

**BOARD OF STUDIES IN B.Sc BOTANY
2021-2022**

**DEPARTMENT OF BOTANY, MICROBIOLOGY
AND HORTICULTURE**

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. 2021-22)
PLANT PHYSIOLOGY AND METABOLISM (COURSE: BO4207)

Total hours of Teaching 60hrs @ 4 hrs/week

Total Credits:03

UNIT – I: Plant – Water relations

(12h)

1. Physical properties of water, Importance of water to plant life.
2. Diffusion, imbibition and osmosis; concept & components of Water potential.
3. Absorption and transport of water and ascent of sap.
4. Transpiration – Definition, types of transpiration, structure and opening and closing mechanism of stomata.

UNIT –II: Mineral nutrition & Enzymes

(12h)

1. Mineral Nutrition: Essential elements (macro and micronutrients) and their role in plant metabolism, deficiency symptoms.
2. Nitrogen metabolism - biological nitrogen fixation in *Rhizobium*, outlines of protein synthesis (transcription and translation).
3. Enzymes: General characteristics, mechanism of enzyme action and factors regulating enzyme action.

UNIT –III: PHOTOSYNTHESIS

(12h)

1. Photosynthesis: Photosynthetic pigments, photosynthetic light reactions, photo-phosphorylation, carbon assimilation pathways: C₃, C₄, and CAM (brief account)
2. Photorespiration and its significance.
3. Translocation of organic solutes: mechanism of phloem transport, source-sink relationships.

UNIT – IV: PLANT RESPIRATION, LIPID METABOLISM

(12h)

1. Respiration: Glycolysis, HMP Shunt, anaerobic respiration, TCA cycle, electron transport system. Mechanism of oxidative phosphorylation.
2. Lipid Metabolism: Types of lipids, Beta-oxidation.

UNIT –V: GROWTH AND DEVELOPMENT

(12h)

1. Growth and development: definition, phases and kinetics of growth.
2. Physiological effects of phytohormones - Auxins, Gibberellins, Cytokinins, ABA, Ethylene and Brassinosteroids.
3. Physiology of flowering - photoperiodism, role of phytochrome in flowering; Vernalization.

Booksfor Reference:

- Steward. F.C (1964): Plants at Work (A summary of Plant Physiology) Addison-Wesley Publishing Co., Inc. Reading, Massachusetts, Palo alto, London.
- Devlin, R.M. (1969):Plant Physiology, Holt, Rinehart & Winston & Affiliated East West Press (P) Ltd., New Delhi
- Noggle, R.& Fritz (1989): Introductory Plant Physiology Prentice Hall of India
- Lawlor.D.W. (1989): Photosynthesis, metabolism, Control & Physiology ELBS/Longmans-London.
- Mayer, Anderson &Bonning (1965): Introduction to Plant Physiology D. VanNostrand. Publishing Co., N.Y.
- Mukherjee, S. A.K. Ghosh (1998) Plant Physiology, Tata McGraw Hill Publishers(P) Ltd., New Delhi.
- Salisbury, F.B & C.W. Ross (1999): Plant Physiology CBS Publishers and Printers, New Delhi.
- Plummer, D. (1989) Biochemistry–the Chemistry of life, McGraw Hill Book Co., London, N.Y. New Delhi, Paris, Singapore, Tokyo.
- Day, P.M.& Harborne, J.B. (Eds.,) (2000): Plant Biochemistry. Harcourt Asia (P) Ltd., India & Academic Press, Singapore.

Suggested activity: Seminars, Quiz, Debate, Question and Answer sessions, observing animations of protein biosynthesis in you tube.

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 transpiration by Ganongs' photometer
6. Demonstration of ascent of sap/Transpiration pull.
7. Effect of Temperature on membrane permeability by colorimetric method.
8. Study of mineral deficiency symptoms using plant material/photographs.
9. Separation of chloroplast pigments using paper chromatography technique.
10. Rate of photosynthesis under varying CO_2 concentrations.
11. Effect of light intensity on oxygen evolution in photosynthesis using Wilmott' bubbler.

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 2021-22)

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. 2021-22)

Time: 2½ Hrs.

Max. Marks: 60

SECTION – A

3×10 =30M

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) What is Transpiration? Describe the mechanism of opening and closing of stomata.
OR
b) What is meant by ascent of sap? Explain this biophysical process with Cohesion - Tension Theory.
2. a) Write 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) Write an Essay on Photophosphorylation.

PART – II

4. a) Give a detailed note on Glycolysis.
OR
b) Write an Essay on Electron transport system
5. a) Give a Detailed note on Photoperiodism
OR
b) Write an Essay on Phytohormones.

SECTION – B

4×5=20M

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

1. Apoplast and Simplast
2. Transcription.
3. Photosynthetic pigments.
4. Types of Lipids.
5. Role of Auxins in Agriculture.

SECTION – C

5×2=10M

Answer **ALL** Questions

1. Aquaporins
2. Polysomes
3. Chemo osmosis
4. Alpha- Oxidation
5. Florigen

BLUE PRINT FOR QUESTION SETTER

UNIT NO/TITLE	LAQ	SAQ	VSAQ	Marks allotted to the Module
UNIT – I: PLANT – WATER RELATIONS	1	1	1	17
UNIT –II: MINERAL NUTRITION & ENZYMES	1	1	1	17
UNIT –III: PHOTOSYNTHESIS	1	1	1	17
UNIT – IV: PLANT RESPIRATION & LIPID METABOLISM	1	1	1	17
UNIT –V: GROWTH AND DEVELOPMENT	1	1	1	17
Total marks allotted to all question including choice				85

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. 2021-22)
PLANT PHYSIOLOGY AND METABOLISM
II B.Sc., -Botany-4/ IV Semester Question Bank

UNIT – I: PLANT – WATER RELATIONS

Essay Questions

1. What is meant by ascent of sap? Explain this biophysical process with Cohesion - Tension Theory.
2. What is 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 Symplast
3. Significance of Transpiration.

Very Short notes.

1. Diffusion
2. Imbibition
3. Water potential
4. Osmosis
5. Plasmolysis
6. Pressure potential
7. Apoplast
8. Symplast
9. Guttation
10. Aquaporins

UNIT –II: MINERAL NUTRITION & ENZYMES

Essay Questions.

1. What are essential elements? Explain the role of Macro nutrients in plant Nutrition.
2. Give a Detailed note on Biological nitrogen fixation in Rhizobium
3. Describe the Mechanism of Enzyme action.

Short notes.

1. Classification of Enzymes
2. Transcription.
3. Translation.

Very Short notes.

1. Prosthetic group
2. Macronutrients
3. Hydroponics
4. Chlorosis
5. Trace elements
6. Channels
7. Active transport
8. Polysomes

9. t-RNA
10. Translation

UNIT –III: PHOTOSYNTHESIS

Essay Questions.

1. Write an Essay on Photophosphorylation.
2. Describe the Mechanism of C3 Pathway.
3. Give a Detailed note on Mechanism of Phloem transport.

Short notes.

1. Photosynthetic pigments.
2. CAM
3. Source -Sink relationships.
4. C4 Pathway

Very Short notes.

1. Chemo osmosis
2. Emerson's enhancement effect
3. Trans cellular theory
4. Electro osmotic theory
5. ATP ase
6. Photo system
7. Photosynthetic bacteria
8. Photo phosphorylation
9. CAM
10. Dark phase
11. Redox

UNIT – IV: PLANT RESPIRATION & LIPID METABOLISM

Essay Questions

1. Give a detailed note on Glycolysis.
2. Write an Essay on Electron transport system
3. Write about Oxidative Phosphorylation

Short notes

1. Types of Lipids.
2. TCA cycle
3. Anaerobic Respiration

Very Short notes.

1. EMP – Pathway
2. Mitochondria
3. Fermentation
4. Respiratory quotient
5. Anaerobic respiration
6. Terminal oxidation
7. Energetics of Beta-oxidation
8. Gluconeogenesis
9. Alpha- Oxidation
10. ATPase complex

UNIT –V: GROWTH AND DEVELOPMENT

Essay Questions.

1. Write an Essay on Phytohormones.
2. Give a Detailed note on Photoperiodism

Short notes.

1. Vernalisation.
2. Brassinosteroids.
3. Role of Auxins in Agriculture
4. Effect of salt stress on plants.

Very Short notes.

1. Apical dominance
2. Anti-gibberellin
3. Triple response growth
4. Epinasty
5. Halophytes
6. Photo period
7. Bolting
8. Richmand – Lang effect
9. Florigen
10. Vernalization