Paper 7A

Biochemistry, Animal Physiology and Endocrinology (Theory)

Marks- 75
Time – 3 Hours

Unit-1: Chemical foundations of physiology: Concept of normal, molar, and molal solutions; Acids, bases, pH and buffers; Diffusion and osmotic pressure.
Enzyme kinetics: Michaelis-Menten equation and its relation to enzyme activity; Significance of K_m and V_{max}; Enzyme inhibition (reversible and irreversible).

Unit -2: Carbohydrates: Linear and ring forms of monosaccharides (Pentose and Hexose); Polysaccharides (starch, glycogen and hyaluronic acid); Glycogenesis and glycogenolysis. Electron transport system and oxidative phosphorylation. Amino acids, peptides and proteins: levels of organization, Transamination, deamination and urea cycle.

Unit -3: Structure and functions of haemoglobin; Blood coagulation: Coagulation factors and mechanism. Cardiac cycle. Blood pressure and its regulation. Mechanism of gaseous exchange through gills and lungs. Osmoregulation in fish.

Unit-4: Neurosecretory cells; Types of neurohormones; Endocrine and paracrine hormones; Placental hormones; Hormones of gastrointestinal tract; Pheromones. Biosynthesis of thyroid hormones. Mechanism of hormone action: Peptide/protein and steroid hormones.

Unit -5: Reproductive cycles (estrous and menstrual) in mammals; Hormonal regulation of spermatogenesis and oogenesis in humans; *In vitro* fertilization and embryo transfer technology; Pregnancy hormones; Lactation; Contraceptive methods for males and females.

Suggested Readings

1. Berg, J., Tymoczko, J. and Stryer, L. (2012). Biochemistry, 7th Edition, W. H. Freeman.
2. Campbell, M. K. and Farrell, S. O. (2010). Introduction to Biochemistry. Cengage Learning India.
3. Chaudhury, S. K. (1996). Practice of Fertility Control: A Comprehensive Textbook. B. I. Churchill Livingston Pvt. Ltd, India.
4. Hadley, M. E. and Levine, M. (2007). Endocrinology, 6th Edition. Pearson, Benjamin Cummings.
5. Hafez, E. S. E. and Evans, T. N. (1973). Human Reproduction: Contraception and Conception. Harper and Row, New York.
6. Hall, J. E. (2011). Guyton and Hall Textbook of Medical Physiology, 12th Edition. Saunders, Elsevier Inc. (Indian print).
7. Hill, R. W., Wyse, G. A. and Anderson, M. (2012). Animal Physiology, 3rd Edition, Sinauer Associates Inc.
8. Hoar, W S. (1983). General and Comparative Physiology. Prentice Hall of India. Pvt. Ltd.
9. Knobil, E. and Neill, J. D. (2006). The Physiology of Reproduction, Vol. 2. Elsevier Publication.
10. Kronenberg, H. M., Larsen, P. R., Melmed, S. and Polonsky, K. S. (2012). William's Textbook of Endocrinology. Saunders, Elsevier Inc.
11. Lehninger Principles of Biochemistry. Nelson, D. L. and Cox, M. (2012). 6th Edition. W.H. Freeman.
12. Murray, R. K., Bender, D., Botham, K. M., Kenelly, P. J., Rodwell, V. and Weil, P. A. (2012). Harper's Illustrated Biochemistry, 29th Edition. McGraw Hill, Lange publication.
13. Norman, A. W. and Litwack, G. (1997). Hormones, 2nd Edition. Academic Press, Elsevier Inc.
14. Norris, D. (2007). Vertebrate Endocrinology, 6th Edition. Academic Press, Elsevier Inc.
15. Prosser, C. L. (1991). Comparative Animal Physiology. W. B. Saunders & Company.
16. Randall, D. and Burggren, W. (2001). Eckert Animal Physiology, 5th Edition. W.H. Freeman.
17. Sherwood, L., Klandorf, H. and Yancey, P. (2010). Textbook of Animal Physiology. Cengage Learning India.

Paper 7B (Practical)

Biochemistry, Animal Physiology and Endocrinology

Marks: 25
Time: 4 Hours

1. WBC count in human blood.
2. RBC count in human blood.
3. Estimation of glucose by colorimetric method.
4. Estimation of protein by colorimetric (Lowry's/Biuret) method.
5. Estimation of hemoglobin in human blood.
6. Study of human salivary amylase activity in relation to temperature.
7. Dissection and display of pituitary and gonads in a teleost.
8. Dissection and display of endocrine glands in albino mouse/rat.
9. Microtomy: Preparation of histological slides of vertebrate tissues - liver, kidney, gonads, intestine and adrenal (minimum four slides of different tissues).

Distribution of Marks

1. Biochemistry and Physiology
2. Endocrinology
3. Microtomy
4. *Viva Voce*
5. Laboratory Record

Total **25 (Internal test – 7 + End semester test - 18)**

Paper 8A

Developmental Biology, Environmental Biology and Biotechnology (Theory)

Marks: 75
Time: 3 Hours

Unit-1: Patterns of cleavage; Morphogenetic movements (epiboly, invagination, ingression, involution and delamination); Embryonic induction and concept of Organizer; Gastrulation in chick up to formation of three germinal layers.

Unit 2: Foetal membranes and types of placenta in mammals; Organogenesis of the vertebrate eye; Regeneration in invertebrates and vertebrates; Teratogenesis and developmental birth defects. Concepts of Ageing.

Unit – 3: Salient features of aquatic and terrestrial ecosystems. Liebig's law of limiting factors and Shelford's law of tolerance. Biogeochemical cycles: carbon, phosphorus and nitrogen cycles. Ecological succession. Major Biomes.

Unit – 4: Environmental concerns: Radioactive pollution; Biological indicators; Biomagnification; Anthropogenic activity and environment: Ozone depletion; Green house effect and global warming; Acid rains.
Wild life conservation: *In situ* (sanctuaries, national parks and biosphere reserves) and *ex situ* (botanical and zoological gardens, Germplasm Bank).

Unit - 5 Biotechnology & Genetic Engineering

Introduction to genetic engineering; Restriction enzymes. Cloning vectors: Plasmid, cosmid, λ phage, shuttle vectors; Expression vectors. Introduction in to host cells: Transformation, transduction; Particle gun. Southern blotting; PCR; DNA Fingerprinting; Genomic library and cDNA library; Application of recombinant DNA technology. Ethical issues and Biosafety regulations.

Suggested Readings:

1. Balinsky, B.I. (1981). An introduction to Embryology, 7th Edition. Cengage Learning India.
2. Beeby, A. and Brennan, M. A. (2008). First Ecology - Ecological Principles and Environmental Issues, 3rd Edition, Oxford University Press, India.
3. Brown, T. A. (2006). Gene Cloning and DNA Analysis: An Introduction. Wiley-Blackwell.
4. Cain, M. L., Bowman, W. D. and Hacker, S. D. (2011). Ecology, 2nd Edition. Sinauer Associates, Inc. Publishers
5. Carlson, B. M. (2006). Foundations of Embryology. McGraw Hill Education (India) Ltd.
6. Gilbert, S. F. (2010). Developmental Biology, 9th Edition. Sinauer Associates, Inc. Publishers.
7. Kalthoff, K. (2000). Analysis of Biological Development, 2nd Edition, McGraw-Hill Professional.
8. Kendeigh, F C. (1984). Ecology with Special Reference to Animal and Man. Prentice Hall Inc.
9. Odum, E. P. (1971). Fundamentals of Ecology, 3rd Edition. W. B. Saunders Company.
10. Odum, E. P. and Barrett, G. W. (2006). Fundamentals of Ecology, 5th Edition, Cengage Learning India.
11. Primrose, S. B. and Twyman, R. (2006). Principles of Gene Manipulation and Genomics, 7th Edition. Wiley-Blackwell.
12. Ratledge, C. (2006). Basic Biotechnology. John Wiley and Sons.
13. Ricklefs, R. E. (2010). Economy of Nature, 6th Edition. W.H.Freeman.
14. Sharma, P. D. (1990). Ecology and Environment, 7th Edition. Rastogi Publications.
15. Shyam, D. and Rosencranz, A. (2001). Environmental Law and Policy in India. Oxford University Press.
16. Stiling, P. D . (2012). Ecology Companion Site: Global Insights and Investigations. McGraw Hill Education.
17. Thieman, W. J. and Palladino, M.A. (2008). Introduction to Biotechnology, 2nd edition. Cengage Learning India.
18. Wolpert, L. and Tickle, C. (2011). Principles of Development, 4th Edition, Oxford University Press.

Paper 8B (Practical)

Developmental Biology, Environmental Biology and Biotechnology

Marks: 25
Time: 4 Hours

1. Permanent preparation of whole mount of chick embryo.
2. Study of regeneration in *Hydra*/*Planaria*.
3. Study of whole mount /sections of different developmental stages of chick embryo from permanent slides.
4. Community analysis.
5. Qualitative analysis of aquatic communities from different water bodies.
6. Estimation of total hardness of water samples.
7. Quantitative estimation of Plankton.
8. Analysis of community similarities and species diversity indices.

9. Field trip and submission of Field Report.

Distribution of Marks

1. Developmental Biology
2. Environmental Biology
3. Spotting
4. *Viva Voce*
5. Laboratory Record
6. Field Report

Total 25 (Internal test – 7 + End semester test - 18)