

| BS-141 | Biology | | | | | | |
|------------------------|--|---|--------|------------|------------|-------|------|
| L | T | P | Credit | Major Test | Minor Test | Total | Time |
| 2 | 1 | - | 3 | 75 | 25 | 100 | 3h |
| Purpose | To familiarize the students with the basics of Biology | | | | | | |
| Course Outcomes | | | | | | | |
| CO1 | Introduction to essentials of life and Cell and classification of organisms | | | | | | |
| CO2 | Macromolecules essential for growth and Development | | | | | | |
| CO3 | Defining the basic concepts of genetics and role in determining various human traits | | | | | | |
| CO4 | Defining the basic concepts of cell division and Immune system | | | | | | |
| CO5 | Introduction of basic Concept of Thermodynamics & Biochemistry | | | | | | |
| CO6 | Introduction of basic Concept of Microbiology & Role of Biology in Different Fields | | | | | | |

Unit – I

Introduction to living world: Concept and definition of Biology; Importance of biology in major discoveries of life Characteristic features of living organisms; Cell ultra-structure and functions of cell organelles like nucleus, mitochondria, chloroplast, ribosomes and endoplasmic reticulum; Difference between prokaryotic and eukaryotic cell; Difference between animal and plant cell.

Classification of organisms: Classify the organisms on the basis of (a) Cellularity;- Unicellular and Multicellular organisms. (b) Energy and Carbon Utilization:- Autotrophs, Heterotrophs and Lithotrophs (c) Habitat (d) Ammonia excretion:- ammonotelic, uricotelic and ureotelic. (e) Habitat- aquatic or terrestrial (e) Molecular taxonomy- three major kingdoms of life

Unit-II

Introduction to Biomolecules: Definition, general classification and important functions of carbohydrates, lipids, proteins, nucleic acids (DNA & RNA: Structure and forms). Hierarchy in protein structure: Primary secondary, tertiary and quaternary structure. Proteins as enzymes, transporters, receptors and structural elements.

Enzymes as biocatalysts: General characteristics, nomenclature and classification of Enzymes. Effect of temperature, pH, enzyme and substrate concentrations on the enzyme activity. Elementary concept of cofactors and coenzymes. Mechanism of enzyme action. Enzyme kinetics and kinetic parameters (K_m and V_{max})

Unit-III

Genetics:-Mendel's laws of inheritance. Variation and speciation. Concepts of recessiveness and dominance. Genetic Disorders: Single gene disorders in human. **Human traits:** Genetics of blood groups, diabetes type I & II.

Cell Division:- Mitosis and its utility to living systems. Meiosis and its genetic significance. Evidence of nucleic acids as a genetic material. Central Dogma of molecular biology

4. Role of immune system in health and disease: Brief introduction to morphology and pathogenicity of bacteria, fungi, virus, protozoa beneficial and harmful for human beings.

Unit-IV

Metabolism:-Concept of Exothermic and endothermic reactions. Concept of standard free energy and Spontaneity in biological reactions. Catabolism (Glycolysis and Krebs cycle) and synthesis of glucose (Photosynthesis:- Light and Dark Reaction) of glucose. ATP as Energy Currency of the cell

Microbiology: Concept of species and strains, sterilization and media compositions, growth kinetics.

Role of Biology: Role of Biology in Agriculture, Medicine, Forensic science, Bioinformatics, Nanotechnology, Micro-electromechanical systems (Bio-MEMS) and Sensors (Biosensors).

Text Book:

1. Introduction to Biotechnology, By Deswal & Deswal, Dhanpat Rai Publications N.A
2. Campbell, J. B. Reece, L. Urry, M. L. Cain and S. A. Wasserman, "Biology: A global approach", Pearson Education Ltd, 2014.
3. E. E. Conn, P. K. Stumpf, G. Bruening and R. H. Doi, "Outlines of Biochemistry", John Wiley and Sons, 2009.
4. D. L. Nelson and M. M. Cox, "Principles of Biochemistry", W.H. Freeman and Company, 2012.

Note: The paper setter will set the paper as per the question paper templates provided

Suggested Books:

1. Molecular Biology of cell, 4th ed. Alberts, Bruce et al. Garland Science Publishing, New York.
2. Microbiology. Pelczar Jr., M.J.; Chan, E.C.S. and Krieg, N.R. Tata McGraw Hill, New Delhi.
3. Lehninger: Principles of Biochemistry, 3rd edition, by David L. Nelson and M.M. Cox. Maxmillan/ Worth publishers.
4. Genetics by Snusted& Simmons.
5. Kuby's Immunology, Goldsby, R A,.Kindt, T.J, Osborne, B.A.(2003) W. H. Freeman and company, New York.
6. Essentials of Molecular Biology 4thed, Malacinski, G. M. (2003) Jones &Bartlet Publishers, Boston

LESSON PLAN

Course Title: Biology

Course No.: BS-141

Name of the Teacher: Dr. Pushpa Bogra

| LECTURE | Topics |
|---------|---|
| 1. | Concept and definition of Biology: Characteristic features of living organisms |
| 2. | Structure and functions of Cell Nucleus |
| 3. | Structure and functions of Mitochondria and Chloroplast |
| 4. | Structure and functions of Ribosomes and ER |
| 5. | Difference between Prokaryotic and Eukaryotic cell; Animal and Plant cell |
| 6. | Unicellular and Multicellular organisms. Autotrophs, Hetrotrophs and Lithotrops |
| 7. | Ammonotelic, uricotelic and ureotelic;; aquatic or terrestrial |
| 8. | Molecular taxonomy- three major kingdoms of life |
| 9. | Definition, general classification of Carbohydrates |
| 10. | Lipids Structure and Classification |
| 11. | Proteins Structure and Classification |
| 12. | Nucleic acids (DNA & RNA: Structure and forms) |
| 13. | Primary secondary, tertiary and quaternary structure. |
| 14. | Proteins as enzymes, transporters, receptors and structural elements. |
| 15. | Enzymes; Characteristics and Classification and Effect of temperature and pH |
| 16. | Effect substrate concentrations on the enzyme activity |
| 17. | Elementary concept of cofactors and coenzymes.. |
| 18. | Mendel's laws of inheritance.. |
| 19. | Variation and speciation. Concepts of recessiveness and dominance |
| 20. | Genetic Disorders: Single gene disorders in human |
| 21. | Genetics of blood groups, Diabetes type I & II. |
| 22. | Mitosis and its significance |
| 23. | Meiosis and its genetic significance |
| 24. | . Evidence of nucleic acids as a genetic material. |
| 25. | Central Dogma of molecular biology |
| 26. | Morphology and pathogenicity of Bacteria beneficial and harmful for human beings. Fungi |

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| 27. | Virus and Protozoa |
| 28. | Exothermic and endothermic reactions |
| 29. | Standard free energy and Spontaneity in biological reactions. |
| 30. | Catabolism :Glycolysis |
| 31. | Krebs cycle |
| 32. | Photosynthesis:- Light Reaction of Photosynthesis |
| 33. | Dark Reaction of Photosynthesis, ATP as Energy Currency of the cell |
| 34. | Species and strains of microorganisms, sterilization |
| 35. | Media compositions, growth kinetics |
| 36. | Applications of Biology in Agriculture & Medicine |
| 37. | Role of biology in Information Technology & Forensic Science |
| 38. | Role of biology in Biosensors and Nanotechnology |
| 39. | Role of biology in Micro-electromechanical systems |

Dr. Pushpa Bogra
Associate Professor

TUTORIAL SHEET

UNIT-1

Q-1 Tabulate the difference between prokaryotic and eukaryotic cell.

Q-2 Differentiate between an animal cell and a plant cell.

Q-3 Differentiate between the following:

(a) Mitochondria and chloroplast (b) 80S and 70S ribosome

(b) Smooth and rough endoplasmic reticulum

Q-4 Classify the organisms on the basis of cellularity and Habitat

Q-5 . Classify the organisms on the basis of carbon utilization and ammonia excretion

Q-6 Give Detailed account of three major kingdom of life.

UNIT-2

Q-1 Classify the carbohydrates into different classes and write down their function.

Q-2 Classify the fats and protein into different classes and write down their function.

Q-3 Different structural levels of organization of proteins.

Q-4 What is the effect of substrate concentration on enzyme activity. Derive the equation for determination of K_m and V_{max} .

Q-5 Classify the enzyme into different classes and also explain their mechanism of action.

UNIT-3

Q-1 Define Mendel's Laws of Inheritance with suitable example.

Q-2 What is the basic of difference of various blood group of human? Explain

Q-3 Categorise the various types of diabetes.

Q-4 Discuss the process of mitosis and meiosis.

Q-5 What is the mechanism of bacterial pathogenicity?

UNIT-4

Q-1 Explain the glycolysis and Krebs cycle for catabolism of glucose

Q-2 Define photosynthesis and explain light and Dark Reactions of photosynthesis

Q-3 What do you mean by sterilization. Explain in brief different methods of sterilization.

Q-4 Write the application of nanotechnology?

Q-5 What are the applications of biology in agriculture and Medicine

Q-6 Write a note on bioinformatics and its application in biology.

31043

BT-1/D-18
Biology
Paper-BS-141

Time: 3h

MM:75

Note: Attempt five questions in all, selecting at least one from each section

Unit I

Q1. What is an endoplasmic reticulum. Explain the function of different types of endoplasmic Reticulum 6

Differentiate the following 3x3

(a) Mitochondria vs chloroplast

(b) 80 S vs 70 S ribosomes

(c) Plant and Animal Cell

Q2 (a) .Write a detailed account of three major kingdom of life 9

(b) Write down the difference between prokaryotic and eukaryotic cells. 6

Unit II

Q3 (a) Write a comprehensive note on different levels of protein structure. 8

(b) Write a note on enzyme kinetics 7

Q4, Explain the following:

(a) Effect of temperature and pH on enzyme activity. 7

(b) 2° structure of DNA and its function. 8

Unit III

Q5. Write note on the following

(a) Central Dogma of Molecular Biology 7

(b) Mendel's Laws of Inheritance with suitable example 8

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| Q6. Write note on the following | |
| (a) Variation and Speciation | 8 |
| (b) Griffith Experiment for DNA as genetic materials | 7 |

Unit IV

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| Q7. Write note on the following | |
| (a) Role of Biology in nanotechnology | 8 |
| (b) ATP as energy currency of the Cell | 7 |
| Q8. Write note on the following | |
| (a) Role of Biology in agriculture | 8 |
| (b) Photophosphorylation | 7 |