

BT-105- FUNDAMENTALS OF BIOLOGY

Course Title	Fundamentals of Biology	Course Code	BT-105
Year	I	Course Group	Foundation
Teaching Scheme in Periods(L:T:P)	4:1:0	Credits	3
Methodology	Lecture+Tutorial	Total Contact periods	150
CIE	60 M	YEAR END EXAM	40M

Prerequisites:

This course requires the basic knowledge of biology of secondary school level

Course Outcomes (COs):

Upon completion of the course, the student shall be able to

CO 1	Explain the concept of living vs. non-living, understand biodiversity, the need for classification, Describe the salient features and classification of Monera, Protista, Fungi, Viruses, Viroids, and Lichens, plant and animal classification.
CO 2	The importance of water in plant life and the mechanisms for the transport of water and solutes (minerals and food) within the plant via the xylem and phloem, Understanding how systems like digestion, respiration, circulation, excretion, locomotion, Neural Control, and Hormonal Coordination function to maintain life
CO 3	Understanding life cycles (asexual/sexual), mastering flowering plant reproduction (flower structure, pollination, fertilization), detailing human reproduction, Students should be able to describe processes, identify structures, explain hormonal roles,
CO 4	Differentiate between prokaryotic and eukaryotic cells , Identify the fundamental components common to all cells
CO 5	Understanding the structure (membrane components, cytoskeletal filaments), functions (transport, signaling, shape, movement), and dynamic interactions that govern cellular life
CO 6	Cover key concepts in cell biology and signalling pathways, including the mechanics and regulation of the cell cycle, the development and characteristics of cancer

CO-PO Mapping

Course Outcome/ Programme Outcome	Basic and Discipline Specific Knowledge	Problem Analysis	Design/Development of Solutions	Engineering Tools, Experimentation and Testing	Engineering Practices for Society, Sustainability and Environment	Project Management	Lifelong Learning	Linked PO
CO	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	
CO1	2	1	1		1		1	1,2,3,5,7
CO2	2		1		1		1	1,3, 5,7
CO3	2		1		1		1	1,3,5,7
CO4	2		1		1		1	1,3, 5,7
CO5	2			2	1		1	1,4,5,7
CO6	2			2	1		1	1,4,5,7
	2	1	1	2	1		1	1,2,3,4,5,7

TIME SCHEDULE

S.No	Content	Periods
1	Unit 1	25
2	Unit 2	25
3	Unit 3	25
4	Unit 4	25
5	Unit 5	25
6	Unit 6	25

Course contents:

UNIT-I

Duration 25 periods (L: 20-T:5)

Diversity of Living Organisms: The Living World, Biological Classification, Plant Kingdom, Animal Kingdom, Structural organization in Animals & Plants, Morphology & Anatomy of flowering plants.

UNIT-II

Duration 25 periods (L: 20-T:5)

Cell Biology: Cell- the basic unit of life, Cell structure and functions, Prokaryotic and Eukaryotic cells, Cell organelles (Nucleus, Mitochondria, Chloroplast, ribosomes and cell membranes)

Cell division-Cell cycle, mitosis, meiosis and cellular communication methods. Cancer- Characteristics of Cancer cells, Benign & Malignant tumor.

UNIT-III

Duration 25 periods (L: 20-T:5)

Plant Physiology: Transport in Plants, plant water relation-osmosis, plasmolysis, imbibition, pathway of water movement in the root, water movement up a plant, transpiration,

Photosynthesis- Definition, factors affecting, Light reaction, dark reaction, electron transport.

Respiration- Definition, cellular respiration, respiratory substrate, aerobic and anaerobic respiration, Glycolysis, fermentation, amphibolic pathway, respiratory quotient, Plant Growth & Development.

UNIT-IV

Duration 25 periods(L:20-T:5)

Functional organization of animal tissue and Human Physiology:

Structural organization in animal tissue and types of tissues: unicellular organisms, multicellular organisms.

Morphology and Anatomy of frog - digestive system, respiratory system, circulatory system, excretory system.

Human Physiology: Digestion system, Respiratory system, Excretion system, Body Fluids & Circulation, Locomotion & Movement, Neural Control & Coordination, Chemical Coordination (Hormones).

UNIT – V

Duration 25 periods (L:20-T:5)

Reproduction: In organisms, sexual reproduction in flowering plants, Animal reproduction

Human Reproduction: Male reproductive system, female reproductive system, fertilization, Menstrual cycle, Reproductive Health, Biology & Human Welfare: Human Health & Diseases.

UNIT-VI

Duration 25 periods (L: 20-T:5)

Biotechnology

Definition, scope, history, applications of biotechnology, Principles of biotechnology-Genetic engineering, Bioprocess engineering. Understanding the terminology of cloning vector, properties of good vector, plasmid, bacteriophage, gene cloning, recombinant DNA, gene transfer, bioremediation, spooling, elution. Basic thermodynamics in biology.

TEXT BOOKS:

1. Introduction to biology and biotechnology, second edition, K.Vaitaidyanath, K. Pratap Reddy, and K.Satya Prasad, BS Publications.
2. NCERT Intermediate Botany and zoology I and II year

REFERENCES:

1. H.G. Rehen and G.Reed, biotechnology Volume I & 2.
2. Basic Biotechnology, Second Edition, by Colin Ratledge and Bjorm Kristiansen, Cambridge University Press.
3. Anatomy and Physiology In Health and Disease,K. J.W. Wilison and A. Waugh, Churchill & Livingston.
4. Plant Physiology F.B Salisbury & C.W. Ross 4th edition Thomson Wadsworth.
5. Dr. C.C. Chatterjee, Human Physiology (11th Edition) Vol I and II, Medical Allied Agency, Kolkata, 1987

Learning outcomes

Upon completion of this course the student will be able to

CO1 Aim to provide a foundational understanding of biological classification, the evolutionary relationships among organisms, and the practical application of microbes in daily life and industry, focus on identifying and differentiating plant and animal structures, understanding tissue systems, and relating structure to function, enabling students to describe, compare, and interpret plant and animal bodies and then applying these to the frog's external features and internal systems

1. Define Biology.
2. What is biodiversity?
3. The number and types of organisms present on Earth is _____.
4. What is nomenclature?
5. What is classification?
6. What is taxonomy?
7. What is genus, phylum, order?
8. Illustrate the taxonomical hierarchy with suitable examples of a plant and an animal.
9. Write the taxonomic category of man and wheat.
10. Why are living organisms classified?
11. What do we learn from the identification of individuals and populations?
12. Define taxon. Give some examples of taxa at different hierarchy levels.
13. What is the basis for classification of algae?
14. Explain the reproduction methods of algae.
15. Mention the divisions of algae and write their main characteristics.
16. What are Bryophytes? Give examples.
17. What are the different levels of organization in Animal Kingdom?
18. What is symmetry? Classify them.
19. Classify animalia kingdom based on common fundamental features.
20. Write differences between chordates and non-chordates.
21. Write characteristics of class Reptilia and Class Aves.
22. What is the difference between direct and indirect development?
23. Water vascular system is the characteristic of which group of the following:
(a) Porifera

- (b) Ctenophora
 - (c) Echinodermata
 - (d) Chordata
24. How important is the presence of air bladder in Pisces?
25. Segmentation in the body is first observed in which of the following:
- (a) Platyhelminthes
 - (b) Aschelminthes
 - (c) Annelida
 - (d) Arthropoda
26. Explain the vegetative characters and floral characters of Solanaceae with economic importance.

Structural Organisation in Plants

1. What is root system and shoot system?
2. What is tap root system, fibrous root system and adventitious roots?
3. Functions of root system.
4. Mention the regions of root with neat diagram.
5. What are the features that distinguish root from stem?
6. Structure of a typical leaf with neat diagram.
7. What is venation? Write its types.
8. Classification of compound leaf.
9. What is phyllotaxy?
10. Inflorescence – classify different types.
11. What is flower? Describe its parts.
12. What is fruit? Write its parts.
13. What is placentation?
14. Draw the structure and explain the parts of dicotyledonous seed.
15. Draw the structure and explain the parts of Monocotyledonous seed.

CO 2 The importance of water in plant life and the mechanisms for the transport of water and solutes (minerals and food) within the plant via the xylem and phloem photosynthesis, respiration, plant growth and development

Unit – II

1. What is photosynthesis?
2. Describe Calvin cycle.
3. Define photorespiration.
4. Explain factors affecting photosynthesis.
5. Differentiate between cyclic and non-cyclic photophosphorylation.
6. Compare anatomy of leaf in C₃ and C₄ plants.
7. Define Kranz anatomy.
8. Elaborate ATP and NADPH.
9. NADP reductase enzyme is located on the stroma side of the membrane.
10. List the parts of the respiratory system.
11. What are the steps involved in respiration?
12. Explain the mechanism of breathing.
13. Define tidal volume.
14. What is inspiratory reserve volume (IRV)?
15. What is ERV?
16. How does exchange of gases take place in lungs?
17. What are the major transport mechanisms for CO₂? Explain.
18. What happens to the respiratory process in a man going up a hill?

Body Fluids and Circulation

1. What are the components of blood?
2. Blood is a _____ tissue.
3. Write in detail about RBC and WBC.
4. Write a note on blood grouping.
5. What is lymph?
6. Circulatory patterns are of _____ and _____.
7. Draw the neat labelled diagram of heart.
8. Define cardiac cycle.
9. What is ECG?

10. How can you regulate the cardiac activity? Explain.
11. Mention the disorders of the circulatory system.
12. What is the importance of plasma proteins?
13. Sinoatrial node is called the pacemaker of heart – why?
14. Explain heart sounds.
15. Draw a standard ECG and explain the different segments in it.

Excretion – Unit II

1. Define GFR.
2. Explain the autoregulatory mechanism of GFR.
3. Describe the role of liver, lungs and skin in excretion.
4. Define micturition.
5. What is meant by the term osmoregulation?
6. Reabsorption of water from the distal part of the tubule is facilitated by _____ hormone.
7. Dialysis fluid contains all the constituents as in plasma except _____.
8. What is Chemical coordination.

CO3 Understanding how systems like digestion, respiration, circulation, excretion, locomotion, Neural Control, and Hormonal Coordination function to maintain life Understanding life cycles (asexual/sexual), mastering flowering plant reproduction (flower structure, pollination, fertilization), detailing human reproduction and reproductive health

Unit III

Reproduction in Plants

1. Sketch the reproductive parts of a flower.
2. Explain the difference between self-pollination and cross-pollination.
3. Describe the different methods of asexual reproduction. Give examples.

Reproduction in Animal Cells

1. Write about medical termination of pregnancy.

2. Explain about gametogenesis.
3. Explain about menstrual cycle.
4. Explain about IVF.
5. Write about female reproductive system.
6. Write about male reproductive system.
7. Explain parturition and lactation.

Biology & Human Welfare

1. What are pathogens?
2. Define elephantiasis.
3. What is innate immunity?
4. What is cancer?
5. Define innate and acquired immunity.
6. What is meant by metastasis?
7. Mention the harmful effects caused by alcohol and drug abuse.
8. Write about the drugs used in drug abuse.
9. Mention the drugs which are commonly abused.
10. Describe the immune system in the body.
11. What is protoplast fusion?
12. What is meant by hidden hunger?
13. Explain the concept of the Blue Revolution.
14. What are the advantages of tissue culture methods over conventional methods of plant breeding in crop improvement programmes?

CO4: Differentiate between prokaryotic and eukaryotic cells, Identify the fundamental components common to all cells, understanding cell division, cell cycle, the development and characteristics of cancerCell –

IV unit

Draw a neat labelled diagram of cell.

Write the difference between mitosis & meiosis.

Describe the structure and function of mitochondria .

Describe the structure and function of Endoplasmic Reticulum .

Describe the function of Nucleus and Golgi Complex .

Write the difference between prokaryotic and eukaryotic cell.

Describe the events taking place during interphase and their structure and function.

Explain the structure and function of lysosomes.

Explain the significance of mitosis .

Explain in detail about mitosis.

Explain in detail about meiosis.

Explain/Describe the phases of cell cycle.

Describe the Fluid mosaic model of plasma membrane.

Define cell.

List out the cell organelles.

What is chloroplast.

What is the avg. cell cycle span for a mammalian cell.

What is G₀ of cell cycle.

What is ECM.

What are characteristics of prokaryotic cell.

What are nuclear pores. State their function.

Explain various mechanisms of motility of cell.

CO5: Understanding the structure (membrane components, cytoskeletal filaments), functions (transport, shape, movement), and dynamic interactions that govern cellular life

UNIT - V

1. What Explain the structure and function of cell wall in microbes.
2. Describe the fluid mosaic model of plasma membrane.
3. What is the fundamental difference between Active & Passive transport.
4. Define phagocytosis.
5. Explain P-type & V-type pumps.
6. Write the difference between transport mechanism, symport.
7. What happens to a cell in antiport.
8. What is symport.
9. Define Antiport.

10. Explain P-type cell.
11. What is exocytosis.
12. What is the how do very large particles like bacteria enter a cell
13. Write in detail about plasma membrane structure & function
14. Explain the active & passive transport of ions, Na^+/K^+ pump
15. What are the functions of cell membrane
16. Describe about the types of cell transport
17. What are the main components and function of cytoskeleton
18. List out the disorders associated with damage of cytoskeleton.
19. Define Ecosystem
20. What are microbes? Give examples.
21. In which food now you find lactic acid bacteria.
22. Name any 2 species of fungus which are used in the production of antibiotics
23. Find out the role of microbes in a single cell Protein and soil
24. How do biofertilizers enrich the fertility of the soil.
25. What is sewage? In which way can sewage be harmful to us.
26. Draw a neat diagram of biogas plant write its construction.
27. Explain the different stages of sewage treatment.
28. Explain about the fermentation plant.
29. Explain the role of microbes in fermented beverages.

CO6: Equip students to define these fields, understand core techniques like Recombinant DNA (rDNA) technology (gene cloning, transfer), identify key tools (restriction enzymes, vectors, hosts),

Unit 6

1. Define cell cycle
2. Name the phases of cell cycle
3. Name the phases of M-Phase
4. Explain the phases of cell cycle
5. Write about interphase of M-Phase
6. No. of stages in M Phase

7. Name the phases in M-Phase
8. Explain the stages in M-Phase
9. Write about Metaphase
10. Write the key events of Telophase
11. Define cytokinesis
12. What is the significance of mitosis
13. Write the key features of Meiosis
14. Name the two sequential cycles of Meiosis
15. Write a note on Meiosis II
16. What is the average cell cycle span for a mammalian cell
17. Distinguish cytokinesis from karyokinesis
18. Why is mitosis called equational division
19. Can there be mitosis without DNA replication in S phase
20. List the 3 main differences between mitosis & meiosis
21. What is the role of cyclin in cell cycle regulation
22. Draw the graph of cyclin Expression cycle
23. Name the classes of cyclins
24. What is cancer
25. How cancer is developed
26. Differentiate Cancer cell and normal cell
27. Define proliferation
28. Define Oncology
29. Name the types of tumour
30. Define Benign tumour & malignant tumour
31. Describe types of Cancer based on type of cell & locations of cell
32. Define oncogenes
33. Write the characteristics of cancer cell
34. Name 4 basic categories of chemical signalling
35. Define Paracrine signalling
36. Write about Enzyme linked receptors

37. Write about Phosphorylation
38. Write about MAP Kinase pathway
39. What are steps involved in cell signalling
40. Write about Endocrine signalling
41. Write the function of receptors in cell signalling
42. Explain the structure of G-protein receptors
43. What is Kinase receptor
44. Types of kinase receptors
45. Write about Tyrosine Kinase receptors

Course Content and Blue Print of Marks for MID Examinations & Year End Examination (YEE)

MID-I Examination					
S. No	Unit	Questions to be set for MID Exam			Remarks
		R	U	A	
1	UNIT-1	1, 2	5(a) 5(b)	7(a) 7(b)	
2	UNIT-2	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	
MID-II Examination					
S. No	Unit	Questions to be set for MID Exam			Remarks
		R	U	A	
1	UNIT-3	1, 2	5(a) 5(b)	7(a) 7(b)	
2	UNIT-4	3, 4	6(a) 6(b)	8(a) 8(b)	
Total Questions		4	4	4	

Year End Examination (YEE)

S. No	Unit	Questions to be set for YEE				Remarks
		R		U	A	
1	UNIT-1	4	1	9(a)	13(a)	
2	UNIT-2					
3	UNIT-3		2	10(a)	14(a)	
4	UNIT4					

5	UNIT-5		3	5, 6	9(b) 11(a) 11(b)	13(b) 15(a) 15(b)	
6	UNIT- 6			7,8	10(b) 12(a) 12(b)	14(b) 16(a) 16(b)	
Total Questions			8		8	8	

Legend:	Remembering (R)	1 Mark
	Understanding (U)	3 Marks
	Application (A)	5 Marks

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA

DIPLOMA EXAMINATION (C-26)

MID-I EXAMINATION

BT-105-FUNDAMENTALS OF BIOLOGY

Model question paper

Duration: 1 hour

Max. Marks: 20

PART – A

Answer All the questions

4 × 1 = 4 M

1. What is biodiversity?

2. What is taxonomy?
3. Define photorespiration.
4. What is osmosis?

Part – B **2 × 3 = 6 M**

5. (a). Write the taxonomic category of man & wheat.
OR
(b). What is genus, family, and order?
6. (a). What is aerobic & anaerobic respiration?
OR
(b) Name the factors affecting photosynthesis.

Part – C **2 × 5 = 10 M**

7. (a). What are autotrophic & heterotrophic bacteria?
OR
(b) What are algae? Write its characteristic features.
8. (a) Describe Calvin cycle.
OR
(b) Write about the pathway of water movement in the root.

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA

DIPLOMA EXAMINATION (C-26)

MID-II EXAMINATION

BT-105-FUNDAMENTALS OF BIOLOGY

Model question paper

Duration: 1 hour

Max. Marks: 20

PART – A

Answer All the questions 4 × 1 = 4 M

1. Blood is a _____ tissue.
2. Define tidal volume.
3. Power house of the cell is _____.
4. What is meant by benign tumor?

PART – B 2 × 3 = 6 M

5. (a) What is artificial hybridization
OR
b) What are the methods of birth control?
6. a. Write the structure & functions of nucleus.

(b) Write the difference between prokaryotic & eukaryotic cells

PART – C 2 × 5 = 10 M

7. (a) Explain cardiac cycle.
OR
(b) Explain the mechanism of gases.
8. (a) Describe the events that takes place in mitosis
OR
(b) What are the steps involved in cell signalling?

STATE BOARD OF TECHNICAL EDUCATION & TRAINING, TELANGANA

DIPLOMA EXAMINATION (C-26)

END EXAMINATION

BT-105-FUNDAMENTALS OF BIOLOGY

Model question paper

Duration: 2 hour

Max. Marks: 40

PART – A

Answer All the questions 4 × 1 = 4 M

1. What is biodiversity unit (1×2)
2. What is cell?
3. Define phagocytosis.
4. Define nomenclature
5. What is symport?
6. Define endocytosis.
7. Define biotechnology.
8. Define genetic engineering.

PART – B 2 × 3 = 6 M

9. (a) What are diploblastic and triploblastic organisms
(or)
(b) What is active & passive transport
10. (a) Write the differences between cilia and flagella
(or)
(b) Write the different steps of gene transfer
11. (a) Write the functions of plasma membrane
(or)
(b) Write difference between cell wall & plasma membrane
12. (a) What is gene cloning
(or)
(b) Mention the basic steps in basically modifying an organism

PART – C2 × 5 = 10 M

13. (a) Write about life cycle of Moss

or

(b) Write the mechanism of motility of cell

14 (a) Write the characteristics of cancer cell

or

(b) Write the applications of biotechnology

15 (a) Explain fluid mosaic model of membrane with a neat labelled diagram (*5th*)

or

(b) Write about P-type and V-type pumps

16 (a) Explain about restriction enzymes

or

(b) Write about Recombinant DNA Technology