate staining.
11. Mention two physical methods of fixation.
12. What do you mean by an embedding of a tissue?

Group B - Short Answer Type Questions (5 marks each)

1. State the steps involved in staining a blood smear with Leishman's stain.
2. Describe the reason for using tap water for blueing in HE staining.
3. State the list criteria for an ideal fixative?
4. State the principle of staining of tissue by silver nitrate.
5. Classify different types of chemical fixatives.

Group C- Descriptive type. (8 marks each)

1. Mention the steps involved in section cutting by a rotary microtome.
2. Discuss the principle and steps involved in the Haematoxylin-Eosin staining procedure.

Unit II: Clinical Biochemistry

Group A -Short definitive type (2 marks each)

1. What are Bence-Jones proteins?
2. What is Gilbert Syndrome?
3. State two causes of hypoproteinaemia.
4. What is OGTT?
5. State the clinical significance of the albumin: globulin ratio.
6. What is the Tropic T test?
7. State two causative factors for atherosclerosis.
8. What is the normal reference range of LDL and HDL proteins in serum?
9. What are the causes for an elevated SGOT level in blood?
10. State two possible causes for developing Hyponatremia?
11. What is glycated haemoglobin?

Group B - Short Answer Type Questions (5 marks each)

1. Discuss the major factors of hypercholesterolemia.
2. Briefly describe the role of insulin in the prevention of hyperglycaemia.
3. How would you calculate eGFR from a subject?
4. What is the pathological indication of the elevation of uric acid in blood?
5. Discuss the pathological significance of the elevation of different isoforms of LDH.

Group C- Descriptive type. (8 marks each)

1. What is the normal reference range of ALP in an adult male? Under what conditions is a marked increase in SGPT and ALP found? What are the different isoforms of troponins? (2+2+2+2)
2. Discuss the variation of levels of T3, T4, and TSH in blood in Hypo & Hyperthyroidism, stating its reason. 6

Unit III: Molecular Biology

Group A -Short definitive type (2 marks each)

1. State one exception to the central dogma model of molecular biology.
2. What is Ori C of replication?
3. Write the functions of DNA polymerase III and DNA ligase.
4. What are Okazaki fragments?

5. What is the wobble hypothesis?
6. What do you mean by the Shine-Dalgarno sequence?
7. What is the importance of the σ -factor of RNA polymerase in transcription?
8. What are restriction endonucleases?
9. State the start and stop codons of translation.
10. Name the structural genes of the lac operon.
11. What is meant by the degeneracy of codons?
12. Differentiate between introns and exons.
13. What do you mean by the "charged" tRNA?

Group B - Short Answer Type Questions (5 marks each)

1. Write the process of Rho-independent termination of transcription.
2. Write five properties of the Genetic Code.
3. Discuss the application of gene therapy in medicine.
4. Briefly describe the process of initiation of prokaryotic transcription.
5. Discuss the steps of initiation of protein synthesis in prokaryotes.

Group C- Descriptive type. (8 marks each)

1. Discuss the process of regulation of gene expression by the lac operon.
2. Discuss the steps for producing recombinant insulin.

Unit IV: Human Evolution

Group A -Short definitive type (2 marks each)

1. What are the principles of Lamarckism?
2. What is Darwin's principle of evolution by natural selection?
3. Differentiate divergent and convergent evolution, with one example.
4. State the different eras of the geological time scale.
5. Mention the impact of evolution on the human brain.
6. Write two characteristics of Homo habilis.
7. What are the periods of the Mesozoic Era?
8. What is meant by the Hardy-Weinberg principle?
9. What is the Oparin and Haldane theory of the origin of life?
10. What is meant by Speciation?

Group B - Short Answer Type Questions (5 marks each)

1. What development of life took place during the Coenozoic era?
2. What were the evolutionary advantages of bipedalism in humans?
3. Discuss the characters of Homo erectus.
4. State the similarities of a neanderthal man with homo sapiens.
5. Mention the assumptions/conditions of the Hardy-Weinberg Equilibrium.

Group C- Descriptive type. (8 marks each)

1. Discuss the major structural characteristics of Australopithecines.
2. Discuss the major projections of the modern synthetic theory of evolution.

Unit V: Biostatistics

Group A -Short definitive type (2 marks each)

1. What is a dependent variable?
2. What is meant by the standard error of mean?
3. Name one physiological parameter that could produce (i) Continuous data and (ii) Discontinuous data.
4. What is a histogram?

5. Distinguish between population and sample.
6. State the uses of a pie diagram.
7. What is a dichotomous variable?
8. Distinguish between parametric and nonparametric tests.
9. What is standard deviation? How is it mathematically represented?
10. What is the advantage of presentation of continuous data by a histogram compared to a frequency polygon?
11. What is an ordinal or ranked variable?

Group B - Short Answer type questions (5 marks each)

1. How are mean, median, and mode mathematically related?
2. Distinguish between dependent and independent variables, with an example.
3. What are the advantages and disadvantages of using mean as a measure of central tendency over median and mode?
4. How can a pie diagram be drawn?

Group C- Descriptive type. (8 marks each)

1. What kind of data is best represented by a bar diagram? Explain with the help of an example, how a bar diagram can be drawn from a data set. What is the smoothening of a frequency polygon? (2+4+2)

End of the sections