

BOARD OF STUDIES IN B.Sc BOTANY

2022-2023

DEPARTMENT OF BOTANY

SYLLABUS FOR B.Sc BOTANY



PITHAPUR RAJAH'S GOVERNMENT COLLEGE

Autonomous and Accredited with 'A' Grade by NAAC (3.17 CGPA)
KAKINADA – 533 001, E G Dist., ANDHRA PRADESH

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
II B.Sc., -Botany-IV/ IV Semester End (W.E.F. 2022-23) PLANT
PHYSIOLOGY AND METABOLISM (COURSE: BO4207)

Total hours of Teaching 60hrs @ 4 hrs/week

Total Credits:03

UNIT – 1: PLANT-WATER RELATIONS (10 Hrs)

1. Importance of water to plant life, diffusion, imbibition, osmosis. water potential, osmotic potential, pressure potential.
2. Ascent of sap
3. Transpiration: stomata structure and mechanism of stomatal movements (K⁺ ion flux).
4. Mechanism of phloem transport; source-sink relationships.

UNIT – II: Mineral Nutrition, Enzymes And Respiration (14 Hrs.)

1. Essential macro and micro mineral nutrients and their role in plants; symptoms of mineral deficiency
2. Absorption of mineral ions; passive and active processes.
3. Characteristics, nomenclature and classification of Enzymes. Mechanism of enzyme action, enzyme kinetics.
4. Respiration: Aerobic and Anaerobic; Glycolysis, Krebs cycle; electron transport system, mechanism of oxidative phosphorylation.

UNIT – III: Photosynthesis and Photorespiration (12 Hrs)

1. Photosynthesis: Photosynthetic pigments, absorption and action spectra; Red drop and Emerson enhancement effect
2. Concept of two photosystems; mechanism of photosynthetic electron transport and evolution of oxygen; photophosphorylation
3. Carbon assimilation pathways (C₃, C₄ and CAM);
4. Photorespiration - C₂ pathway

UNIT – IV: Nitrogen and lipid metabolism (12 Hrs.)

1. Nitrogen metabolism: Biological nitrogen fixation – asymbiotic and symbiotic nitrogen fixing organisms. Nitrogenase enzyme system.
2. Lipid metabolism: Classification of Plant lipids, saturated and unsaturated fatty acids.
3. Anabolism of triglycerides, β -oxidation of fatty acids, Glyoxylate cycle.

Unit – V: Plant growth - development and stress physiology (12 Hrs)

1. Growth and Development: Definition, phases and kinetics of growth.
2. Physiological effects of Plant Growth Regulators (PGRs) - auxins, gibberellins, cytokinins, ABA, ethylene and brassinosteroids.
3. Physiology of flowering: Photoperiodism, role of phytochrome in flowering.
4. Seed germination and senescence; physiological changes.

Text books:

- Botany – IV (Vrukshasastram-II) : Telugu Akademi, Hyderabad
- Pandey, B.P. (2013) College Botany, Volume-III, S. Chand Publishing, New Delhi –
- Ghosh, A. K., K. Bhattacharya & G. Hait (2011)
- A Text Book of Botany, Volume III, New Central Book Agency Pvt. Ltd.
- , Kolkata Books for Reference: – Aravind Kumar & S.S. Purohit (1998)
- Plant Physiology – Fundamentals and Applications, AgroBotanica,
- Bikaner – Datta, S.C. (2007) Plant Physiology, New Age International (P) Ltd.,
- Publishers, New Delhi – Hans Mohr & P. Schopfer (2006) Plant Physiology, Springer (India) Pvt. Ltd., New Delhi – Hans-Walter Heldt (2005) Plant Biochemistry, Academic Press, U.S.A. – Hopkins, W.G. & N.P.A. Huner (2014) Introduction to Plant Physiology,
- Wiley India Pvt. Ltd., New Delhi – Noggle Ray & J. Fritz (2013) Introductory Plant Physiology,
- Prentice Hall (India), New Delhi – Pandey, S.M. & B.K. Sinha (2006) Plant Physiology, Vikas Publishing House, New Delhi – Salisbury, Frank B. & Cleon W. Ross (2007) Plant Physiology,
- Thomsen & Wadsworth, Australia & U.S.A – Sinha, R.K. (2014) Modern Plant Physiology,
- Narosa Publishing House, New Delhi – Taiz, L. & E. Zeiger (2003) Plant Physiology, Panima Publishers, New Delhi – Verma,
- V. (2007) Text Book of Plant Physiology, Ane Books India, New Delhi

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA

II B.Sc., BOTANY PRACTICAL PAPER – IV PRACTICAL SYLLABUS

PLANT PHYSIOLOGY AND METABOLISM

Total hours of laboratory Exercises 30 hrs @ 2 per week

Total credits:02

Suggested Laboratory Exercises:

1. Osmosis – by potato osmoscope experiment
2. Determination of osmotic potential of plant cell sap by plasmolytic method using leaves of *Rhoeo* / *Tradescantia*.
3. Structure of stomata (dicot & monocot)
4. Determination of rate of transpiration using cobalt chloride method
5. Demonstration of ascent of sap/Transpiration pull.
6. Effect of Temperature on membrane permeability by colorimetric method.
7. Study of mineral deficiency symptoms using plant material/photographs.
8. Separation of chloroplast pigments using paper chromatography technique.
9. Rate of photosynthesis under varying CO_2 concentrations.
10. Effect of light intensity on oxygen evolution in photosynthesis using Wilmott' bubbler
11. Respiration – Aerobic/Anaerobic.

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
II B.Sc., Botany Practical Examinations at the End of Semester-IV
(PLANT PHYSIOLOGY AND METABOLISM)
Botany Practical Model Paper-IV (w.e.f 2022-23)

Time: 2 hours

Max. Marks: 50

- 1. Experiment 'A' Major experiment from Plant-Water relations / Plant metabolism 15M**

Scheme of valuation:

Aim, Principle and Procedure	-	5M
Conduct of Experiment	-	6M
Report of result and inference	-	4M

- 2. Experiment 'B' Minor Experiment 7M**

Scheme of valuation:

Aim, Principle and Procedure	-	5M
Report of result and inference	-	2M

- 3. Scientific observation and data analysis 4×5=20M**

- D. Plant-Water relations**
- E. Mineral nutrition and Enzymes**
- F. Plant metabolism**
- G. Plant growth and development**

Scheme of valuation:

Identification	-	1M
Diagram	-	1M
Reasons/analysis	-	1M

- 4. Record & Viva-voce 5+3=08M**

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
II Year B.Sc., Degree Examinations at IV Semester End
Botany Paper IV: PLANT PHYSIOLOGY & METABOLISM
(Course: BO4207 Model Paper w.e.f. 2022-23)

Time: 2Hrs.

Max. Marks: 50

SECTION – A

3 × 10 = 30 M

Answer any **THREE** of the following by choosing atleast one question from each Part.,
draw neat and labeled diagrams wherever necessary

PART – I

1. a) Illustrate Transpiration? Describe the mechanism of opening and closing of stomata.
OR
b) Give an account on ascent of sap? Explain this biophysical process with Cohesion - Tension Theory.
2. a) Give an essay on general characters of Enzymes.
OR
b) Give a detailed note on biological nitrogen fixation in Rhizobium
3. a) Describe the mechanism of C3 Pathway.
OR
b) Give an account on Photophosphorylation.

PART – II

4. a) Give a detailed note on Glycolysis.
OR
b) Give an account on Electron transport system
5. a) Give a Detailed note on Photoperiodism
OR
b) General account on Phytohormones.
6. a) Give a detailed note on Photorespiration
OR
b) Give a detailed note on Electron transport chain

SECTION – B

4 × 5 = 20 M

Answer any **FOUR** of the following Questions, Draw neat and labeled diagrams
wherever necessary

1. Apoplast and symplast
2. Transcription
3. Photosynthetic pigments
4. Types of lipids
5. Role of Auxins in agriculture
6. Vernalisation

BLUE PRINT FOR QUESTION SETTER

UNIT NO/ TITLE	LAQ	SAQ	MARKS ALLOTTED TO THE MODULE
UNIT-I: PLANT - WATER RELATIONS	2	1	25
UNIT-II : MINERAL NUTRITION & ENZYMES	3	2	40
UNIT-III: PHOTOSYNTHESIS	3	1	35
UNIT-IV : PLANT RESPIRATION & LIPID METABOLISM	2	1	25
UNIT-V: GROWTH AND DEVELOPMENT	2	1	25
Total marks allotted to all questions including choice			150

Note: Question paper setters are requested to adhere strictly to the above blue print while preparing the said paper

PITHAPUR RAJAH'S GOVERNMENT COLLEGE (AUTONOMOUS), KAKINADA
II B.Sc., -Botany-IV/ IV Semester End (W.E.F. 2022-23)
PLANT PHYSIOLOGY AND METABOLISM
II B.Sc., -Botany-4/ IV Semester Question Bank

UNIT – I: PLANT – WATER RELATIONS

Essay Questions

1. Explain ascent of sap? Explain this biophysical process with Cohesion - Tension Theory.
2. Explain Transpiration? Describe the mechanism of opening and closing of stomata.
3. Describe the Mechanism of water absorption in plants. Add a note on factors affecting rate of water absorption.

Short notes.

1. Importance Water in Plant Metabolism
2. Apoplast and Simplast
3. Significance of Transpiration.

UNIT –II: MINERAL NUTRITION & ENZYMES

Essay Questions.

1. Electron Transport Chain
2. Krebs Cycle
3. Enzyme Kinetics

Short notes.

1. Classification of Enzymes
2. Absorption of mineral ions
3. Anaerobic Respiration

UNIT –III: PHOTOSYNTHESIS

Essay Questions.

1. Essay on Photorespiration.
2. Describe the mechanism of C₃ Pathway.
3. Describe photorespiration.

Short notes.

1. Difference between C₄ & CAM
2. Photosynthetic Pigments
3. Red drop Effect
4. Emerson enhancement effect.

UNIT – IV: PLANT RESPIRATION & LIPID METABOLISM

Essay Questions

1. Essay on Nitrogen metabolism
2. Explain the mechanism of symbiotic nitrogen fixation
3. β oxidation of lipids
4. Glyoxylate pathway

Short notes

1. Classification of lipids
2. Nitrogenase and hydrogenase enzymes
3. Anabolism of triglycerides
4. Transamination and deamination
- 5.