



**RAJARSHI SHAHU MAHAVIDYALAYA, LATUR
(AUTONOMOUS)**

AFFILIATED TO

**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY,
NANDED**

B. Sc. GENERAL (SEMESTER PATTERN)

B. Sc. SECOND YEAR (CBCS)

BOTANY – CURRICULUM

(MCQ + THEORY PATTERN)

w. e. f. JUNE, 2018

RAJARSHI SHAHU MAHAVIDYALAYA, LATUR

(AUTONOMOUS)

B. Sc. GENERAL (SEMESTER PATTERN)

B. Sc. SECOND YEAR (CBCS) BOTANY – CURRICULUM

(MCQ + THEORY PATTERN)

Semester	Paper No.	Paper Title	Lectures/ Practicals	Marks			Credits
				In Sem. Evaluation	End Sem. Evaluation	Total Marks	
III	V	Morphology and Taxonomy of Angiosperms	45	20	30	50	02
	VI	Economic Botany and Pharmacognosy	45	20	30	50	02
	Lab. Course III	Based on theory paper – V&VI	24	--	--	50	02
	SEC-I	Nursery and Floriculture	45	--	50	50	02
IV	VII	Environmental Biology; Gardening and Land Scaping	45	20	30	50	02
	VIII	Plant Breeding and Biotechnology	45	20	30	50	02
	Lab. Course IV	Based on theory paper – VII& VIII	24	--	--	50	02
	SEC-II	Mushroom Cultivation Techniques	45	--	50	50	02
					Total	400	16

Workload:

1. Theory: Three Lectures / Paper / Week.

2. Practical: One practical (Three Lectures) / Batch / Week

RAJARSHI SHAHU MAHAVIDYALAYA, (AUTONOMOUS) LATUR

B.Sc. Second Year
Semester – III
(MCQ + Theory Pattern)

BOTANY

Theory Paper-V: Morphology and Taxonomy of Angiosperms

Periods – 45

Maximum Marks – 50

Objectives: The student will be able to:

1. Describe the function of classification.
 2. Distinguish between taxonomy and systematics and be able to identify a classification as systematic or taxonomic.
 3. Describe the reasons for preferring natural classifications over artificial classifications.
 4. Describe the reason that classical taxonomy is an hierarchical scheme of classification.
 5. Describe the role that key characteristics play in taxonomy.
 6. Describe why consistency is both valuable for taxonomy and hard to achieve.
 7. Relate the reason that botanical taxonomy uses "division", rather than "phylum" as the hierarchical level below that of kingdom and above that of class.
 8. Define different taxonomic terms.
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Unit-I: Morphology of Angiosperms-I (10 L):

1. Root: Definition, characters, types (taproot and adventitious) and functions.
2. Stem: Definition, characters, modifications (stem tendril, runner, and rhizome) and functions.
3. Leaf: Definition, structure of typical leaf (Hibiscus), Types of leaf apex and margin, Functions, Types, Phyllotaxy and Venation.

Unit-II Morphology of Angiosperms-II (10 L):

1. Inflorescence: Definition, structure of typical inflorescence Types- Racemose and Cymose.
2. Flower: Definition, structure of typical flower (Hibiscus), symmetry and types (hypogynous, epigynous, perigynous).
3. Fruit: Definition and its Types.

Unit-III: Taxonomy of Angiosperms (12 L):

1. Introduction,
2. Scope and objectives of angiosperm taxonomy.
3. Botanical Survey of India (BSI).
4. Binomial nomenclature,
5. Chemotaxonomy and Cytotaxonomy.
6. Taxonomic ranks.
7. Types of classification (artificial, natural and phylogenetic)
8. Bentham & Hooker's system of classification with merits and demerits.

Unit-IV: Study of families (13 L):

Distribution, vegetative morphology (habitat, habit, root, stem, leaf), Reproductive morphology (inflorescence, flower, pollination, fruit) Floral Formula, Floral Diagram, Systematic position (as per Bentham & Hooker system) Distinguishing characters and Economic importance of plants (at least two) of the following families:

1. Brassicaceae.
2. Fabaceae.
3. Solanaceae.
4. Lamiaceae.
5. Euphorbiaceae.
6. Poaceae.

SUGGESTED READINGS :

- | | |
|---|------------------------------|
| 1. A Text Book of Systematic Botany | Sutaria R N |
| 2. Taxonomy of Angiosperms | Pandey S N and Mishra S D |
| 3. Taxonomy of Angiosperms | Sambamurthy A V S |
| 4. Taxonomy of Angiosperms | Vashishta P C |
| 5. Modern Plant Taxonomy | Subramanyam N S |
| 6. Principles of Angiosperms Taxonomy | Davis P. H. and Heywood V.H. |
| 7. Angiosperms | Chopra G.L |
| 8. Taxonomy of Angiosperms | Kumarsen Annie |
| 9. Introductory Taxonomy of Angiosperms | S.Sundara Rajan |
| 10. Flora of Osmanabad. | Naik, V.N. (1969) |
| 11. Flora of Marathwada | Naik, V.N. (1998) |

RAJARSHI SHAHU MAHAVIDYALAYA, (AUTONOMOUS) LATUR

B. Sc. Second Year Semester – III (MCQ + Theory Pattern)

BOTANY

Theory Paper-VI Economic Botany and Pharmacognosy

Periods – 45

Maximum Marks – 50

Objectives:

1. Acquire good knowledge about economic importance of cereals, pulses, oilseed crops.
 2. Acquire good knowledge about chemistry of active constituents of medicinal plants.
 3. Know methods of isolation of active constituents of medicinal plants.
 4. Identify and estimate of active constituents of medicinal plants.
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Unit-I: Economic Botany -I (10 L):

Introduction:

Botanical name, family, distinguishing characters (at least two), method of cultivation and economic importance of the following-

1. Cereals (Wheat).
2. Pulses (Pigeon pea).
3. Fiber yielding plants (Cotton).
4. Cotton processing.
5. Rubber production.

Unit-II: Economic Botany-II (10 L):

Botanical name, family, distinguishing characters (at least two), method of cultivation and economic importance of the following-

1. Oil yielding plants (Soybean, Sunflower)
2. Soya milk production.
3. Starch processing.
4. Timber yielding plants (Teak, Neem).
5. Medicinal plants (Aloe, Withania).

Unit-III: Introduction to Pharmacognosy (11L)

1. History, definition and scope of Pharmacognosy
2. Traditional and alternative systems of medicine
3. Classification of crude drugs.
4. Concept of active principle (Five examples)

Unit-IV: Ayurvedic Pharmacy (14L)

1. Introduction
2. Tridosha concept.
3. Indigenous systems of medicine (Ayurveda, Siddha, Unani).
4. Ayurvedic principles- Ras, Guna, Vipaka, Virya, Prabhava.
5. Ayurvedic formulations – Asava, Arishta, Kvatha, Churna, Ksharas, Leha, Vatika, Taila, Bhasma.
6. Drug adulteration.
7. Study of drugs w.r.t. occurrence, distribution, morphological characters, Constituents and uses of *Adhatoda* (Leaf drug)

SUGGESTED READINGS :

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|---------------------------------|---|
| 1. Economic Botany | Pandey B. P (1987) |
| 2. Text book of Economic Botany | Verma V. (1984) |
| 3. Economic Botany, | Hill A.W (1981) |
| 4. Economic Botany. | Albert, F.H. . |
| 5. Economic Botany | Hill, A.F |
| 6. Pharmacognosy | Trease and Evans |
| 5. Pharmacognosy | Shah and Qadry |
| 7. A Text Book of Pharmacognosy | Ghani A. |
| 8. Text book of Pharmacognosy | M. Ali. |
| 9. Practical Pharmacognosy | Kokate C.K., |
| 10. Pharmacognosy | Kokate C.K. Purohit A.P. and Gokhale S.B. |
| 11. Pharmacognosy | Trease G.E. and Evans. W.C. · Tyler V.E Brady |
| 12. Bhaishyajakalpana | Vaidya S.S. and Dole.V.A |
| 13. Text book of pharmacognosy | Wallis,T.E. |

SKILL ENHANCEMENT COURSE -I
PAPER II: MUSHROOM CULTIVATION TECHNIQUES (SEC)

Credits:

Lectures :

Marks: 50

Objectives:

1. The courses aims at developing skills and making the students become self-reliable and employable besides giving them an edge when they seek employment in other Government and private sectors.
 2. When students pass out of the college with their degrees, they also are equipped with additional skills to meet the challenges in future.
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Unit: I Cultivation System & Farm design:

Fundamentals of cultivation system- small village unit & larger commercial unit. Principles of mushroom farm layout- location of building plot, design of farm, bulk chamber, composting platform, equipments & facilities , pasteurization room & growing rooms.

Unit: II composting, Spawn & Spawning:

Principles of composting, machinery required for compost making, materials for compost preparation. Methods of Composting- Long method of composting (LMC) & Short method of composting (SMC).

Unit: III Casting materials & Case running:

Importance of casing mixture, Quality parameters of casing soil, different types of casing mixtures, commonly used materials.

Unit: IV Cultivation of Button , Oyster and Straw Mushrooms:

Collection of raw materials, compost & composting, spawn & spawning, casing & case run, cropping & crop management, picking & packing. Visit to relevant Labs/Field Visits

Practicals

1. Oyster cultivation and demonstration of Button mushroom cultivation
2. Tissue isolation, Sub culturing, Spawn making and fruiting bags production, Processing.
3. Field trip to commercial mushroom farms and scientific institutions.

Text Book:

1. Mushroom Cultivation, Tripathi, D.P.(2005) Oxford & IBH Publishing Co. PVT.LTD, New Delhi.
2. Mushroom Production and Processing Technology, Pathak Yadav Gour (2010) Published by Agrobios (India).
3. A hand book of edible mushroom, S.Kannaiyan& K.Ramasamy (1980). Today & Tomorrows printers & publishers, New Delhi
4. Handbook on Mushrooms, Nita Bahl, oxford & IBH Publishing Co.

RAJARSHI SHAHU MAHAVIDYALAYA, (AUTONOMOUS)LATUR

B.Sc. Second Year

Semester – III

BOTANY

Lab. Course-III

(Based on theory paper – V)

Practicals: 12

Marks: 25

Practical 1: Study of Root and its modifications.

Practical 2: Study of Stem and its modifications.

Practical 3-4: Study of Leaf.

Practical 5: Study of Inflorescence.

Practical 6-7: Study of flower.

Practical 8-13: Description, identification and classification of the plants with floral formulae and floral diagrams of their families (mentioned in theory syllabus).

Practical 14-15: Botanical excursions (one long excursion =3practicals).

RAJARSHI SHAHU MAHAVIDYALAYA, (AUTONOMOUS) LATUR

B.Sc. Second Year

Semester – III

BOTANY

Lab. Course-III

(Based on theory paper - VI)

Practicals: 12

Marks: 25

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- Practical 1: Botanical name, family, distinguishing characters (at least two), method of cultivation and economic importance of Wheat and pigeon pea.
- Practical 2: Botanical name, family, distinguishing characters (at least two), method of cultivation and economic importance of Soybean and Sunflower.
- Practical 3: Botanical name, family, distinguishing characters (at least two), method of cultivation and economic importance of Cotton.
- Practical 4: Botanical name, family, distinguishing characters (at least two), method of cultivation and economic importance of Neem and Teak.
- Practical 5: Botanical name, family, distinguishing characters (at least two), method of cultivation and economic importance of *Aloe* and *Withania*.
- Practical 6-: Histochemical tests of food storing tissue in pigeon pea, Wheat, lignin and cellulose.
- Practical 07: Extraction of pectic substance.
- Practical 08: Extraction of Tannin.
- Practical 09-11: Preparation of ayurvedic formulations (as per syllabus) .
- Practical 12: Botanical excursion.

N.B: 1)Any ten Practicals

2) Several Short Excursions and Atleast one Long Excursion

RAJARSHI SHAHU MAHAVIDYALAYA, (AUTONOMOUS)LATUR

B. Sc. Second Year
Semester – IV
(MCQ + Theory Pattern)

BOTANY
Theory Paper-VII Environmental Biology; Gardening and Land Scaping

Periods – 45

Maximum Marks – 50

Objectives:

1. To provide an understanding for the fate and impact of pollution on “organic” life.
 2. To characterize the biological impacts of toxins and contaminants on “organic life”.
 3. To critically evaluate environmental topics in the media and the science behind these studies.
 4. To learn an understanding of the methods of gardening.
 5. To understand the technique potting.
 6. To know aesthetic importance of garden.
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UNIT – I: ENVIRONMENTAL BIOLOGY-I (12 L)

1. Ecology – Definition and Scope
2. Structure of ecosystem (Abiotic and Biotic)
3. Types of ecosystem (Pond ecosystem and Forest ecosystem)
4. Ecological pyramids and energy flow
5. Food chain and Food web
6. Morphological and anatomical adaptations of plants to water stress conditions
 - i. Hydrophytes –Lotus leaf (petiole), Hydrilla.
 - ii. Xerophytes – Nerium leaf, Casurina stem.

UNIT – II: ENVIRONMENTAL BIOLOGY-II (10 L)

1. Pollution: Causes, effects and control measures of:
 - i. Water pollution,
 - ii. Soil pollution
 - iii. Air pollution
2. Aforestation and deforestation
3. Chipko movement

UNIT – III: GARDENING (13 L)

1. Scope and objectives of gardening .
2. Style of gardens: Formal, Informal.
3. Types of gardens: English, Mughal, Hindu-Buddhist and Japanese.
4. Components of garden .
5. Pots and container.
6. Essentials of pot culture.
7. Potting compost.
8. Potting.

UNIT – IV: LANDSCAPE DESIGNS (10 L)

1. Landscape Design: Definition, Landscape elements of construction.
2. Computer application in landscape .
3. Hedges for gardens & farms.
4. Lawns & Grasses: Planting methods, maintenance, pest management.
5. Development of flowerbeds and their designs.
6. Preparation of Bonsai and Flower Arrangement.

SUGGESTED READINGS:

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|-------------------------------------|-----------------------|
| 1. A text book of Plant Ecology | Ambasht R.S. |
| 2. Fundamentals of Ecology | Dash M.C. |
| 3. Ecology. | Michael S. |
| 4. Ecology and Environment | Sharma, P.D. |
| 5. Modern Concepts of Ecology | Kumar H.D. |
| 6. Fundamentals of Ecology | E.P. Odum |
| 7. Environmental Chemistry | A.K. De |
| 8. Environmental Biology | Biswarup Mukherjee |
| 9. Modern Concepts of Ecology | H.D. Kumar |
| 10. Environmental Science | Turk and Turk |
| 11. Manual of Field Ecology | R. Mishra |
| 12. Plant Ecology | Ambhast |
| 13. Air Pollution Vol I | A.C. Stern |
| 14. Environmental Impact Assessment | Larry Canter, |
| 15. Environmental management | Biswarup Mukherjee V. |
| 16. Pollution Biology: | Hyne |
| 17. Nursery and Landscaping | Veena Amarnath |
| 18. Indoor Gardening | S.C. Day |
| 19. Gardening | Parimal Mehra |

RAJARSHI SHAHU MAHAVIDYALAYA, (AUTONOMOUS) LATUR

B. Sc. Second Year

Semester – IV

(MCQ + Theory Pattern)

BOTANY

Theory Paper-VIII Plant Breeding and Biotechnology

Periods – 45

Maximum Marks – 50

Objectives:

1. To understand different methods of plant breeding.
 2. To acquire good knowledge about techniques in genetic engineering.
 3. To acquire good knowledge about tissue culture in plants.
 4. To understand methods of isolation of protoplasts and its fusion.
 5. To understand the importance of GMO.
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Unit-I: PLANT BREEDING-I (10L)

1. Definition, Aims and Objectives
2. Centres of origin.
3. Methods of Plant Breeding:
 - i. Plant introduction and acclimatization.
 - ii. Mass Selection.
 - iii. Pure line selection.
 - iv. Clonal selection.
 - v. Pedigree selection.

Unit-II: PLANT BREEDING-II. (10L)

1. Hybridization.
2. Heterosis and hybrid vigour.
3. Mutation breeding.
4. Polyploidy.
5. Breeding in cotton

UNIT-III: BIOTECHNOLOGY – I (13)

1. Genetic Engineering:
 - i. Definition, scope and importance
 - ii. Tools: a) Restriction Endonucleases
b) Vectors: plasmids, cosmids.
 - iii. Technique of r-DNA
 - iv. Genomic and c-DNA libraries
2. Agrobacterium mediated gene transfer: (Biology of *Agrobacterium*, Ti - plasmid, and *Agrobacterium* mediated transfer technique),
4. Transgenic plants.

UNIT –IV: BIOTECHNOLOGY – II (12)

1. Tissue culture:
 - i. Introduction,
 - ii. Concept of Totipotency of cell,
 - iii. Basic aspects of tissue culture laboratory,
 - iv. Technique of tissue culture
 - v. Callus culture, differentiation and morphogenesis.
2. Applications of Tissue culture:
 - i. Micropropagation,
 - ii. Production of secondary metabolites,
 - iii. Somatic hybridization,
 - iv. Anther culture and production of haploids.

SUGGESTED READINGS:

- | | |
|--|--|
| 1. Plant Breeding: Principles and Methods. 7 th edition | Singh, B.D. (2005) |
| 2. Principles of plant breeding. | Allard, R.W. (1960). |
| 3. Plant Breeding: Theory and Practice 2 nd edition. | Chopra, V.L. (2000). New Delhi. |
| 4. Plant Breeding: Mendalian to Molecular Approaches. | Jain, H. K. and Kharwal, M.C. (2003) |
| 5. Advances in Plant Breeding. Vol 1 and 2, | Mandal, A.K., Ganguli, P.K., Banerjee, |
| 6. Principles and Practices of Plant Breeding | Sharma, J. R |
| 7. Plant Breeding | H.K. Chowdhari |
| 8. Biotechnology An Expanding Horizons | B.D.Singh |
| 9. Biotechnology | Verma S.K. |

SKILL ENHANCEMENT COURSE -II

PAPER II : NURSERY, GARDENING AND FLORICULTURE (SEC)

Credits:2

Lectures : 45

Marks: 50

Objectives:

1. The courses aims at developing skills and making the students become self-reliable and employable besides giving them an edge when they seek employment in other Government and private sectors.
 2. When students pass out of the college with their degrees, they also are equipped with additional skills to meet the challenges in future.
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Unit- I : Nursery:

1. Definition, objectives, scope and building up of infrastructure for nursery.
2. Planning and seasonal activities - Planting - direct seeding and transplants.
3. Nursery Management and Routine Garden Operations.

Unit- II : Propagation methods:

- 1 Sowing/raising of seeds and seedlings, transplanting of seedlings.
2. Air-layering, cutting, selection of cutting ,propagule collecting season, treatment of cutting rooting medium and planting of cuttings - Hardening of plants.
3. Propagation of ornamental plants by rhizomes, corms tubers, bulbs and bulbils.
4. Green house - mist chamber, shed root, shade house and glass house for propagation.

Unit- III: Floriculture:

1. Ornamental Plants: Flowering annuals; herbaceous, perennials; Divine vines; Shade and ornamental trees.
2. Ornamental bulbous and foliage plants; Cacti and succulents.
3. Ornamentals-palms.
4. Cultivation of plants in pots; Indoor gardening; Bonsai.

Unit IV: Commercial Floriculture:

1. Factors affecting flower production; Production and packaging of cut flowers; Flower arrangements; Methods to prolong vase life of flowers
2. Cultivation of Important cut flowers (Carnation, Aster, Dahlia, Gerbera, Anthuriums, Gladiolous, Marigold, Rose, Liliium)
3. Management of pests, diseases and harvesting.
4. Methods of harvesting.

Books for Reference:

1. Bose T.K. & Mukherjee, D., 1972, Gardening in India, Oxford & IBH Publishing Co., New Delhi.
2. Sandhu, M.K., 1989, Plant Propagation, Wile Eastern Ltd., Bangalore, Madras.
3. Kumar, N., 1997, Introduction to Horticulture, Rajalakshmi Publications, Nagercoil. institution)
4. Randhawa, G.S. and Mukhopadhyay, A. 1986. Floriculture in India. Allied Publishers.

Suggested Activities:

Raising a nursery, managing it, studying and drawing various land scaping designs, practicing layering methods, using shade nets to protect horticultural crops, practicing indoor gardening ,techniques, visiting florists and recording their methods of prolonging vase life of commercial cut flowers.

Practicals :

1. Tools, implements and containers used for propagation and nursery techniques.
2. Propagation by cutting, layering, budding and grafting
3. Seed propagation- preparation of portable trays, seed treatments, sowing and seedling production.
4. Identification and description of annuals, herbaceous perennials, climbers, creepers, foliage and flowering shrubs, trees, palms, ferns, ornamental grasses; cacti and succulents..
5. Planning and designing of gardens, functional uses of plants in the landscape
6. Preparation of land for lawn and planting.
7. Identification of commercially important flower crops and their varieties.
8. Propagation practices in flower crops, sowing of seeds and raising of seedlings of annuals.
9. Use of chemicals and other compounds for prolonging the vase life of cut flowers.
10. Grading, packing and marketing of cut flowers.

11. Visit to commercial nurseries and commercial tissue culture laboratory
12. Study project under supervision of lecturer – nursery/ornamental flowers/ plants/lawn designing/landscape designing

Expected domain skills to be achieved:

Ability to use a variety of garden tools and implements, proficiency in layering and grafting techniques (cleft grafting and bud grafting), landscape drawings using computers, raising of healthy nurseries of flowering plants, managing vase life of cut flowers etc.

RAJARSHI SHAHU MAHAVIDYALAYA, (AUTONOMOUS)LATUR

B.Sc. Second Year

Semester – IV

BOTANY

Lab. Course-IV

(Based on theory paper -VII)

Practicals: 12

Marks: 30

Practical 1: Study of morphological and anatomical adaptations in hydrophytes – *Lotus petiole*

Practical 2: Study of morphological and anatomical adaptations in xerophytes – *Nerium*.

Practical 3: Determination of water holding capacity of different soils.

Practical 4: Estimation of salinity of different water samples.

Practical 5-6: Study of vegetation by quadrat method.

Practical 7: Determination of pH of different soils by pH paper/ pH meter.

Practical 8: Garden tools and implements.

Practical 9: Different types of pots.

Practical 10: Procedure of potting.

Practical 11: Preparation of Bonsai.

Practical 12-13: Visits to Gardens, Nurseries, Agriculture Colleges/Universities, Exhibitions, Polyhouses, Flower shows etc.

N.B: 1) Any ten Practicals

2) Several Short Excursions and At least one Long Excursion

RAJARSHI SHAHU MAHAVIDYALAYA, (AUTONOMOUS)

B.Sc. Second Year

Semester – IV

BOTANY

Lab. Course-IV

(Based on theory papers - VIII)

Practicals: 12

Marks: 25

Practical 1-3: Colchicine treatment to induce tetraploidy in onion root cells.

Practical 4-5: Demonstration of techniques of hybridization (emasculation, pollination, tagging and bagging)

Practical 6-7: Effect of physical or chemical mutagens on crop plants (photographs) of M_1 and M_2 population.

Practical 8-9: Preparation and sterilization of the MS medium, slant preparation and inoculation.

Practical 10-11: Demonstration of techniques in callus culture and somatic hybridization

Practical 12-13: Visit to Plant breeding station, tissue culture laboratory/ Biotechnology institute is compulsory.

N.B: 1) Any Ten practicals

2) Several short Excursion and at least one Long Excursion.

**SKELETON OF QUESTION PAPER
B.Sc. Second Year**

Semester – III & IV

Theory Paper-V, VI, VII and VIII

Time: 1.30 hours

Maximum Marks: 30

Note: (i) Attempt all questions.

(ii) Draw neat and well labeled diagrams wherever necessary.

Q1. Attempt all of the following (Each 3 marks)

12

- a)
- b)
- c)
- d)

Q2. Attempt any ONE of the following

08

- a)
- b)

Q3. Attempt any ONE of the following

10

- a)
- b)

RAJARSHI SHAHU MAHAVIDYALAYA, LATUR

(Autonomous)



B.Sc.II PRACTICAL EXAMINATION IN BOTANY

SEE WINTER/SUMMER

Time: Three Hours

Maximum Marks: 30

Note: - (i) Attempt all questions.

(ii) Draw neat and well labeled diagrams wherever necessary.

Q. 1. Long answer type question.	10
Q. 2. Long answer type question.	10
Q. 3. Spotting: (02 spots)	05
Q. 4. Viva- Voce.	05