

Appendix to UO No Acad/C2/2471/2007 Dated 22/08/2007
KANNUR UNIVERSITY
B.Sc. PLANT SCIENCE (MAIN) - 2007 ADMISSION SYLLABUS
Scheme of Examination

YEAR	PAPER	HOURS/WEEK		DURATION OF EXAM.	EVALUATION		TOTAL
		THEORY	PRACTICAL		ALLOTMENT OF MARKS		
					EXTERNAL	INTERNAL	
I	I	2	2	3	55	10	65
II	II	3	2	3	55	10	65
special	I	4	1	3	60	10	70
special	2	4	1	3	60	10	70
III	III	4	3	3	55	10	65
	IV	4	2	3	55	10	65
	V	5	1½	3	55	10	65
	VI	4	1½	3	55	10	65
TOTAL	8	30	14	24	450	80	530

LIST OF DISTRIBUTION OF MARKS FOR PRACTICAL EXAMINATIONS			
PAPER	TOPICS	TIME	MARKS EXTERNAL
I	PHYCOLOGY, MYCOLOGY LICHENOLOGY, BRYOLOGY MICROBIOLOGY, PTERIDOLOGY, PALAEOBOTANY & PLANT PATHOLOGY.	3 HOURS	45
II	PLANT MORPHOLOGY, SYSTEMATIC BOTANY, APPLIED BOTANY, REPRODUCTIVE MORPHOLOGY AND ANGIOSPERM ANATOMY.	3 HOURS	45
III	GYMNOSPERMS, PLANT PHYSIOLOGY BIO-CHEMISTRY, ENVIRONMENTAL SCIENCE, CYTOLOGY, GENETICS AND PHYTO GEOGRAPHY.	3 HOURS	45
IV	Horticulture and Nursery management, Plantation Botany and conservation Biology	3 HOURS	40
TOTAL		12 HOURS	175

DETAILS OF INTERNAL ASSESSMENT THEORY	PAPER- WISE - 10 Marks
ATTENDANCE.	90% TO 100% - 2 Marks 75 % TO 89% - 1 Mark LESS THAN 75% - 0 Marks
ASSIGNMENT	1 – ASSIGNMENT = 2 Marks
SEMINAR	1 – SEMINAR = 2 Marks
2 CLASS TESTS/TERMINAL OR MODEL EXAMINATIONS (AVERAGE OF TWO TEST PAPERS MAY BE CONSIDERED)	2 X2 =4 MARKS. Above 75 % - 4 Marks 60 % to 74% -3 Marks 40% to 59% - 2 Marks Below 40% - 1 Mark

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DETAILS OF INTERNAL ASSESSMENT PRACTICAL	PAPER WISE
ATTENDANCE	2 Marks
REGULARITY IN SUBMITTING RECORDS	1 Mark
PERFORMANCE IN LAB: WORK.	2 Marks
TOTAL – 5 x 3	15 Marks
RECORD (PAPER WISE:10 x 3)	30 Marks
HERBARIUM SUBMISSION	7 Marks
FIELD BOOK WITH TOUR REPORT	3 Marks
COLLECTION, IDENTIFICATION, SUBMISSION OF LOWER GROUPS OF PLANTS (10 Numbers)	5 Marks
TOTAL	60 Marks

Practical Paper IV Internal Assessment

Record	10 Marks
Herbarium	05 Marks
Attendance	02 Marks.
Regularity	01 Mark
Performance in practical	02 Marks.
Total	20 Marks

PROJECT AND VIVA-VOCE EXTERNAL EVALUATION	
PROJECT (Minimum Two Projects From Third B.Sc Plant Science)	10 Marks
VIVA-VOCE.	5 Marks
TOTAL	15 Marks

ELIGIBILITY TO APPEAR FOR PRACTICAL EXAMINATION

- 1 CERTIFIED RECORD
- 2 HERBARIUM & FIELD BOOK
- 3 COLLECTION OF LOWER GROUPS WITH A BRIEF REPORT,
(VERIFY THIS REPORT ON THE FIRST DAY OF PRACTICAL EXAMINATION)
- 4 PROJECT REPORT(CERTIFIED AND BONAFIDE)

LOWER GROUPS OF PLANTS

SPECIMENS PRESERVED IN FORMALDEHYDE ACETIC ALCOHOL (FAA)
OR
HERBARIUM SHEETS OF

ALGAE

FUNGI

LICHEN

BRYOPHYTA

PTERIDOPHYTA

GYMNOSPERMS

PATHOLOGY

SCHEME OF EXAMINATION
B.Sc PLANT SCIENCE MAIN-THEORY

Year of study	Hours of study		Details of papers	Duration of exam.	Marks		Total
					External	Internal	
	Theory	Practical	Theory				
I Year	60	60	Paper I Phycology, Mycology, Lichenology, Bryology and Plant pathology	3 Hours	55	10	65
II Year	90	60	Paper II Pteridology, Gymnosperms, Palaeobotany, Angiosperm Anatomy and Evolution	3 Hours	55	10	65
			Plant science special paper I- Horticulture and Nursery management	3 Hours	60	10	70
			Plant Science special paper II Plantation Botany and Conservation biology.	3 Hours	60	10	70
III Year	125	100	Paper III Angiosperm. Morphology, Systematic Botany, Applied Botany, Reproductive Botany Palynology, Ethnobotany, Pharmacognosy, Bio-informatics and Microtechnique.	3 Hours	55	10	65
	130	60	Paper IV Plant Physiology, Bio chemistry, Biotechnology, Bio physics	3 Hours	55	10	65
	135	45	Paper V Environmental Science, Phytogeography, Biometrics, Plant breeding, Microbiology and Research methodology	3 Hours	55	10	65
	120	35	Paper VI Cytology and Genetics	3 Hours	55	10	65
Total				18	450	80	530

SCHEME OF EXAMINATION
B.Sc PLANT SCIENCE MAIN - PRACTICAL

Year of study	Details of practical papers	Duration of Examination	Marks		Total
			External	Internal	
I Year	No Practical Examination				
II Year	No Practical Examination				
III Year	Practical Paper I Phycology, Mycology,Lichenology,Bryology, Pteridology,Palaeobotany and Plant pathology	3 Hours	45	05	50
	Paper II Angiosperm Anatomy, Angiosperm Morphology Systematic Botany and Reproductive Botany.	3 Hours	45	05	50
	Paper III Gymnosperm, Plant Physiology, Biochemistry, Environmental science, Microbiology, Cytology And Genetics	3Hours	45	05	50
	Plant Science special Practical Paper IV Horticulture and nursery management, Plantation Botany and conservation biology	3 Hours	40	20	60
	Records 3x10			30	
	Herbarium submission			07	
	Field book with tour report			03	
	Collection, identification, submission of lower groups of plants			05	
	Project		10		
	Viva -Voce		05		
Total			190	80	270

DISTRIBUTION OF HOURS: PAPER - I: PHYCOLOGY, MYCOLOGY, LICHENOLOGY, BRYOLOGY AND PLANT PATHOLOGY		
TOPICS	THEORY	PRACTICAL
PHYCOLOGY	20	20
MYCOLOGY&LICHENOLOGY	15	15
BRYOLOGY	15	20
PLANT PATHOLOGY	10	05
TOTAL	60	60

DISTRIBUTION OF HOURS: PAPER - II: PTERIDOLOGY, GYMNOSPERMS, PALAEO BOTANY, EVOLUTION AND ANGIOSPERM ANATOMY		
TOPICS	THEORY	PRACTICAL
PTERIDOPHYTA	20	15
GYMNOSPERMS	15	10
PALAEOBOTANY	10	05
ANGIOSPERM ANATOMY	35	30
EVOLUTION	10	00
TOTAL	90	60

DISTRIBUTION OF HOURS: PAPER – III: SYSTEMATICBOTANY, APPLIED BOTANY, REPRODUCTIVE BOTANY, PALYNOLOGY, ETHNO BOTANY, PHARMACOGNOSY, MICRO TECHNIQUE, BIO INFORMATICS AND ANGIOSPERM MORPHOLOGY		
TOPICS	THEORY	PRACTICAL
ANGIOSPERM MORPHOLOGY	10	10
SYSTEMATIC BOTANY	45	60
APPLIED BOTANY	10	10
REPRODUCTIVEBOTANY	15	08
PALYNOLOGY	05	02
ETHNOBOTANY	05	Nil
PHARMACOGNOSY	05	Nil
BIO- INFORMATICS.	15	05
MICROTECHNIQUE.	15	05
TOTAL	125	100

DISTRIBUTION OF HOURS: PAPER – IV: PLANT PHYSIOLOGY, BIO CHEMISTRY, BIOTECHNOLOGY AND BIOPHYSICS		
TOPICS	THEORY	PRACTICAL
PLANT PHYSIOLOGY	60	40
BIO-CHEMISTRY	30	10
BIO-TECHNOLOGY	30	05
BIO-PHYSICS	10	05
TOTAL	130	60

DISTRIBUTION OF HOURS: PAPER – V: ENVIRONMENTAL SCIENCE, MICROBIOLOGY, PLANT BREEDING, BIOMETRICS, PHYTOGEOGRAPHY & RESEARCH METHODOLOGY		
TOPICS	THEORY	PRACTICAL
ENVIRONMENTAL SCIENCE	60	15
PHYTOGEOGRAPHY	10	05
BIO-METRICS	15	05
PLANT BREEDING	15	10
MICROBIOLOGY	30	10
RESEARCH METHODOLOGY.	05	-----
TOTAL	135	45

DISTRIBUTION OF HOURS: PAPER – VI: CYTOLOGY AND GENETICS		
TOPICS	THEORY	PRACTICAL
GENETICS	90	30
CYTOLOGY	30	05
TOTAL	120	35

TOTAL DURATION OF B.Sc PLANT SCIENCE MAIN DEGREE COURSE	
TOTAL THEORY	780 HOURS
TOTAL PRACTICALS	420 HOURS

PAPER 1 – PHYCOLOGY, MYCOLOGY, LICHENOLOGY, BRYOLOGY, AND PLANT PATHOLOGY

Paper I		
Distribution of hours		
Topics	Theory	Practical
Phycology	20	20
Mycology and Lichenology	15	15
Bryology	15	20
Plant pathology	10	05
Total	60	60

PHYCOLOGY - [Theory 20 Hours. Practical 20 Hours.]

- 1) Introduction – Range of thallus structure – Phylogenetic trends – Pigments – Reproduction – Life cycle – Classification based on F .E Fritsch 2 Hours
- 2) General characteristics of the following major groups stressing the structure, reproduction and life cycle of the types given below –
 - a. Cyanophyceae - *Nostoc*
 - b. Chlorophyceae - *Chlorella, Volvox, Ulothrix, Cladophora, Zygnema, Oedogonium, and Chara*
 - c. Xanthophyceae - *Vaucheria*
 - d. Bacillariophyceae - *Pinnularia*
 - e. Phaeophyceae - *Sargassum*
 - f. Rhodophyceae - *Polysiphonia* 15 Hours
- 3) Economic importance
 - a. Role of algae in soil fertility fertilizer –Nitrogen fixation- Symbiosis

- b. Commercial products of algae –Agar, Alginates, Carrageenin, Diatomaceous earth
- c. Algae - medicinal aspects, algal blooms and red tides 3 Hours

PRACTICAL – 20 Hours.

1. Make micro preparations of vegetative and reproductive structures of the types mentioned in the syllabus
2. Identify the algal specimens up to the generic level and make labeled sketches of the specimens observed

MYCOLOGY AND LICHENOLOGY

[Theory 15 Hours , Practical - 20 Hours.]

1. Introduction, structure, reproduction, life cycle, evolutionary trends, Classification based on AINSWORTH 2 Hours.
2. Distinguishing characters of different classes of fungi representing the following genera .
 - a. Myxomycotina - General characters.
 - b. Zygomycotina - *Rhizopus*
 - c. Ascomycotina
 - Hemiascomycetes - *Saccharomyces*
 - Plectomycetes - *Penicillium*
 - Pyrenomycetes - *Xylaria*
 - Discomycetes - *Peziza*
 - d. Basidiomycotina
 - Teliomycetes - *Puccinia*
 - Hymenomycetes - *Agaricus*
 - e Deuteromycotina - *Cercospora*

10 Hours
- 3 Economic importance of Fungi , mycorrhiza. 1 Hour.

Lichenology

General account, economic importance.

Type Usnea 2 Hours.

PRACTICAL- 15 Hours.

Students should be trained to

1. Make micro preparation of vegetative and reproductive structures of the types mentioned in the syllabus
2. Identify the specimens up to generic level
3. Make labeled sketches of the specimens observed

BRYOLOGY [Theory 15 Hours , Practical - 20 Hours.]

1. Introduction and Classification 2 Hours.
2. Study of the habit, thallus organization, vegetative and sexual reproduction and alternation of generation of the following types
Riccia , *Marchantia* ,*Funaria* 12 Hours.
3. Economic Importance of Bryophytes 1 Hour.

PRACTICAL – 20 Hours.

1. *Riccia* – Habit - Internal structure of thallus – V. S . of thallus through archegonia, antheridia and sporophyte
2. *Marchantia* –Habit- thallus T. S . , thallus with Archegonial receptacle, Antheridial receptacle, Male receptacle V .S . , Female receptacle e VS., T.S . of thallus through gemma, Sporophyte V. S .
3. *Funaria* – Habit , V. S . of archegonial cluster, V .S . of antheridial cluster, Sporophyte V. S .

PLANT PATHOLOGY [Theory 10 Hours , Practical 5 Hours]

1. History of plant pathology – Classification of plant diseases on the basis of causative organisms and symptoms – Host parasite interaction – Defense mechanism in host, Mechanism of infection, transmission and dissemination of diseases

2 Hours.

2. Control of plant diseases – Quarantine and seed certification –remedial and biological control. 2 Hours.
3. Study of the following diseases with emphasis on symptoms, disease cycle and control measures of Leaf mosaic of Tapioca, Citrus Canker, Bunchy top disease of banana plant, Quick wilt of Pepper, Soft rot of Ginger(*Pythium aphanidermatum*), Blast disease of Paddy, Abnormal leaf fall of Rubber 8 Hours.
4. Brief account of the following fungicide s- Bordeaux mixture , Tobacco decoction , Neem cake & oil. 1 Hour

PRACTICAL 5 Hours.

Identify the Diseases mentioned with respect to causal organism and symptoms

Students should be trained to prepare the fungicide Bordeaux mixture & Tobacco decoction .

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2. TRAINOR F. R . - Introductory Phycology- John Wiley and sons Inc. New York
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4. KUMAR H .D . and SINGH A.N. - A Text Book on Algae
5. SHARMA O .P . - A Text Book of Algae
6. PANDEY AND TRIVEDI - A Text Book of Fungi, Bacteria and Virus –Vikas Pub:
Publishing House New Delhi
7. DUBE - A Text Book of Fungi, Bacteria, and Virus - Vikas Publishing House, New
Delhi
8. DUBE H. C . – An Introduction to Fungi -Vikas Publishing House, New Delhi
9. GANGULEE DAS AND DUTTA - College Botany Vol.1 Central Book Depot.,
Calcutta

10. PARIHAR N .S . – An introduction to Bryophyta - Central Book Depot. Alahabad
11. PREMPURI –Bryophytes –a broad perspective - Athmaram and Sons
12. VASISHTA B. R. - Bryophyta - S. Chand and Co. New Delhi
13. CHOPRA R.N. & KUMAR P . K. – Biology of Bryophytes - Wiley Eastern Ltd. New Delhi
14. BILRAMI K. S. & DUBE -A Text book on modern Plant Pathology - Vikas Publishing House, New Delhi
15. RENGASWAMY G . - Disease of Crop plants in India - Prentice Hall of India New Delhi
16. SMITH K. M. - A Text Book of Plant Diseases.

PAPER II

PTERIDOLOGY, GYMNOSPERMS , PALAEO BOTANY, ANGIOSPERM ANATOMY AND EVOLUTION.

Paper II		
Distribution of hours		
Topic	Theory	Practical
Pteridology	20	15
Gymnosperms	15	10
Palaeo botany	10	05
Angiosperm Anatomy	35	30
Evolution	10	00
Total	90	60

Pteridology (Theory 20Hours , Practical 15 Hours.)

1. Introduction : General characters morphological and phylogenetic classification. 2 Hours.

Study of the habitat , habit, internal structure, reproduction and life cycle of the following types

1. *Psilotum*
2. *Lycopodium*
3. *Selaginella*
4. *Equisetum*
5. *Adiantum*
6. *Marsilea*

(Developmental details not required)

15 Hours.

General topics

Stelar evolution in Pteridophytes , heterospory and seed habit, relationships of pteridophytes with bryophytes and gymnosperms , economic importance of pteridophytes.

3 Hours

Practical (15 Hours.)

1. *Psilotum* : External features , stem T .S . , synangium T. S .
2. *Lycopodium* : Habit, stem T. S . , stobilus V. S.
3. *Selaginella* : Habit , rhizophore T. S , stem T . S , axis with strobilus , V .S . of strobilus , Megasporophyll and microsporophyll .
3. *Equisetum* - Habit , rhizome and stem T .S . and V. S . of strobilus.
4. *Adiantum* - Habit , Petiole T. S . ,porophyll T. S . prothallus
- 5 *Marsilea* - Habit , Rhizome and petiole T . S, sporocarp T.S. ,V. S . and R. L . S.

Gymnosperms(Theory 15 Hours practical 10Hours.)

- 1 Introduction and classification of gymnosperms. 2 Hours.
- 2 Study of the Habit , Internal structures , reproduction and life cycle of the following types
Cycas ,Pinus , Gnetum.

(Developmental details need not to be studied)

10 Hours

- 3 Evolutionary trends in gymnosperms , relation of gymnosperm with pteridophytes and angiosperms - economic importance of gymnosperms. 3 Hours.

Practical (10 Hours)

- 1 *Cycas* – seedling , coralloid root and coralloid root T. S T . S . of leaflet and petiole ,micro and mega sporophyll, male cone V. S micro sporophyll T. S . entire and V. S . of ovule.

- 2 Pinus - Branch of indefinite growth ,spur shoot, T. S of old stem and needle R .L .S and T. L . S. of stem , male and female cone, V .S . of male and female cone.
- 3 Gnetum -: Habit , stem T. S . ,(young and mature) , leaf T. S . , male and female strobilus , V . S . of male and female cone , ovule V. S . and seed

Angiosperm Anatomy (Theory 35 Hours , Practical 30 Hours.)

- 1 Objective and scopes of plant anatomy 1 Hour
- 2 Cell wall organization – Gross structure - Primary and secondary wall pits – plasmodesmata - microscopic and sub microscopic structures – Extra cell wall material. Non living inclusions of the cell – Reserve food - secretory products, by products. 5Hours
- 3 Tissues – Meristems , Definition , Classification based on origin, position, growth patterns, functions. 2 Hours
- 4 Apical meristems & theories on apical organization - Apical cell theory , Histogen theory, Tunica -Corpus theory. Organization of root apex in dicots & monocots. 5 Hours
- 5 Permanent tissues – Definition, classification - simple , complex and secretory. 5 Hours
- 6 Tissue systems – Epidermal tissue systems, Ground tissue systems & Vascular tissue systems. Different types of vascular arrangements. 3 Hours
- 7 Primary structure – Root, stem and leaf. [Dicot & Monocot]
Secondary growth - Root and stem, Anomalous secondary growth - Bignonia, Boerhaavia , Dracaena. 12 Hours
- 8 Origin of lateral roots, Nodal Anatomy , Abscission of leaf. 2 Hours

PRACTICAL – 30 HOURS

- 1 Non living inclusions - Cystolith , Raphide , sphaero-raphide, Aleurone grains,
- 2 Starch grains (Eccentric, concentric, compound)
- 3 Apical meristem (root apex and stem apex)
- 4 Simple permanent tissue – Parenchyma, Chlorenchyma , Aerenchyma , Collenchyma and Sclerenchyma
- 5 Primary structure – Dicot stem : *Hydrocotyl e*, *Coccini a*, *Eupatorium* or any dicot stem.
- 6 Monocot stem : Bamboo, Grass , *Asparagus* or any monocot stem.
- 7 Dicot root : *Tinospora*, *Ficus*, Pea.
- 8 Monocot root : *Colocasia*, *Hedychium*, *Pandanus* or any monocot root .
- 9 Secondary structure [Normal type] – Stem : *Tinospora*, *Thithonia*, *Vernonia* or any normal type
- 10 Secondary structure - Root : [Normal type -] *Tinospora*, *Ficus*, *Carica papaya*, *Ricinus* or any normal type

- 11 Secretory tissue : Resin canal, Nectary, Latex vessel, Lysigenous and Schizogenous cavities.
Laticifers – Articulated and non articulated.
- 12 Epidermal structures – Trichomes, Hairs, Glands, Stomata.
- 13 Anomalous secondary thickening - *Bignonia, Dracaena, Boerhaavia*
- 14 Leaf anatomy - Dicot leaf : *Ixora*. Monocot leaf : Grass

PALAEO BOTANY (Theory – 10 and Practical - 5)

- 1 Objectives of palaeo botany. Fossil formation – Techniques of study.
- 2 Geological time scale. Evolutionary trends
- 3 Primitive land plants - Precambrian flora - Algae, Fungi and Bryophyta.
- 4 Fossil pteridophytes – Rhynia , Lepidodendron, Lepidocarpon . Fossil Gymnosperm - Lygenopteris.
- 5 Applied aspects of Palaeobotany - Exploration of fossils – Exploration of fuels.

Practical – 5 Hours.

- 1 Fossil pteridophytes – Rhynia Stem , Lepidodendron, Lepidocarpon,
- 2 Gymnosperm - Lygenopteris

EVOLUTION – (Theory - 10 Hours.)

- 1 Progressive & Retrogressive.
- 2 Parallel and Convergent evolution.
- 3 Micro & Macroevolution .
- 4 Theory of Lamarck, Wiesman and De vries, Darwinism, Neo- Darwinism
- 5 Isolation, Mutation, Genetic drift, Speciation
- 6 Variation and Evolution – Hybridization and Evolution – Polyploidy and evolution – Mutation and evolution.

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16.Esau K . (1965) - Plant Anatomy – Wiley Eastern , Newyork

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PAPER III

**Angiosperm Morphology, Systematic Botany, Applied Botany, Reproductive Botany, Palynology,
Ethno botany, Pharmacognosy, Micro technique & Bio informatics.**

Paper III		
Distribution of hours		
Topics	Theory	Practical
Angiosperm Morphology	10	10
Systematic Botany	45	60
Applied Botany	10	10
Reproductive Botany	15	08
Palynology	05	02
Ethno botany	05	00

Pharmacognosy	05	00
Bioinformatics	15	10
Micro technique	15	05
total	125	105

Angiosperm Morphology 10 Hours.

Inflorescence : Racemose, Cymose & Mixed / Special types with examples

Flower-as a modified shoot, Flower parts, their arrangements, relative position, numeric- plan, cohesion, adhesion, symmetry of flower ,aestivation types, placentation types, floral diagram & floral formula .

Classification of fruits with examples

10 Hours.

Practical 10 Hours.

Identify, describe the different types of Inflorescence, flowers, fruits,& placentation types.

Systematic Botany

45 Hours.

- 1 Objectives, Importance of Systematics . 1 Hour.
- 2 A Brief History of Angiosperm classification. 5 Hours.
- 3 Detailed study of Bentham & Hooker 's System of classification 3 Hours.
- 4 Plant Nomenclature 2 Hours.
- 5 Herbarium technique-Important Herbaria, Botanical Gardens. 2 Hours.
- 6 Origin of Angiosperms - Brief account. 2 Hours..

Study of the following families with special reference to morphology of modified parts if any and plants of economic importance.

Annonaceae, Nymphaeaceae ,Capparidaceae, Malvaceae. Rutaceae , Anacardiaceae ,

Leguminosae [Fabaceae – 3 Sub families] , Myrtaceae , Combretaceae , Cucurbitaceae , Apiaceae .

Rubiaceae , Asteraceae .Sapotaceae , Apocynaceae , Asclepiadaceae , Convolvulaceae , Solanaceae ,

Scrophulariaceae , Acanthaceae , Verbenaceae , Lamiaceae .

Amaranthaceae , Euphorbiaceae .

Orchidaceae , Scitaminae , Lilliaceae , Arecaceae , Poaceae .

30 Hours.

Practical 60 Hours..

Study of representative members [at least two] of all the prescribed families as evidenced by the record of work.

A minimum of 30 herbarium specimens giving representation to all the prescribed families with field least 50 plants collected.

Identification of herbarium specimens and campus plants.

Field work for the study of plants of different climatic conditions under the supervision of teacher's for days. Visit of any tribal colony to study the plants used by them in their daily life .

Field study is compulsory for appearing practical examinations.

Applied Botany 10 Hours.

Study of the Botanical name ,Family, Morphology of useful parts, and utility of the following ;

- 1 Cereals & millets - Rice, wheat , Maize , Ragi .
- 2 Legumes - Horse gram , Ground nut, Bengal gram , Blackgram , Greenpeas.
- 3 Sugar yielding plants - Sugarcane , Sweet potato.
- 4 Spices & condiments – Cinnamon , Cumin, Clove , Cardamom , Pepper .
- 5 Fibre – Cotton , Coir , Jute.
- 6 Dyes- Indigo , Henna.
- 7 Rubber - Para rubber
- 8 Gums & resins - Gum Arabic , Asafoetida.
- 9 Tuber crops –Tapioca , Yam , Carrot , Potato , Colocasia.
- 10 Tropical Fruits – Banana , Jack Fruit , Pineapple
- 11 Oil yielding – Sesame oil , Palm oil , mustard oil.
- 12 Medicinal plants - Ocimum , Acorus , Adhatoda , Sida , Phyllanthus , Turmeric.
- 13 Beverages - Coffee , Tea , Cocoa .

Practical 10 Hours.

Study of the raw materials or direct products mentioned in the syllabus with study of common plants used by tribals as mentioned in ethnobotany.

Ethno botany 5 Hours.

- 1 Definition – importance , scope , categories and significance.
- 2 Study of various methods to collect Ethno botanical data.
- 3 Plant parts used by tribes in their daily life : as food , clothing , shelter , agriculture and medicine.
- 4 Study of common plants used by tribes. *Aegle marmelos* , *Ficus religiosa* , *Curcuma longa* , *Cynadon dactylon* , *Ocimum sanctum* and *Mangifera indica*.

Reproductive Botany 15 Hours.

- 1 Introduction to angiosperm embryology with special reference to Indian embryologists.
- 2 Micro sporogenesis - structure and functions of wall layers.
- 3 Development of male gametophyte - Dehiscence of anther.
- 4 Mega sporogenesis - Development of female gametophyte - Embryo sac - Development and types - Monosporic – Polygonum type , Bisporic - Allium type , Tetrasporic - Adoxa type.
- 5 Pollination - Fertilization - Barriers of fertilization - Germination of pollen grains - Double fertilization.
- 6 Structure of Embryo-Dicot [Capsella] Monocot [Triticum]
- 7 Endosperm types and it's development , functions.

Palynology 5 Hours

Pollen structure, pollen morphology , pollen allergy - viability test for pollen grains , Economic importance and it's importance in taxonomy .

Practical 10 Hours.

Identify C . S . of anther , Dicot embryo , Monocot embryo & 8 nucleated embryo sac .

Study of pollen grains of any 3 plants.

Pharmacognosy 5 Hours.

- 1 Historical development of pharmacognosy , Definition & scope of pharmacognosy , Relation to allied fields of study , Systematic scheme of pharmacognosic studies , Systems of classification of drugs .
- 2 Sources of crude drugs - roots , rhizome , bulb , corm , leaves , stem , flowers , fruits & seeds.
- 3 Source of tannins & dyes.

Bio-informatics 15 Hours

- 1 History and development of computers –digital computers, analog computers, hybrid computers.
2 Hours
- 2 Business & scientific computers, micro ,mini, main frame ,super computers .2 Hours
- 3 General awareness of computer hardware - CPU and other peripheral devices .[input, output, computer memory , and auxillary storage devices. 2 Hours
- 4 Basic knowledge of computer systems- Soft ware-types , Programming languages - machine language , assembly language & high level language. 2 Hours
- 5 General awareness of popular commercial &scientific software packages. 2 Hours
- 6 Introduction to the Web – Biology home page. 2 Hours
- 7 Information retrieval system – WEB search engines – Biological Abstracts . 2 Hours
- 8 General account of applications of computers. 1 Hour

Practical 15 Hours.

- 1 All theory classes should be conducted with the aid of personal computers.
- 2 Students are expected to work with at least any one of the commercial / scientific software packages ,to explore the web and to be able to find , recognize , down load , install & use soft ware in various areas useful to the research of biology .

MICRO TECHNIQUE 15 Hours

1. Introduction - microscopy - simple and compound – phase contrast ; dark field illumination and electron microscopes. 3 Hours
- 2 Microtome – rotary and sledge 1 Hour
3. Killing and fixation agents – Carnoys formula , farmers formula, F .A. A 1 Hour
4. Dehydration - reagents 1 Hour
5. Sectioning - hand and microtome 2 Hours
6. Stains and staining techniques - double staining . General account
Stains : saffranin , hematoxylin , acetocarmin. 3 Hours

- 7 . Mounting media : D . P. X and Canada balsam 1 Hour
- 8 Whole mounts - cytological methods :
maceration , smear and squash preparation 3 Hours

Practical - 5 Hours

General awareness of Micro technique - maceration ,smear etc.

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- 27 Basham S. - Word 2000 in easy steps – Dreamtech press , New Delhi.

PAPER IV

PLANT PHYSIOLOGY , BIOCHEMISTRY , BIOPHYSICS AND BIOTECHNOLOGY

Paper IV		
Distribution of hours		
Topics	Theory	Practical
Plant Physiology	60	40
Bio chemistry	30	10
Bio technology	30	05
Biophysics	10	05
Total	130	60

PLANT PHYSIOLOGY 60 Hours.

1. General introduction :- physiological processes; their significance and applications. 1 Hour.
2. Water relations of plants: Importance of water to plant life. 14 Hours.
 - a] Absorption of water- organs of absorption, root and root hair. Physical aspects of absorption - imbibition , diffusion and osmosis. Plant cell as an osmotic system; osmotic pressure , turgor pressure , wall pressure and diffusion pressure deficit , water potential and osmotic potential. Plasmolysis and its significance, practical applications. Mechanism of water absorption – active and passive absorption, root pressure. Path way of water across root cells.
 - b] Ascent of sap- vital and physical theories.
- c] Loss of water from plants : transpiration - cuticular, lenticular and stomatal mechanism - theories – starch sugar hypothesis, potassium - ion theory . Significance of transpiration - guttation, anti - transpirants, factors affecting transpiration.

Water stress and its physiological consequences to drought.

3. Mineral nutrition : Gross chemical analysis of the plant body , ash analysis, criteria for essentiality of elements, macro and micro elements , role of essential elements and their deficiency symptoms . Culture methods - sand culture, hydroponics and aeroponics. Mechanism of mineral absorption (a) passive absorption- ion exchange and Donnan equilibrium . (b) active absorption- carrier concept , Lundegardh hypothesis .

5 Hours

4. Photosynthesis : Introduction , significance and general equation. Photosynthetic apparatus , structure and function of chloroplast , quantasomes - solar spectrum and its importance - Fluorescence and phosphorescence. Red drop , Emerson effect- Two pigment systems- raw material for photosynthesis- Mechanism of photosynthesis- Light reaction - cyclic and non cyclic photophosphorylation . Hill reaction - Dark reaction: Calvin cycle. Comparative study of C_3 , C_4 , and CAM plants. Photorespiration - Bacterial photosynthesis and chemo synthesis - Factors affecting photosynthesis - Law of limiting factor.

15 Hours.

5. Respiration : Introduction , definition and significance and general equation. Respiratory substances, types of respiration- aerobic and anaerobic.

Aerobic respiration - glycolysis , Krebs's cycle , terminal oxidation. Anaerobic respiration – fermentation : alcoholic and lactic acid fermentation. Energy relation of respiration - R .Q . and its significance - Factors affecting respiration.

9 Hours.

6. Translocation of solutes : Path way of movement t, phloem transport , mechanism of transport - Munch hypothesis , protoplasmic streaming theory - activated diffusion hypothesis , electro osmotic theory.

7. Nitrogen metabolism : Source of nitrogen - Biological nitrogen fixation - symbiotic and a symbiotic. Nitrogen fixation by blue green algae - rotation of crops. Reduction of nitrate - reductive amination and transamination. Nif genes - Leghaemoglobin.

3 Hours.

8. Growth : Phases of growth - vegetative and reproductive growth - growth curve - plant growth regulators - Auxins, Gibberellins , Cytokinins , ethylene , Abscissic acid - synthetic plant hormones - practical applications. Senescence and abscission.

Photoperiodism and vernalization - phytochrome and its significance. Physiology of bud and seed dormancy, germination.

5 Hours.

9. Plant movements : Tropic and nastic movements. Circadian rhythm and biological clock . 5 Hours.

10. Stress physiology : water stress , salt stress.

3 Hours.

PRACTICAL 40 Hours.

- 1 Water potential of onion peel / Rheo peel by plasmolytic method.
- 2 Imbibition of water by different types of seeds.

- 3 Effect of temperature on permeability.
- 4 Papaya petiole osmoscope.
- 5 Determination of stomatal index.
- 6 Compare the rate of transpiration by the upper and lower surface of the leaf by cobalt chloride method.
- 7 Determination of water absorption and transpiration ratio.
- 8 Measurement of rate of transpiration using Ganong's potometer or Farmer's potometer.
- 9 Separation of plant pigments by paper chromatography.
- 10 Evolution of oxygen during photosynthesis.
- 11 Measurement of photosynthesis by Wilmot's bubbler.
- 12 Evolution of CO₂ during respiration.
- 13 Ganong's respirometer and measurement of R .Q .
- 14 Simple respiroscope.
- 15 Alcoholic fermentation using Kuhn en's fermentation vessel.
- 16 Geotropism using clinostat.
- 17 Measurement of growth using Arc auxanometer.

BIOCHEMISTRY**30 Hours.**

1. Molecules and life . 2 Hours.
- 2 . Carbohydrates - Classification, occurrence, structure and functions of monosaccharide's (glucose and fructose), oligosaccharides (sucrose and maltose) , polysaccharides(starch and cellulose), synthesis of glycosidic bonds - Enzymatic hydrolysis of glycosidic bonds - amylases and invertases. 4 Hours
- 3 . Nucleic Acids - Chemistry of purines and pyrimidines . Structure of DNA & RNA 3 Hours
- 4 . Amino acids- classification based on polarity, structure - Amphoteric property of Amino acids - peptide formation – Amino acid metabolism - transamination and deamination . 3 Hours
- 5 .Proteins – classification based on function – properties – structure - role of bonds in stabilizing protein structure - hydrolysis of proteins. 4 Hours
- 6 . Lipids- classification - complex lipids, phospholipids, spingolipids, glycolipids. Simple lipids- fatty acids, fats, waxes, synthesis and degradation of fatty acids , Beta - oxidation. Cholesterol and its importance. 4 Hours
- 7 . Metabolism – Basic metabolism - Energy metabolism – Intermediary metabolism – Interrelationships of metabolic pathways – Regulation of metabolism . 2 Hours

8 . Enzymes - general account - structure, classification and nomenclature (recommended by Commission on Enzymes). Mechanism of enzyme action - inhibition of enzymes - regulation of enzymes - allosteric inhibition - Iso - enzymes, coenzymes and cofactors - effect of temperature on enzyme action – effect of pH . 5 Hours

9 . Secondary Plant Products – Introduction – classification and function [General account] 2 Hours

PRACTICAL 10_Hours

1. Qualitative test for carbohydrates - Molisch's test, Benedict's test (for reducing sugar).
Iodine test for starch ; Seliwanoff's tes t.
2. Test for amino acids - Ninhydrin test , Xantho proteic test , Millon's test.
3. Test for proteins - Biuret test .
4. Amylase activity on starch .

BIOTECHNOLOGY (30 Hours)

1. Introduction – History – major achievements – Biotechnology in India . 2 Hours.
2. Plant Tissue culture - Culture media ; composition , preparation and sterilization – Totipotency : definition and importance - Dedifferentiation and redifferentiation - Callus and suspension culture, meristem culture - Somaclonal variation - Somatic embryogenesis , Synthetic seeds - Anther culture and production of haploids - protoplast culture – somatic hybrids –cybrids .

6 Hours

- 3 .Recombinant DNA technology : General account of cloning vehicles – plasmid, bacteriophages, cosmids and phagemids. Cutting and joining of DNA molecules- restriction endonucleases, ligases- Gene library and cDNA library - Isolation and sequencing of DNA . (Brief account) .

8 Hours.

- 4 . Gene transfer techniques in plants - Direct DNA uptake by protoplast – vector method- *Agrobacterium* mediated gene transfer – physical method - electroporation - shot gun method – microinjection. 5 Hours

- 5 . Biotechnology of Nitrogen Fixation-Nitrogenases, nif - genes – Regulation of expression of nif- genes . Role of hydrogenases 4 Hours.

- 6 . Application of Biotechnology in medicine, agriculture and human welfare - Bio-safety issues.
Isolation and purification of DNA from plant cells- DNA sequencing. 2 Hours.

- 7 .Cryopreservation – methods – plant cell bank – pollen bank & achievements. 2 Hours.

8. Methods in biotechnology – I P R , P C R , R F L P , E L I S A , SOUTHERN BLOTTING .

1 Hour

PRACTICAL 5 Hours.

1. Use of equipments and glass wares- petridishes, flasks, culture tubes, Pasteur pipettes, forceps, knives, hot air oven, autoclave, shaker, pH meter, laminar air flow system.
2. Preparation of media, sterilization, inoculation and callus induction (Demonstration only).

Visit to a well equipped Biotechnology laboratory

BIOPHYSICS (Theory 10 hours)

1. Principles and applications of the following :- Colorimeter, Spectrophotometer, Centrifuge .
2. Basic knowledge of the following separation methods :- Chromatography, Electrophoresis.
3. Buffers -their functions in biological systems -Uses of buffers in biological research , pH meter.
4. Cryobiology - Freeze drying (lyophilisation) - its applications.

Practical 5 Hours.

1. Preparation of buffer.
2. Measurement of pH .

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Plant Physiology

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8. Devlin & Witham – Plant Physiology (C B S publishers).
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2. Lehninger - Principles of Biochemistry (CBS publishers).
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4. Debajyothi Das – Biochemistry (Academic publishers).
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- 8 Galen .W. Ewing - Instrumental methods of chemical analysis Mc - Graw Hill Book Company
9. D . Freifelde r- Physical Biochemistry W . H . Freeman
- 10 .E . J . Casey - Biophysics – Concepts and Mechanics Van Nostrand Reinhold Company
11. Blair E .J . - Introduction to chemical instrumentation Mc-Graw Hill Book Company
- 12 Willard H . H . ,J .A . Dean, L .L . Merritt and F. A . Settle-Instrumental methods of analysis CBS Publishers and Distributors Delhi
13. Sasidharan A . – Biophysics

REFERENCE**Biotechnology**

- 1 George E . F . and Sherington P . D . - Plant propagation by Tissue culture.
- 2 Reinert J. and Bajaj Y . P. S – Plant cell, Tissue and Organ Culture(WC Brown publishers) .
- 3 Gupta P. K. - Elements of Biotechnology (Rastogi publications).
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- 5 Pamela Peters – Biotechnology : A guide to genetic engineering (WC Brown publishers)
- 6 Razdan M . K . – An introduction to Plant Tissue Culture(Oxford and I B H publishers)
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- 8 Ramawat K. G . – Plant Biotechnology (S. Chand & company)
- 9 Ignacimuthu S . J . – Applied Plant Biotechnology (Tata Mc Graw Hill)

PAPER V

Environmental Science, Phyto-geography, Biometrics, Microbiology,
Plant breeding and Research methodology

Paper V		
Distribution of hours		
Topics	Theory	Practical
Environmental Science	60	15
Phytogeography	10	05
Biometrics	15	05
Plant breeding	15	10
Microbiology	30	05
Research methodology	05	00
Total	135	40

Environmental Science 60 Hours.

Ecology –

1. Definition- Scope and relevance to society and human environment.

Need for public awareness.

3 Hour.

2 Ecosystems-Concept of an ecosystem- structure and function of an ecosystem-Biotic and

- abiotic components- Energy flow in an ecosystem. 3 Hours.
3. Ecological succession-Definition & types. 3 Hours.
 4. Food chains -Food web & ecological Pyramids. 3 Hours.
 5. Introduction- types, characteristic features, structure and functions of the following ecosystems.
 - A 1. Forest ecosystem 2. Grassland ecosystem 3. Desert ecosystem 4 .Aquatic ecosystems, Ponds, Streams, Rivers, Oceans, Estuaries. 6 Hours.
 - B Morphological, anatomical& physiological adaptations of –Hydrophytes, Xerophytes, Halophytes, Epiphytes, Parasites. 3 Hours.

Natural Resources

Renewable and non-renewable resources. Natural resources and associated problems.

- 1 Forest resources: Use and over exploitation. Deforestation, Timber extraction, mining, dams and their effects on forests and tribal people.
- 2 Mineral resources: Use and exploitation ,Environmental effects of extracting and using mineral resources.
- 3 Water resources: Use and over exploitation of surface water and ground water ,floods, drought, conflicts over - water, dams, benefits and problems.
- 4 Food resources: World food problems, Changes caused by agriculture and over grazing ,effects of modern agriculture, fertilizer-pesticide problems, water logging and salinity.
- 5 Energy resources :Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources.
- 6 Land resources: Land as a resource, land degradation, Man induced land slides, soil erosion and desertification.
- 7 Role of an individual in conservation of natural resources.
- 8 Equitable use of resources for sustainable life styles.

8 Hours.

Biodiversity and it's conservation-

- 1 Introduction –
- 2 Definition- genetic, species and ecosystem diversity.
- 3 Bio-geographical classification of India.
- 4 Value of bio-diversity : consumptive use ,productive use ,social, ethical ,aesthetic and option values .
- 5 Biodiversity at global, National and local levels. India as mega-diversity nation.

- 6 Hot-spots of biodiversity. Threats to biodiversity: habitat loss ,poaching of wild life ,man-wild life conflicts.
- 7 Endangered and endemic species of India. Conservation of biodiversity :In-situ and Ex-situ conservation of biodiversity. Ecological niche, eco-types & ecological indicators.

8 Hours.

Environmental pollution

- 1 Definition causes, effects and control measures of –
- 2 1. Air pollution 2. Water pollution 3. Soil pollution 4. Marine pollution 5. Noise pollution 6. Thermal pollution 7 Nuclear hazards.
- 3 Solid waste Management : Causes, effects and control measures of urban and industrial wastes.
- 4 Role of an individual in prevention of pollution. Pollution case studies.
- 5 Disaster management : Floods, earthquake, cyclone and land slides

8 Hours.

Social issues and the Environment

- 1 From unsustainable to sustainable development. Urban problems related to energy. Water conservation, Rain water harvesting, water shed management. Resettlement and rehabilitation of people : it's problems and concerns.
- 2 Environmental ethics :Issues and possible solutions.
- 3 Climate change. Global warming, acid rain, ozone layer depletion ,nuclear accidents and holocaust.
- 4 Waste land reclamation. Consumerism and waste products.
- 5 Environment protection Act. Air[prevention and control of pollution] Act. Water[prevention and control of pollution] Act. Wildlife Protection Act. Forest conservation Act. Hill preservation Act.
- 6 Issues involved in enforcement of environmental legislation.
- 7 Public awareness .Forest Management.
- 8 Brief study of the major forests in India. Influence of forest on environment. Social forestry.
- 9 Mangrove vegetation of Kerala
- 10 Need of protection of mangrove vegetation .National parks &wildlife sanctuaries.

7 Hours.

Human Population and the environment.

- 1 Population growth ,variation among nations.

- 2 Population explosion -Family welfare programme.
- 3 Environment and human health.
- 4 Human Rights. Value of education. HIV/AIDS. Women and Child Welfare.
- 5 Role of information technology in Environment and human health.

8 Hours.

Practical - 15 Hours.

- 1 Visit a local polluted site and documentation of major pollutants.
- 2 Study of ecological and anatomical modifications of Xerophytes, Hydrophytes, halophytes, epiphytes and Parasites.
- 3 Study of plant community by quadrat method.
- 4 Observation and study of different ecosystems mentioned in the syllabus.

PHYTOGEOGRAPHY 10 Hours

I Importance of Phytogeography.

- 2 Continental drift. Age and area concept.
- 3 Aims and methods of migration and dispersal.
- 4 Vegetation types of India.

10Hours.

Practical- 05 hours

- 5 Preparation of map of India to show distribution of vegetation types.

BIOMETRICS 15 Hours.

- 1 General introduction. Statistical terms and symbols. 2 Hours
- 2 Sample and sampling. Methods of sampling. Collection and representation of data. 2 Hours
- 3 Measures of central tendency –Mean, Mode, Median.[Exercise] 3 Hours
- 4 Measures of dispersion –Range, Quartile deviation, Mean deviation, Stand deviation, Standard error, Variance. 2 Hours
- 5 Distribution patterns-Normal distribution, Binomial distribution. 2 Hours

6	The Chi-square test-introduction,	Definition.[Exercise]	1 Hour
7	Correlation- coefficient of correlation[Exercise].	1 Hour	
8	Regression analysis [Exercise]	2 Hours	
9	Design of experiments- Randomized blocks, Latin square.	1 Hour	

Practical -5 Hours.

Workout problems from mean mode, median, chi-square test, standard deviation,
correlation & regression analysis.

PLANT BREEDING 15 Hours

- 1 . Introduction 1 Hour
- 2 . Objectives in plant breeding - Plant introduction. Agencies of plant introduction in India
Procedure of introduction - Acclimatization - Achievements. 2 Hours
- 3 . Selection - mass selection , pure line selection and clonal selection Geneti cbasis of selection and methods.
2 Hours
- 4 . Hybridization : procedure of hybridization, inter generic , inter specific , inter varietal hybridization with examples .
Composite and synthetic varieties.
Heterosis and its exploitation in plant breeding . Polyploidy breeding.
Breeding for disease resistance 5 Hours
- 5 Methods of vegetative propagation : Cutting , grafting , layering , special methods of propagation –
propagation by seeds. 2 Hours
- 6 Mutation breeding – methods - achievement in India.
Breeding for pest, diseases and stress resistance. 3 Hours

Practical - 10 Hours

Demonstration of Grafting, Budding & Hybridization

MICROBIOLOGY 30 hours

- 1 History & scope of microbiology . 1 Hours
- 2 **Bacterial classification:** Morphological classification, classification based on staining reaction : Ultra structure of bacteria , Reproduction , Economic importance. 4 Hours
- 3 Mycoplasma & Actinomycetes –General account. 1 Hour
- 4 General characteristics ,nomenclature, classification, structure, chemical composition ,properties and reproduction of bacteriophages and T. M. V . Transmission of viruses and role of vectors. Economic importance.
4 Hours
- 5 **Soil microbiology** – soil microorganisms , the rhizosphere , Biogeochemical activity of microorganisms in soil - N₂ cycle ,Carbon cycle , sulphur cycle , Phosphorous cycle , Iron cycle. Decomposition of organic matter, microbial degradation of cellulose , lignin, starch & syntrophism in the soil , biogas production.
4 Hours
- 6 **Aquatic microbiology** - Sources of water, sources of water contamination, standards of water, testing suitability of water, importance of aquatic microbes, methods of water purification , microbiology of sewage or waste water. Methods of waste water treatment. 4 Hours
- 7 **General account of microbiology of air.** 1 Hour
- 8 **Food microbiology** - Food spoilage and preservation methods.[general account].
Food born pathogens and food poisoning. 3 Hours
- 9 **Industrial microbiology:** Production of alcohol , vinegar, antibiotics, vitamins, vaccines, insulin, organic acids, bread, diary products & single cell protein. 3 Hours
- 10 Agricultural microbiology**
- 11 Objectives of green revolution, Role of microbes in soil formation, Role of microbes in soil fertility, Symbiotic microbes and crop production, Microorganisms as bio- fertilizers . Mycorrhiza & crop production, bio - pesticides, Harmful role of microorganisms . 3 Hours
- 12 Medical microbiology**
Normal micro flora of human body-skin , conjunctiva ,nose, mouth, upper respiratory tract. General awareness of microbial diseases of human beings. 2 Hours

Practical 5 Hours.

- 1 Gram staining of bacteria.
- 2 Test for the coliform bacteria in contaminated water.
- 3 Isolation of Rhizobium from root nodules of leguminous plants.

4 Examination of different forms of bacteria.

Research methodology 5Hours.

Research methods-Introduction - types of research, descriptive, experimental types – collection, analysis and interpretation of data, report writing.

Reference

- 1 Kormonty – Concept of Ecology – Prentice Hall
- 2 Odum E . P. - Ecology - ..
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- 16 T .K .Saha - Bio-statistics – Theory & Practical - Emkay Pub:
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PAPER VI

CYTOLOGY& GENETICS.

Paper VI		
Distribution of hours		
Topics	Theory	Practical
Cytology	30	05
Genetics	90	30

CYTOLOGY 30 Hours

- 1 History and progress of cell biology
- 2 Structural organization of prokaryotic and eukaryotic cells

Evolution of prokaryotic and eukaryotic cells

3 Hours

- 3 Ultra structure and functions of the cell components and organelles

A) Cell wall

B) The cell membrane

C) Endoplasmic reticulum

D) Ribosomes

D) Golgi apparatus

E) Lysosomes

F) Peroxisomes

G) Vacuole

H) Mitochondria

I) Chloroplast

J) Nucleus

10 Hours

4. The chromosomes

Chromosome morphology

Eukaryotic chromosomes and molecular organization .

Chromatin - composition and structure - chemical organization .

Nucleoproteins –histones and non – histones .

Nucleosome model of DNA organization, satellite and repetitive DNA . 7 Hours

5 . Special types of chromosomes

A) salivary gland chromosomes

B) Lamp brush chromosomes

C) B chromosomes

2 Hours

6 . Chromosome mutation

Structural aberration - deletion , duplication , inversion and translocation .

Numerical aberration-- aneuploidy , haploidy , polyploidy

3 Hours

8 Mitosis and Meiosis : transmission of genetic information

cell cycle : Significance of mitosis and meiosis

5 Hours

GENETICS: 90 HOURS

Units I to XI (Classical Genetics: 60 hours)

I Introduction

History of genetics, Scope of genetics, Genetic terminologies, Genes and environment. Heredity and variation. Genotype and Phenotype. Significance of genetics in society.

4 Hours

II Mendelian Genetics

Mendel and his experiments, Mendel's success, Mendelian principles, Mendelian ratios, monohybrid and dihybrid crosses, back cross, test cross and reciprocal crosses. Relevance of Mendelian principles.

5 Hours

III Probability factors in genetics

Segregation and probability

Independent assortment and probability

Pedigree analysis.

3 Hours

IV Genetics after Mendel

Modified Mendelian ratios.

Allelic interaction.

Co- dominance- Coat color in cattle.

Incomplete dominance .Flower color in *Mirabilis*

Interaction of genes.

a) Comb pattern in poultry. 9:3:3:1.

b) Epistasis . Recessive. Coat color in mice. 9:3:4.

c) Dominant epistasis. Fruit colour in summer squash. 12:3:1

d) Complementary genes. Flower color in *Lathyrus* 9:7

e) Duplicate gene with cumulative effect. Fruit shape in summer squash. 9:6:1

f) .Duplicate dominant genes in shepherd's purse. 15:1

g) Inhibitory factor. Leaf color in Paddy. 13:3

12 Hours

V Multiple alleles

General account. ABO blood group in man. MN and RH factor.

Self sterility in *Nicotiana*. Coat color in rabbits.

5 Hours

VI Lethal genes

Recessive lethal. Coat color in mice, albinism in Corn.

2 Hours

VII Quantitative characters.

General characters of quantitative inheritance, Polygenic inheritance

Skin color in man, ear size in Maize.

Transgressive variations, penetrance and expressivity, Pleiotropic genes.

4 Hours

- VIII Linkage and crossing over.
Linkage and its importance, linkage and independent assortment.
Complete and incomplete linkage. Crossing over – a general account, mechanism of crossing over.
Cytological basis of crossing over, two point and three point test cross.
Determination of gene sequence . Interference and coincidence. Mapping of chromosomes.
6 Hours
- IX Sex determination
Sex chromosomes, chromosomal basis of sex determination
XX- XY, XX-XO mechanism. Sex determination in Bryophyte,
(*Sphaerocarpus*), sex determination in higher plants (*Melandrium album*)
Genic balance theory of sex determination in *Drosophila*.
Sex chromosomal abnormalities in man. Klinefelter's syndrome, Turner's syndrome.
Sex linked inheritance. Eye color in *Drosophila*, Hemophilia in man.
Y- Linked inheritance. Sex limited and sex influenced inheritance.
10 Hours
- X Extra nuclear inheritance.
General account, maternal influence. Plastid inheritance in *Mirabilis*.
Shell coiling in snails, kappa particle in *Paramecium*.
5 Hours
- XI Population genetics.
Gene frequencies, genotype frequencies, Equilibrium of gene frequencies.
Hardy –Weinberg law, Factors that alters gene frequencies in a population.
Mutation, selection, migration, genetic drift, inbreeding and heterosis.
5 Hours
- Units XII to XV (MOLECULAR GENETICS: 30 HOURS)**
- XII DNA as genetic material
Structure of DNA types, B, A and Z types.
Replication of DNA, Circular and helical DNA.
Semi conservative model, experimental support, Meselson and Stahl experiment.
Enzymology of replication: topoisomerase, helicase, primase, polymerase and ligase.
DNA repairing mechanism.
7 Hours.

RNA structure. Properties and function of tRNA, mRNA and rRNA.
Genetic code. Synthesis of protein, transcription, translation

Central dogma, reverse transcription, Teminism.

10 Hours

XIII Mutation

General account, types of mutations, molecular basis of mutation. Transition, transversion and frame shift mutation, tautomerism. Mutagenic agents, physical and chemical, Induced mutations, Significance of mutation

5 Hours

XIV Concept of gene.

Units of a gene, cistron, recon, muton,

Split genes or introns, RNA splicing, ribozymes, overlapping gene.

Gene regulation- transcriptional control- one gene one enzyme concept.

The lac operon- the structural gene, operator gene, the promoter gene,

The regulator gene, artificial synthesis of a gene .synthesis of gene for yeast alanine tRNA. Genet regulations in prokaryotes and eukaryotes brief account only

The Britten & Davidson model of regulation

5 Hours

XV Transposable genetic elements.

General account, Characteristic , Transposons, (Tn) and Insertion Sequences (IS)

Cellular oncogenes, general account only.

2 Hours

PRACTICALS

CYTOLOGY: 5 HOURS

Make acetocarmine squash preparation of onion root tips and to identify different stages of mitosis.

Make acetocarmine squash preparation of the flower buds of any of the following plants. *Coix* , *Tradescantia*, *Capsicum* to identify different stages of Meiosis

GENETICS: 30 HOURS

Work out problems in

- 1 Monohybrid cross (Dominance and incomplete dominance)
- 2 Dihybrid cross (Dominance and incomplete dominance)

3 Gene interactions (All types of gene interactions mentioned in the syllabus)

- a) Recessive epistasis 9 : 3 : 4 .
- b) Dominant epistasis 12 : 3 : 1
- c) Complementary genes 9 : 7
- d) Duplicate genes with cumulative effect 9 : 6 : 1
- e) Inhibitory genes 13 : 3
- f) Duplicate dominant gene 15 : 1
- g) Comb pattern in poultry 9 : 3 : 3 : 1

5 Linkage and crossing over

Two point and three point crosses
Construction of genetic map.

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**FIRST YEAR B.Sc. DEGREE EXAMINATION
PART – III: PLANT SCIENCE (MAIN)**

(MODEL QUESTION PAPER)

**PAPER - I: PHYCOLOGY, MYCOLOGY, LICHENOLOGY,
BRYOLOGY AND PLANT PATHOLOGY**

Time: 3 Hours

Max. Marks: 55

(Draw diagrams only when specified)

Part – A

Answer any **one** of the following:

1. Explain the range of thallus organization in algae giving suitable examples.
2. With suitable diagrams explain the thallus organization and reproduction in *Riccia*.
3. What are the general characters of Fungi? How they are classified?

(1 x 10 = 10)

Part - B

Answer any **three** of the following:

4. Describe briefly the characteristic features of Bacillariophyceae
5. Write about the role of algae in soil fertility.
6. Give an account of the economic importance of fungi.
7. Write about the causative organism, symptoms, disease cycle and control measures of Quick wilt of pepper.
8. Describe the V. S of female receptacle of *Marchantia*

(3 x 5 = 15)

Part – C

Answer any **five** of the following:

9. Write a note on asexual reproduction in Algae.
10. Draw the internal structure of *Marchantia* thallus.
11. Explain the defense mechanism in host.
12. Explain the V.S of the Apothecium in *Usnea*.
13. Explain the sexual reproduction in *Oedogonium*.
14. Write notes on A) Sclerotium B) Appresorium and C) Haustorium.
15. Describe the gametophyte of *Funaria*.

(5 X 3 = 15)

Part D

Answer any **five** of the following:

16. What is meant by gametangial Copulation?
17. What is heterocyst? Explain its function
18. Draw a labeled diagram of the V.S of Gemma cup
19. Explain the structure of *Sargassum* receptacle
20. Explain the characteristic features of Myxomycotina
21. Name the pathogen and control of soft rot of Ginger
22. Explain the importance of neem cake

(5 x 2 = 10)

Part E

Answer any **five** of the following:

23. Tetra spore
24. Hormogones
25. Dolipore septum
26. Stroma
27. Columella
28. Rhizoids
29. Coenosporae
30. Quarantine

(5 x 1 = 5)

SCHEME OF EXAMINATION: Hours: 60 Max. Marks: 55							
PAPER – I: PHYCOLOGY, MYCOLOGY, LICHENOLOGY, BRYOLOGY AND PLANT PATHOLOGY							
Part No & Marks	Total Questions	Questions to be Attempted	Phycology (20)	Mycology & Lichenology (15)	Bryology (15)	Plant Pathology (10)	Total
Part A 10 Marks	3x10=30	1x10=10	1	1	1	--	30
Part B 5 Marks	5x5=25	3x5=15	2	1	1	1	25
Part C 3 Marks	7x3=21	5x3=15	2	2	2	1	21
Part D 2 Marks	7x2=14	5x2=10	2	2	1	2	14
Part E 1Mark	8x1=8	5x1=5	2	3	2	1	8
Total	30	19	9	9	7	5	98

**SECOND YEAR B.Sc. DEGREE EXAMINATION
PART – III: PLANT SCIENCE (MAIN)**

(MODEL QUESTION PAPER)

**PAPER – II: PTERIDOLOGY, GYMNOSPERMS, PALAEO BOTANY,
EVOLUTION AND ANGIOSPERM ANATOMY**

Time: 3 Hours

Max. Marks: 55

(Draw diagrams only when specified)

Part - A

Answer any **one** of the following:

- 1 Compare the ovules of *Cycas*, *Pinus* and *Gnetum* with reference to their structural organization.
- 2 Give an account of the stelar types found in the stem of *Psilotum*, *Selaginella* and *Equisetum* Draw labeled diagrams to illustrate your answer.
- 3 What are secretory tissues? Give an illustrated account of glandular trichomes, hydathodes and laticifers with examples.

(1 x 10 = 10)

Part - B

Answer any **three** of the following:

- 4 Bring out the internal structure of the sporocarp of *Marsilea* with a diagram.
- 5 With the help of a diagram describe the structure of the male cone of *Pinus*.
- 6 Describe the anomalous secondary thickening in *Dracaena* stem.
- 7 Write in detail the structure of a bifacial leaf with a labeled diagram.
- 8 Explain progressive and retrogressive evolution.

(3 x 5 = 15)

Part - C

Answer any five of the following:

- 9 Describe the sorus of *Adiantum*.
- 10 Bring out the structure of the sporangiophore of *Equisetum* with a diagram.
- 11 What is periderm? How it is formed?
- 12 Explain Neo- Darwinism.
- 13 Draw a neat labeled diagram of *Pinus* needle T.S
- 14 Describe the stem anatomy of the fossil gymnosperm that you have studied.
- 15 Explain different types of complex tissues.

(5 x 3 = 15)

Part - D

Answer any **five** of the following:

- 16 Distinguish between homosporous and heterosporous.
- 17 Write the xerophytic adaptations in *Equisetum*.
- 18 Briefly describe the importance of Palaeobotany.
- 19 Mention two similarities and dissimilarities of parenchyma and collenchyma.
- 20 Explain Tunica-Corpus theory.
- 21 Describe how growth takes place in male *Cycas*.
- 22 Explain the female strobilus of *Gnetum*.

(5 x 2 = 10)

Part - E

Answer any **five** of the following:

- 23 What does Rhizophore mean?
- 24 Vallicular canal
- 25 Coralloid root
- 26 Fossil.
- 27 Transfusion tissue.
- 28 Motor cells.
- 29 Convergent evolution
- 30 Quiescent centre.

(5 x 1 = 5)

SCHEME OF EXAMINATION: Hours: 90 Max. Marks: 55								
PAPER – II: PTERIDOLOGY, GYMNASPERMS, PALAEO BOTANY, EVOLUTION AND ANGIOSPERM ANATOMY								
Part No & Marks	Number of questions	Questions to be attempted	Pteridology (20)	Gymnosperm (15)	Palaeo Botany (10)	Angiosperm Anatomy (35)	Evolution (10)	Total
Part A 10 Marks	3x10=30	1x10=10	1	1	--	1	--	30
Part B 5 Marks	5x5=25	3x5=15	1	1	--	2	1	25
Part C 3 Marks	7x3=21	5x3=15	2	1	1	2	1	21
Part D 2 Marks	7x2=14	5x2=10	2	2	1	2	--	14
Part E 1Mark	8x1=8	5x1=5	2	2	1	2	1	8
TOTAL	30	19	8	7	3	9	3	98

**FINAL YEAR B.Sc. DEGREE EXAMINATION
PART – III PLANT SCIENCE (MAIN)**

(MODEL QUESTION PAPER)

PAPER – III: SYSTEMATICS, APPLIED BOTANY, REPRODUCTIVE MORPHOLOGY, PALYNOLOGY, ETHNO BOTANY, PHARMACOGNOSY, MICRO TECHNIQUE, BIO INFORMATICS AND ANGIOSPERM MORPHOLOGY

Time: 3 Hours

Max. Marks: 55

(Draw diagrams only when specified)

Part - A

Answer any **one** of the following:

- 1 What is a natural system of classification? Describe a natural system that you have studied. Explain the principle, merits and demerits of this system.
- 2 With suitable diagrammatic sketches, explain the different types of inflorescences that you have studied
- 3 Why Asteraceae is considered as the advanced family among dicotyledons? Explain.

(1 x 10 = 10)

Part - B

Answer any **three** of the following:

- 4 Write the most important distinguishing features of the family Apocynaceae.
- 5 Write the botanical name, family, morphology of the useful part and uses of Gingili and Cocoa.
- 6 What is endosperm? How is it developed? What are the different types?
- 7 What is killing and fixation? Write its objectives. Explain any three killing and fixing fluids which give acidic fixation image.
- 8 With suitable diagrams explain the different types of dry indehiscent fruits.

(3 x 5 = 15)

Part - CAnswer any **five** of the following:

- 9 Briefly describe the importance of Palynology in Plant Taxonomy.
- 10 Describe any three plants and their parts used by the Tribes of Kerala in their daily life.
- 11 What is a Soft ware, programming language and machine language?
- 12 Explain the different types of branching in Solanaceae
- 13 Explain the floral variation in Nymphaeaceae.
- 14 What is maceration? Describe a common method that you have studied.
- 15 Describe any three sources of crude drugs with example.

(5 x 3 = 15)

Part - DAnswer any **five** of the following:

- 16 Explain the corolla in Papilionaceae.
- 17 Write the family, botanical name, and morphology of useful parts of Turmeric.
- 18 What is tapetum? Write any two functions of it.
- 19 What is stain? Write any two stains you have used.
- 20 What are ROM and RAM?
- 21 Explain the gynoeceium in Orchidaceae
- 22 What is placentation? How is it different from aestivation?

(5 x 2 = 10)

Part - EAnswer any **five** of the following:

- 23 Name a taxonomic category.
- 24 Write the botanical name of the source plant of palm oil.
- 25 What is meant by ruminant endosperm?
- 26 What is endothelium?
- 27 What is a lomentum?
- 28 What is meant by chasmogamy?
- 29 Rotary microtome
- 30 Charles Babbage.

(1 x 5 = 5)

**FINAL YEAR B.Sc. DEGREE EXAMINATION
PART – III: PLANT SCIENCE (MAIN)**

(MODEL QUESTION PAPER)

PAPER – IV: PLANT PHYSIOLOGY, BIO CHEMISTRY, BIOTECHNOLOGY AND BIOPHYSICS

Time: 3 Hours

Max. Marks: 55

(Draw diagrams only when specified)

Part - A

Answer any **one** of the following:

1. Explain the mechanism involved in water absorption in higher plants.
2. Explain the various steps involved in glycolysis.
3. Describe the gene transfer techniques in plants.

(1 x 10 = 10)

SCHEME OF EXAMINATION:			Hours: 125		Max. Marks: 55							
PAPER - III: SYSTEMATICS, APPLIED BOTANY, REPRODUCTIVE MORPHOLOGY, PALYNOLOGY, ETHNO BOTANY, PHARMACOGNOSY, MICRO TECHNIQUE, BIO INFORMATICS AND ANGIOSPERM MORPHOLOGY												
Part No & Marks	Number of questions	Questions to be attempted	Systematics (45)	Applied Botany (10)	Reproductive Morphology (15)	Palynology (5)	Ethnobotany (5)	Pharmacognosy (5)	Micro technique (15)	Bio-Informatics (15)	Morphology	
Part A 10 Marks	3x10=30	1x10=10	2	--	--	--	--	--	--	--	1	
Part B 5 Marks	5x5=25	3x5=15	1	1	1	--	--	--	1	--	1	
Part C 3 Marks	7x3=21	5x3=15	2	--	--	1	1	1	1	1	--	
Part D 2 Marks	7x2=14	5x2=10	2	1	1	--	--	--	--	1	1	
Part E 1Mark	8x1=8	5x1=5	3	1	1	--	--	--	--	1	1	
TOTAL	30	19	38	8	8	3	3	3	11	6	17	

Part- B

Answer any **three** of the following:

- 4 Describe Hatch- Slack path way and its significance.
- 5 Explain the Recombinant D.N.A. technology
- 6 Describe photorespiration.
- 7 Classification and properties of proteins.
- 8 Functions and uses of buffers in biological research

(3 X 5 = 15)

Part - C

Answer any **five** of the following:

- 9 Describe electro- osmotic theory.
- 10 Donnan equilibrium
- 11 Phospho lipids
- 12 Application of biotechnology in medicine.
- 13 What is southern blotting?
- 14 Amylases and invertases.
- 15 Freeze drying and its application.

(5 x 3 = 15)

Part D

Answer any **five** of the following:

- 16 What is meant by Senescence and dormancy?
- 17 What is meant by respiratory quotient?
- 18 Explain peptide linkage.
- 19 What is enzyme inhibition?
- 20 What is meant by somaclonal variation?
- 21 Explain somatic embryogenesis.
- 22 Explain electrophoresis.

(5 x 2 = 10)

Part - E

Answer any **five** of the following:

- 23 Ethylene
- 24 Iso- enzymes
- 25 Vernalization
- 26 Cybrid
- 27 Restriction endonuclease
- 28 Secondary metabolites
- 29 Glycosidic bonds.
- 30 Ultra centrifuge.

(5 x 1 = 5)

SCHEME OF EXAMINATION: Hours: 130 Max. Marks: 55						
PAPER – IV: PLANT PHYSIOLOGY, BIO CHEMISTRY, BIOTECHNOLOGY AND BIOPHYSICS						
Part no & marks	Total Questions	Questions to be attempted	Plant Physiology (60)	Bio Chemistry (30)	Bio Physics (10)	Bio Technology (30)
Part A 10 Marks	3x10=30	1x10=10	2	--	--	1
Part B 5 Marks	5x5=25	3x5=15	2	2	--	1
Part C 3 Marks	7x3=21	5x3=15	2	2	1	2
Part D 2 Marks	7x2=14	5x2=10	2	2	1	2
Part E 1Mark	8x1=8	5x1=5	3	3	1	1
Total	30	19	11	9	3	7

**FINAL YEAR B.Sc. DEGREE EXAMINATION
PART – III: PLANT SCIENCE (MAIN)**

(MODEL QUESTION PAPER)

**PAPER – V: ENVIRONMENTAL SCIENCE, MICROBIOLOGY, PLANT BREEDING
BIOMETRICS, PHYTOGEOGRAPHY AND RESEARCH METHODOLOGY**

Time: 3 Hours

Max. Marks: 55

(Draw diagrams only when specified)

Part - A

Answer any **one** of the following:

- 1 Explain the various biotic and a biotic components of an ecosystem.
- 2 Give an illustrated account of the structure and reproduction of a Bacteriophage.
- 3 Explain the causes and effect, and effective control of water pollution.

(1 x 10 =10)

Part - B

Answer any **three** of the following:

- 4 Describe the structure of a bacterial cell with a suitable diagram.

- 5 What do you mean by sustainable development?
- 6 Briefly explain the importance of mutation breeding in crop improvement.
- 7 What is chi- square test? Explain its application in biology
- 8 Explain the role of heterosis in breeding programs.

(3 x 5 = 15)

Part - CAnswer any **five** of the following:

- 9 What is the role of microbes in soil nitrogen fixation?
- 10 Explain the importance of autopolyploidy with an example.
- 11 Distinguish mass selection from pure line selection.
- 12 Give an account of the type of vegetation in India
- 13 What is meant by mega diversity? Write an example.
- 14 Write the role of mean and standard deviation in data interpretation
- 15 Briefly explain the consequences of global warming.

(5 x 3 = 15)

Part - DAnswer any **five** of the following:

- 16 Actinomycetes.
- 17 What is meant by plant introduction?
- 18 Mycoplasma.
- 19 Role of radioisotopes in environmental pollution
- 20 Acid rain and its consequences
- 21 Field experiments in research.
- 22 Frequency distribution

(5 x 2 = 10)

Part - EAnswer any **five** of the following:

- 23 Plant quarantine.
- 24 Mangroves.
- 25 Endemism.
- 26 Continental drift.
- 27 Botulism.
- 28 Latin square.
- 29 Data analysis.
- 30 Pandemic disease.

(5 x 1 = 5)

SCHEME OF EXAMINATION: Hours: 135 Max. Marks: 55								
PAPER – V: ENVIRONMENTAL SCIENCE, MICROBIOLOGY, PLANT BREEDING, BIOMETRICS, PHYTOGEOGRAPHY AND RESEARCH METHODOLOGY								
Part No & Marks	Total Questions	Questions to be attempted	Environmental Science (60)	Micro Biology (30)	Phytogeography (10)	Plant Breeding (15)	Biometrics (15)	Research Methodology (5)
Part A 10 Marks	3x10=30	1x 10=10	2	1	-	--	--	--
Part B 5 Marks	5 x 5=25	3x5=15	1	1	--	2	1	--
Part C 3 Marks	7 x 3=21	5x3=15	1	2	1	2	1	--
Part D 2 Marks	7 x 2=14	5x2=10	2	2	--	1	1	1
Part E 1Mark	8 x 1=8	5x1=5	2	2	1	1	2	--
Total	30	19	8	8	2	6	5	1

**FINAL YEAR B.Sc. DEGREE EXAMINATION
PART – III: PLANT SCIENCE (MAIN)**

(MODEL QUESTION PAPER)

PAPER – VI: CYTOLOGY AND GENETICS

Time: 3 Hours

Max. Marks: 55

(Draw diagrams only when specified)

Part - A

Answer any **one** of the following:

1. Explain the prophase I of meiosis with suitable diagrams. Add a note on its significance.
2. Describe multiple alleles with suitable examples you have studied.
3. Explain the mechanism involved in protein synthesis.

(1 x 10 = 10)

Part - B

Answer any **three** of the following:

4. What is meant by sex determination? Explain the chromosomal basis of sex determination. Describe the XX- XY mechanism of sex determination.

5. Describe the ultra structure of chloroplast. Draw suitable diagrams.
6. Explain the semi conservative model of DNA replication.
7. What is meant by gene interaction? Explain the inhibitory gene interaction in Paddy.
8. What is meant by genetic code? Explain its characteristics.

(3 x 5 = 15)

Part - CAnswer any **five** of the following:

- 9 Why Mendel selected *Pisum sativum* as his experimental material?
- 10 Explain the structure of different forms of DNA.
- 11 Explain the structure of salivary gland chromosome.
- 12 Describe the importance of cytokinesis in cell division.
- 13 Explain the importance of pedigree analysis.
- 14 Write an account of transposable genetic elements.
- 15 Describe Hardy Weinberg equilibrium.

(5 x 3 = 15)

Part - DAnswer any **five** of the following:

- 16 Explain the structure of nucleus
- 17 What is meant by linkage and crossing over?
- 18 What is meant by lethal genes?
- 19 Explain cellular oncogene
- 20 Chemical and physical mutagens.
- 21 Explain one gene one enzyme hypothesis.
- 22 Describe the law of independent assortment.

(5 x 2 = 10)

Part - EAnswer any **five** of the following:

- 23 What is the typical dihybrid test cross ratio?
- 24 What is meant by co-dominance
- 25 What is a Centromere.
- 26 Frame shift mutation
- 27 Anticodons
- 28 Lysosomes
- 29 Pleiotropism
- 30 What is meant by Teminism.

(5 x 1 = 5)

SCHEME OF EXAMINATION:		Hours: 120		Max. Marks: 55					
PAPER – VI: CYTOLOGY AND GENETICS									
Part number & marks	Questions to be attempted		Cytology 30 hours		Genetics - 90 hours				Total
					Units I to XI - 60 hours		Molecular Genetics 30 hours		
Part A 10 Marks	1 x 10 = 10		1 x 10 = 10		1 x 10 = 10		1 x 10 = 10		30
Part B 5 Marks	3 x 5 = 15		1 x 5 = 5		2 x 5 = 10		2 x 5 = 10		25
Part C 3 Marks	5 x 3 = 15		2 x 3 = 6		3 x 3 = 9		2 x 3 = 6		21
Part D 2 Marks	5 x 2 = 10		1 x 2 = 2		3 x 2 = 6		3 x 2 = 6		14
Part E 1Mark	5 x 1 = 5		2 x 1 = 2		3 x 1 = 3		3 x 1 = 3		08
Total	19	55	7	25	12	38	11	35	98

B Sc . PLANT SCIENCE PAPER I

[SECOND YEAR OF STUDY]

HORTICULTURE AND NURSERY MANAGEMENT

THEORY 120 Hours

PRACTICALS . 30 Hours

- 1) Introduction and scope of horticulture, divisions, soil preparation, soil treatment, garden tools and implements, preparation of nursery beds, organic manure and fertilizers, irrigation methods . 5 Hours.
- 2) Methods of plant propagation
 - a) Vegetative propagation-Cutting-stem cutting, root cutting, leaf cutting.
Grafting and budding-requirements for grafting, formation of graft union.
Methods of grafting-whip grafting, side grafting, wedge grafting, bark grafting, approach grafting-Advantages.
Budding-Methods of budding-T-budding, Patch budding, Top budding
Layering-Definition-uses of layering, types of layering-Tip layering, simple Layering, serpentine layering, air layering, trench layering, mound layering
Propagation by specialized stem and roots-bulbs, corms, tubers, tubercles, rhizomes and pseudo bulbs

b) Propagation by seeds-seed testing, treatments to overcome seed dormancy-seed treatments to facilitate seed germination, Protection of seeds against pathogens, growing seedlings in field nursery, indoor seedling production in containers, transplanting of seedlings. **15 Hours.**

3) Floriculture-Introduction-Garden designing, garden components-lawns, shrubs, trees flower beds, and borders, hedges, edges, drives, paths, carpet beds, garden adornments. **10 Hours**

4) Gardening-ornamental gardening, Indoor gardening, kitchen garden-water garden, green houses and rockery, Ornamentals-annuals, biennials, climbers, shrubs, trees, hedges edges. **10 Hours.**

5) Special types of garden-japanese garden, roof garden, Indoor garden, Indoor – gardening of, residential buildings **3 Hours.**

6) A general study of commercial floriculture-cultivation of rose, jasmine, chrysanthemum, aster, orchids, anthurium gladiolus-important cut flowers-flower arrangements and dry decoration-Bonsai **10 Hours**

7) Land scaping , principles of land scape designs, components of land scape designs ,lawn grass varieties, Arboriculture and role of trees in land scaping **6 Hours.**

8) Olericulture-importance of vegetables, types of vegetable growing, home gardening market gardening food value of vegetables methods of planting thinning transplanting watering, methods of fertilizer application cultivation-mulching, methods of weed control , irrigation ,role of growth regulators in vegetable production.

Control of diseases and pests –methods of control-crop rotation, field sanitation, use of Chemicals, cultivation of vegetables with special reference to tomato, bringal, bitter-Gourd, ash gourd, pumpkin. colocasia, ginger, tapioca, musa-cultivation of fruits-banana Pine apple. **16 Hours.**

9) Harvesting-storage, marketing of fruits and vegetables preservation and processing of fruits and vegetables-principles of preservation-temporary and permanent methods of preservation role of sugar and salts in preservation, thermal processing, chemical-preservation, dehydration, freezing, canning etc. **15 Hours.**

10) Growth regulators in horticulture rooting hormones, growth promoters, growth-

retarders, flower induction, parthenocarpy.

7 Hours.

11) Plant protection measures, weedicides, fungicides, pesticides. 4 Hours.

12) Nursery management lay out of nurseries, importance of nursery, propagation structures and soil mixtures, pre planting treatments, maintenance of nursery

transplantation and after care

5 Hours.

13) Plant growing structures Advantages of growing in green houses. types of roofing hot beds, cold frames.

2 Hours.

14) Media for propagation of nursery plants, characteristics of media, common media for propagation-soil, sand, peat, sphagnum moss, vermiculture soil mixture and preparation of nursery beds.

2 Hours.

15) Micro propagation of horticultural plants-Definition, application in agriculture, preparation of media, sterilization, inoculation and incubation, culturing-micro propagation of orchids.

5 Hours.

16) Mushroom cultivation

1) Introduction, Nutritional value of mushrooms.

1 Hour

Edible mushrooms and poisonous mushrooms.

2) Procedure of mushroom cultivation-Building and lay out, Composting, peak healing

Spawn and spawning-crop management, picking, gardening and packing, cultivation of White Button Mushroom (*Agaricus bisporus*) and Paddy Straw Mushroom (*Pleurotus* spp)

4 Hours.

PRACTICAL (30Hours)

1 .Preparation of potting mixture of known combination and potting in earthen pots or polythene bags.

2) Preparation of compost/ wormi compost using different substrates.

3) Plant propagation techniques budding, layering, grafting.

4) cultivation of vegetable/ornamental plant/fruit crop listed in the syllabus.

5) Preparation of Bordeaux mixture.

6) Cultivation of a vegetable or ornamental plant or fruit crop listed in syllabus.

7) Visit to a well established nursery and tissue culture laboratory.

8) Flower arrangement in different styles

- 9) Hybridization techniques.
- 10) Practical methods of mushroom cultivation.

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- 5) Peter Mc Hoy (1984) Garden Planning and Design. Blandford press, U.K
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PLANT SCIENCE PAPER II

[SECOND YEAR OF STUDY]

PLANTATION BOTANY AND CONSERVATION BIOLOGY

[Theory –120 Hours. , Practical –30Hours.]

- 1 . Importance of plantation crops and spices on the economy of India 2 Hours.
- 2 .Present status of plantation crops and spices in kerala 2 Hours.
- 3 .Study of the plantation crops and spices mentioned below in relation to the following aspects-importance,origin,distribution,morphology,taxonomy,floral biology, morphology and biochemistry of the useful parts:- tea,coffee,rubber,coconut, arecanut,cashew,pepper,turmeric and cardamom 20 Hours.
- 4 .A detailed study of crop propagation and importance of the above crops with special reference to:-

- a) Improved methods of propagation-budding- grafting, layering
- b) In vivo and in vitro methods of rapid multiplication
- c) Nursery practices-production of planting materials
- d) plant introduction and selection techniques
- e) hybridization techniques-distant hybridization-sterility and incompatibility systems-parasexual hybridization
- f) polyploidy and mutation breeding
- g) breeding for resistance to pests,diseases and stress
- h) quality breeding
- genetic improvement of crops by biotechnology. **20 Hour**
5. A detailed study of the-agronomic practices of the crops mentioned with special reference to:-
- a)soil and climate
- b)land preparation and planting techniques
- c)organic manure-green manure,compost,farmyard manure
- d)macro and micro nutrient-management offertilisers
- e)chemical fertilizers-nitrogen,potassium and phosphorus
- f) growth regulators-natural,synthetic
- g)irrigation and fertigation
- h)stress and stress resistance
- i)inter cropping and mixed cropping
- j)integrated crop management and biofarming **20 Hours.**
6. Study of the symptoms,etiology,crop loss and management of the major pests and fungal diseases of crops mentioned earlier **10 Hours.**
- 7 .Detailed study of major plant protactants-fungicides,bactericides,pesticides andherbicides **5 Hours.**
- 8 .biological control of pests and diseases **2 Hours.**
- 9 .traditional diseases management strategies **2 Hours.**
- 10 Integratedpest and disease management **2 Hours.**
- 11 .Study of the harvesting,storage,processing and marketing of the economically important products of the crops mentioned earlier **10 Hours.**
- 12 .Seed certification agencies-procedure of seed testing **1 Hour.**

- 13 Conservation biology: problems of conservation – causes of threat to the environment-human interference-deforestation-over exploitation of resources-habitat destruction-pollution-(with reference to kerala) **10 Hours.**
- 14 .conservation of genetic resources-Gene pools-role of botanic gardens-conservation and patenting of life forms-conservation and socio-economic problems. **4 Hours.**
- 15 Management of ecosystems-strategies for various ecosystems -grass land,wet land,coastal forest,mountain-problems of coastal ecosystems and coastal zone management-Eco tourism and its implications. **10 Hours.**

PRACTICAL (30 Hours.)

- 1) Collection, identification and submission of herbarium specimens of the crops mentioned in the syllabus.
 - 2) Field observations on the floral biology of the crops
 - 3) Study of different breeding techniques in plantation crop and spices by visiting- major research stations.
 - 4) Study and identification of improved varieties of crops mentioned in the syllabus.
 - 5) Collection identification and submission of common diseases of the crop plants.
 - 6) Visit to plantations to study harvesting and processing techniques of major crops and spices (field visit under the supervision of teachers)
7. Familiarization with agronomic practices of any two crops.
8. Study the effect of different pollutants on vegetation in an eco fragile area.

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**PLANT SCIENCE PAPERS - SCHEME OF EXAMINATIONS
THEORY [SECOND YEAR OF STUDY]**

	Duration	Internal	External	Total marks
Plant Science Paper I				
Horticulture & Nursery				
Management	3 Hours..	10	60	70
Plant Science paper I I				
Plantation Botany and				
Conservation biology				
	3 Hours.	10	60	70
Total		20	120	140

Practical [Only at the end of Third Year of Study]

Practical Paper IV	3 ,,	20	40	60
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Internal Assessment

Record	10	Marks
Herbarium	5	Marks,

Attendance	2	Marks
Regularity	1	Mark
Performance in Practical	2	Marks

[Total –140 +60 = 200 marks.]

A field study of at least 3 days for Plant Science may be conducted on the II year of study.

A report on field study & visit to a research station may be submitted for internal assessment.

Herbarium ,on Pest &diseases, Crop Plants , may be submitted for internal assessment [15 Nos:]

Eligibility to appear practical exam:

Record, Field study report & Herbarium may be produced for verification on fifth day of prl: exams along with practical paper IV.

SECOND YEAR B.Sc.DEGREE EXAMINATION

PARTIII Plant science (Main)

SPECIAL PAPER – I: HORTICULTURE AND NURSERY MANAGEMENT. (MODEL QUESTION PAPER)

Time: 3 Hours

Max. Marks: 60

(Draw diagrams only when specified)

Part - A

Answer any **one** of the following:

- 1 Give an account of micro propagation. Explain its significance to horticulture.
- 2 Explain the methods of vegetative propagation practiced in horticulture.
- 3 Give a general account of commercial floriculture.

(1 x 10 = 10)

Part - B

Answer any **three** of the following:

- 4 Explain the different methods of preservation and processing of fruits and vegetables.
- 5 Explain the process of paddy straw mushroom cultivation.
- 6 Plant growing structures.
- 7 Principal and practice of landscaping.
- 8 Explain the plant protection measures in horticulture.

(3 x 5 = 15)

Part – C

Answer any **five** of the following:

- 9 Role of growth regulators in vegetable production
- 10 Nutritional value of mushrooms
- 11 Rockery.
- 12 Management of house garden.
- 13 Anthurium cultivation
- 14 Garden adornments.
- 15 Importance of nursery.

(5 x 3 = 15)

Part - D

Answer any **five** of the following:

- 16 Bonsai production
- 17 Canning
- 18 The scope of horticulture
- 19 Hot beds
- 20 Poisonous mushrooms.
- 21 Role of sugar in preservation
- 22 Parthenocarpy.
- 23 Vermiculture
- 24 Indoor gardening.

(5 x 2 = 10)

Part - E

Answer any **ten** of the following:

- 25 Organic farming
- 26 Sphagnum moss.
- 27 Kitchen garden.
- 28 Embryoid
- 29 Focalization
- 30 Rakes.
- 31 Drip irrigation.
- 32 Scion
- 33 Bordeaux mixture.
- 34 Arboriculture.
- 35 Water garden.
- 36 Air layering

(10 x 1 = 10)

SCHEME OF QUESTION PAPER – PLANT SCIENCE: PAPER-I

PART.NO. & MARKS.	HORTI CULTURE 60 HOURS	NURSERY MANAGEMENT 30 HOURS	OLERICULTURE. 30 HOURS	TOTAL	QUESTIONS TO BE ANSWERED.	TOTAL MARKS.
Part A 1 x 10 = 10	2 questions	1 question	--	3 questions	1 only.	30
Part B 3 x 5 = 15	2 questions.	2 questions	1 question.	5 questions	3 only.	25
Part C 5 x 3 = 15	3 questions.	3 questions.	1 question	7 questions.	5 only.	21
Part D 5 x 2 = 10	4 questions.	3 questions.	2 questions	9 questions.	5 only	18
Part E 10 x 1 = 10	6 questions	4 questions	2 questions	12 questions	10 only.	12
Total 60	17	13	6	36	24	106

SECOND YEAR B.Sc.DEGREE EXAMINATION
PART III Plant science (MAIN)
SPECIAL PAPER – II: PLANTATION BOTANY AND CONSERVATION BIOLOGY
(MODEL QUESTION PAPER)

Time: 3 Hours

Max. Marks: 60

(Draw diagrams only when specified)

Part – A

Answer any **one** of the following:

1. Define conservation. Give an account of the present status and causes of deforestation of Kerala.
2. Justify the statement that “Tissue cultural technique is considered as an essential component of modern plant improvement programmers”
3. Write an account of the cultivation aspects of Cardamom Describe the morphological character of Cardamom plant including floral characters.

(1 x 10 = 10)

Part - B

Answer any **three** of the following:

4. Explain the economic status and future prospects of Turmeric.
5. Briefly describe the nursery management and cultivation of Rubber
6. Explain the budding technique with suitable diagrams.
7. What is meant by bulk method of selection? What is its merit and demerits?
8. What are the seed treatment methods? How seed testing can be done?

(3 x 5 = 15)

Part - C

Answer any **five** of the following:

9. Explain the genetic basis of sterility in plants.
10. What is seed bank?
11. What is Bordeaux mixture? Write its composition
12. Describe the symptoms of “abnormal leaf fall of Rubber”
13. What are the important techniques of irrigation?
14. Name any three synthetic plant growth regulators
15. What are the patenting rules?

(5 x 3 = 15)

Part - D

Answer any **five** of the following:

16. Crop pattern in high ranges of Kerala
17. Floral biology of Cashew
18. Eco tourism and impact on environment
19. What are synthetic fungicides?
20. What is the necessity of plant introduction?
21. Harvesting and post harvesting practices of Turmeric.
22. Ex-situ conservation.
23. What are the commercial uses of Gibberellins?
24. Mutation breeding.

(5 x 2 = 10)

Part - E

Answer any **ten** of the following:

25. Name the useful part of Areca nut
26. Give the Botanical name of any two beverage crops.
27. Name the pollinating agent in Pepper.
28. What is meant by crop rotation?
29. Pot mixture.
30. N.P.K. mixture.
31. Name the causal organism of “wilt disease of Coconut”
32. Expand T.B.G.R.I
33. Name any two air pollutants’.
34. Give one example to genetically modified plant
35. What is I.A.A.?
36. What are micro nutrients?

(1 x 10 =10)

SCHEME OF QUESTION PAPER – PLANT SCIENCE: PAPER-II				
Part No. & Marks	Questions to be Attempted	Plantation Botany.	Conservation Biology.	Total
Par A. 3x 10	1 x 10 =10	2	1	3
Part B 5x 5	3 x 5 =15	3	2	5
Part C 7x 3	5 x 3 =15	4	3	7
Part D 9x 2	5 x 2 =10	5	4	9
Part E 12x 1	10 x 1 =10	6	6	12
Total	24 60	20	16	36

**FINAL YEAR B. Sc DEGREE EXAMINATION.
PLANT SCIENCE (MAIN) PRACTICAL EXAMINATION.
MODEL QUESTION PAPER.**

PAPER I

Time: Three hours.

Maximum 45 marks.

**PHYCOLOGY, MYCOLOGY, LICHENOLOGY, BRYOPHYTA, PTERIDOPHYTA
MICROBIOLOGY, PALAEO BOTANY AND PLANT PATHOLOGY.**

- 1 Make suitable micro preparation to bring out the structure of **A, B, C**.
Draw a cellular diagram of each and label the parts. Identify giving the reasons and leave the preparation for valuation.
Preparation – (3 marks), Diagram-(1 mark), Reasons-(2 marks).
Identification (1 mark).
(3 x 7 = 21 marks.)
- 2 Perform the gram staining of bacterial solution **D**.
Write the procedure. Show the result.
Procedure-(1 mark). Result-(3 marks.).
(4 marks)
- 3 Identify **E** giving important features. Draw a neat labeled diagram.
Identification with reasons - (2 marks). Labeled diagram- (2 marks).
(4 marks).
- 4 Identify the disease **F**. Name the pathogen. Give the important symptoms.
Disease – (1/2 marks). Pathogen- (1/2 marks). Symptoms-(2 marks).
(3 marks)
- 5 Identify **G, H, I** and **J** giving four important reasons.
Identification – (½ marks). Reasons (1 ½ marks).
(4X2= 8 marks)
- 6 Spot at sight **K, L, M, N, and O**.
(1 x 5= 5 marks)

Key to the specimen

- 1 A, B, C---Specimens from Thallophyta, Bryophyta and Pteridophyta.
- 2 D-Bacterial solution.
- 3 E- Fossil type mentioned in the syllabus.
- 4 F- Plant disease mentioned in the syllabus.
- 5 G and H Fungi or Lichen I- Bryophyta. J- Pteridophyta.
- 6 K,L,M. Thallophyta N- Bryophyta. O- Pteridophyta

PAPER II**ANGIOSPERMANATOMY, ANGIOSPERM MORPHOLOGY, SYSTEMATIC BOTANY,
APPLIED BOTANY, AND REPRODUCTIVE BOTANY.**

Time: 3.hours.

Maximum: 45 marks.

1. Take a T.S of **A** stain and mount in glycerin, Draw a cellular diagram of a portion enlarged. Label the parts and identify giving reasons. Leave the preparation for valuation. Preparation- (5 marks). Labeled diagram (2 marks). Identification (1 Mark). Reasons (2 marks).
(10 marks).
2. Refer specimen B and C to their respective families. Give the systematic position. Point out the important characters of identification. Family. (½ mark). Systematic position (½ mark). Identifying characters (5 . marks).
(2 x 6= 12 marks).
3. Take a V.S of D .Report for valuation. Draw. its V.S, label the parts. Draw its floral diagram and represent the floral formula. Flower V.S (I mark). Labeled diagram (2 marks). Floral diagram (1½marks). Floral formula (½mark).
(5 marks)
4. Identify and write the morphological importance of E
(2 marks).
5. Write the anatomical features of F.
(2 marks).
6. Give the binomial, family, and exact morphology of useful part of **G, H** and **I**. Binomial (1mark) Family (½ mark), Morphology(½mark)
(2 x 3= 6 marks).
7. Identify and draw a labeled diagram of **J**. Point out its embryological features. Identification (1 mark) .Diagram (1½mark). Features (1 ½ marks)
(4 marks).
8. Spot at sight. **K** and **L**.
(1 x 2= 2 marks)
9. Give the botanical name and family of **M** and **N**. Botanical name (½mark). Family (½ mark)
(1 x 2= 2 marks).

KEY TO SPECIMENS

1. A- Anatomy-Stem or root as per syllabus.
2. B -and C -.Plants / twigs with flowers and buds from dicotyledons families as per syllabus
3. D. Flowering twigs from any of the families as per syllabus.
4. E.- Inflorescence, fruit or placentation types.
5. F-. Any anatomy material as per syllabus.
6. G-H and I – direct products as per syllabus
7. J- Anther T.S. Dicot and monocot embryo. Mature 8 nucleated embryo sac.
8. K and L Campus plants strictly from campus it self
9. M and N. Verify the herbarium sheets (30 numbers). Select two.

PAPER III**GYMNOSPERMS, PLANT PHYSIOLOGY, BIOCHEMISTRY, ENVIRONMENTAL SCIENCE, CYTOLOGY AND GENETICS.**

Time: 3 hours.

Maximum: 45marks.

- 1 Make a properly stained micro preparation of **A**. Draw a labeled cellular diagram and identify giving reasons. Leave the preparation for valuation. Preparation (3 marks). Labeled diagram (1½ marks). Identification (½ marks) .Reasons (1 mark).
(6 marks).
- 2 Prepare an aceto carmine squash of **B**. Identify **two** clear stages of mitotic division. Draw a labeled diagram of each stage and report for valuation Preparation (1 mark). Stages (2 marks). Labeled diagram (1 mark).
(2 x 4 = 8 marks).
- 3 Analyze qualitatively and identify **C**. Write the procedure. Procedure (2 marks). General and confirmatory test (2 marks)
(4 marks).
- 4 Name the ecological group in which **D** belongs . Comment on their adaptations. Ecological group (1 mark). Adaptations (2 marks).
(3 marks).
- 5 Explain the working of the experiment **E**. Draw a labeled diagram. Write the precaution to be taken. Aim (1mark).Requirements (½marks).Working (2 ½ marks). Observation and inference (1 mark). Precaution (1 mark)
(6 marks).
- 6 Spot at sight. **F, G and H**.
(1 x 3 =3 marks)
- 7 Work out the problems **I and J**.
(10 + 5 = 15 marks)

Key to specimen.

- 1 A Gymnosperm specimen mentioned in the syllabus.
- 2 B Onion root tip.
- 3 C Biochemistry Material
- 4 D Ecology specimen entire of section.
- 5 E Experiment
- 6 F Gymnosperm specimen.
G Gymnosperm specimen
H Physiology apparatus
- 7 I- Problems Dihybrid cross, Incomplete dominance and Linkage.
J Modified Mendelian ratios (Interaction)(2 problems only)

B. Sc Plant Science (Main)

Practical paper IV— Model question paper

**Horticulture, nursery management and Plantation Botany
and conservation biology**

Time 3 hours

Maximum 40 Marks

- I From the given material **A** Conduct the process of budding.
Write the procedure. Procedure 2 marks, conducting 3 marks
(5 marks)
- 2 From the given material **B** conduct the process of grafting
Write the procedure. Procedure 2 marks, conducting 3 marks
(5marks)
- 3 From the given material **C** conduct the process of air layering
Write the procedure. Procedure 2 marks, conducting 3 marks
(5marks)
- 4 From the given material **D** conduct the process of Hybridization
Write the procedure. Procedure 2 marks, conducting 3 marks
(5 marks)
- 5 Identify the disease **E** and **F** name the pathogen, mention any 2
Important symptoms, write any two control measures.
Disease I mark, pathogen I mark, 2 important symptoms I mark
2 control measures I mark
(2 x 4= 8 marks)
- 6 Identify the crop **G** and **H**. Write its binomial. and family
Family I mark. Binomial I mark.
(2 x 2 = 4 marks)
- 7 Write the floral morphology of the given flower **I**
Floral morphology 2 marks
(2 marks)
- 8 Write the process of harvesting and processing of **J**.
(2+2 = 4 marks)
- 9 Spot at sight. **K** and **L**. Write the binomial
Binomial I mark (2 x 1 =2)

Specimen key

- 1 material **A** for budding - T budding
- 2 Material **B** for grafting-Tongue grafting
- 3 Material **C** for layering—Air layering
- 4 Material **D** for hybridization Crotalaria, Cassia etc
- 5 Material **E** and **F** pathology specimens mentioned in the syllabus
- 6 **G** and **H**. Any two plantation crop mentioned in the syllabus
- 7 Floral morphology of **I**. Flower of any plantation crop mentioned in the syllabus.
(Other than G and H)
- 8 Any plantation crop mentioned in the syllabus **J**.
- 9 Specimens from olericulture **K** and **L**

Sd/-
K.S. Prasannakumar , Chairman,
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