

## **SYLLABUS OF BOTANY**

### **Botany B.Sc. Part-I**

Effective from session 2009-2010

There shall be three papers and a practical examination as follows:

Paper-I	Bacteria, Viruses and Fungi	45 Marks
Paper-II	Algae and Bryophytes	45 Marks
Paper-III	Pteridophytes, Gymnosperms and Elementary Pale botany	45 Marks
Practical		65 Marks

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**Total**

**200 Marks**

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### **Paper-I**

#### **Bacteria, Viruses and Fungi**

##### **Section-A (Bacteria)**

- a) **Bacteria:** Their fine structure, nutrition, reproduction, classification and economic importance.
- b) **Plant Virus:** General symptoms, transmission, Structure of TMV and its replication.
- c) **Lichen:** Structure, nutrition, reproduction and economic importance.

##### **Section-B (Fungi)**

- a) Classification as given by Alexopoulos (1962).
- b) Habit and habitat, structure, reproduction, mode of nutrition and economic importance of Fungi. Important features in the life-history of: Saprolegnia, Albugo, Peziza, Eurotium, Ustilago, Puccinia, Agaricus, Colletotrichum and Alternaria (Developmental details are not required).

### **Paper-II**

#### **Algae and Bryophytes**

##### **Section-A (Algae)**

- a) Classification as given by G.M. Smith (1955).
- b) Habit and habitat, structure of thallus, reproduction and economic importance.
- c) Important features in the life-history of: Oscillatoria, Gloeotrichia, Scytonema, Chlamydomonas, Volvox, Oedogonium, Vaucheria, Chara, Sargassum, Ectocarpus, Batrachospermum. (Developmental details are not required).

##### **Section-B (Bryophytes)**

- a) General classification.
- b) Habit and habitat, range of structure of gametophyte and sporophyte, Important features in the life-history of: Riccia, Marchantia, Pellia, Porella, Anthoceros, Sphagnum, Pogonatum. (Developmental details are not required)

### **Paper-III**

#### **Pteridophytes, Gymnosperms and Elementary Pale Botany**

##### **Section-A**

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Classification as given by K.R. Sporne. Range of structure of sporophyte and gametophyte. Important feature in the life-history of: Rhynia, Lycopodium, Selaginella, Equisetum, Marsilea. (Developmental details are not required)

### Section-B (Gymnosperms and Elementary Paleobotany)

- Classification of Gymnosperms up order as given by D.D. Pant (1957).
- Morphology and life-history including Development of: Cycas and Pinus.
- Introduction to Pale botany: Geological cras: Processes of fossilization and types of fossils. Method of study of fossils.

### Practical Examination

Duration of Examination: 4.30 hrs.

The Practical Examination will comprise:

- |    |   |          |
|----|---|----------|
| 1- | Preparation of double stained T.L. and L.S. of a pteridophyte or a gymnosperm material. Mounting to be done in glycerin | 14 Marks |
| 2- | Suitable minor preparation of a Pteridophyte or Gymnosperm not given in Question I                                      | 06 Marks |
| 3- | Minor preparation of an Alga  | 06 Marks |
| 4- | Minor preparation of a Bryophyte  | 07 Marks |
| 5- | Minor preparation of a Fungus   | 06 Marks |
| 6- | Eight Spot representing various groups  | 16 Marks |
| 7- | Viva-voce   | 05 Marks |
| 8- | Class record and collection (2+3)   | 05 Marks |

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**Total**

**65 Marks**

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### Botany B.Sc. Part-II

Effective from session 2009-2010

There shall be three papers and a practical examination as follows:

Paper-I	Angiosperms and Economics Botany	45 Marks
Paper-II	Ecology and Genetics	45 Marks
Paper-III	Plant physiology and Plant Biochemistry	45 Marks
Practical		65 Marks

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**Total**

**200 Marks**

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### Paper-I

#### Angiosperms and Economic Botany

### Section-A (Taxonomy)

- Study of Bentham and Hooker's system of classification.
- A detail study of the following families: Ranunculaceae, Cucurbitaceae, Asteraceae, Scrophulariaceae, Lamiaceae, Euphorbiaceae, Palmae and Poaceae.

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- c) A knowledge of the distinguishing features of the following families: Papaveraceae, Brassicaceae, Capparidaceae, Caryophyllaceae, Malvaceae, Rutaceae, Acanthaceae, Verbenaceae, Apocynaceae, Rubiaceae, Asclepiadaceae, Amaranthaceae, Liliaceae and Musaceae.

### Section-B (Anatomy, Embryology and Economic Botany)

- a) **Anatomy:** Anatomical anomalies and ecological variations in the primary structure of stems; Anomalous secondary growth, Distribution of mechanical tissues in plants.
- b) **Embryology:** The Microsporangium, Megasporangium, Female Gametophyte, Male Gametophyte, Fertilization, Endosperms, Embryo, Fertilization and Seed formation, Practical applications of experimental embryology.
- c) **Economic Botany:** Botanical name, Family, Part used, mode of extraction, nature and economic importance of plants in relation to the following: **Timber-** Teak, Sal, Sheesham, Pine; **Fiber-** Cotton, Jute, Sunn hemp, Coir; **Oil-** Mustard, Castor, Groundnut, Coconut; **Medicine-** Rauwolfia, Opium; **Biodiesel-** Jatropha.

### Paper-II

#### Ecology and Genetics

##### Section-A (Ecology)

- a) Introduction and scope of ecology, Environmental and ecological factors; Comparative morphology of xerophytes, hydrophytes and epiphytes.
- b) Brief idea of population and community, Ecological succession, Concept of climax.
- c) Concept of ecosystem: Trophic structure of community and interaction of organisms.
- d) Energy flow through the ecosystem; Cycling of carbon and nitrogen.
- e) Brief idea of B.O.D. and biological magnification.

##### Section-B (Genetics)

Cellular and sub-cellular structure; Morphology of Chromosomes, cell division; Pre-Mendelian concept of heredity; Mendelism; Intraction of genes; Linkage and Crossing over; Chromosomal aberration; Polyploidy and Mutation; Sex linked inheritance; Determination of sex; Cytoplasmic inheritance; Gene concept: Muton, Recon and Cistron; Chemistry of nucleus including chromosomes.

### Paper-III

#### Plant Physiology and Plant Biochemistry

##### Section-A (Plant Physiology)

- a) Soil-water in relation to Plants: Water potential of a cell; diffusion, permeability, wilting; Free and bound water; Absorption and loss of water in plants.
- b) Soil-minerals in relation to Plants: Micro and macronutrients and their absorption; Deficiency symptoms; Translocation of solutes and assimilates.
- c) Photosynthesis: Mechanisms of the light reaction; C-reduction in C<sub>3</sub> and C<sub>4</sub> plants; Factors affecting photosynthesis.
- d) Respiration: Mechanisms of anaerobic, aerobic and photo-respiration; Respiratory quotients; Factors governing respiration.
- e) Fat Metabolism: Structure and properties of fats and fatty acids, their synthesis and break down.
- f) Growth: Elementary idea of growth regulators, their structure and role in plant growth; photoperiodism; Vernalization.

##### Section-B (Plant Biochemistry)

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- Proteins: Chemical composition; Primary, Secondary and Tertiary structure of proteins; Biological significance of proteins; Mechanism of protein synthesis.
- Carbohydrate: General account of monosachharides, disachharides and polysachharides; structure and properties of ribose, deoxy-ribose, glucose, fructose, sucrose, maltose, starch and cellulose.
- Nucleic acids: Chemical composition; Structure of DNA and RNA; Biological significance.
- Enzymes: Structure; General properties; Nomenclature; Mechanism of enzymatic reaction.
- Vitamins: Type and their role in plant metabolism.

### Practical Examination

Duration of Examination: 4.30 hrs.

The Practical Examination will comprise:

- An angiospermic specimen for anatomical study with double staining. Mounting to be done in glycerine. 08 Marks
- (a) Description in semi-technical language of one plant belonging to families prescribed and referring it to its family giving reasons 06 Marks  
(b) Comparative study of floral parts of two plants belonging to the families prescribed 04 Marks
- To make squash preparation of the material provided and to show stages of mitotic division 05 Marks
- To answer five question about one plant physiology experiment (From list-A) 05 Marks
- To perform one plant physiology/plant biochemistry experiment (From list-B) 07 Marks
- Common on ecological anatomy of the material provided (*Casuarina young stem, Leaves of Typha, Nerium, Eichhornia, grass*) 04 Marks
- Eight spots including items of Economics Botany 16 Marks
- Viva-voce 05 Marks
- Class record and collection (3+2) 05 Marks

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**Total**

**65 Marks**

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### List-A

#### Plant Physiology Experiments for Demonstration:

- To demonstrate osmosis using egg membrane,
- To demonstrate root pressure in plants,
- To demonstrate transpiration,
- To demonstrate that O<sub>2</sub> is evolved during photosynthesis,
- To demonstrate that light and CO<sub>2</sub> are necessary for photosynthesis,
- To demonstrate anaerobic respiration in germinating seeds,
- To demonstrate the process of fermentation,
- To demonstrate respiration in aerial parts of plants,
- To demonstrate continuity of vessels in *Tinospora* stem.
- To demonstrate continuity of intercellular spaces in *Nymphaea* petiole.

**N.B. These experiments may be modified in the examination.**

### List-B

**Plant physiology/Biochemistry Experiments: To be performed by students.**

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- 1- To determine the osmotic concentration of plant cell sap by plasmolytic method using leaves of *Tradeseantia/Rhoeo*,
- 2- To measure the rate of transpiration per unit leaf area by photometer,
- 3- To compare the differential rate of transpiration of the sides of a leaf by cobalt chloride method,
- 4- To study the structure of stomata and the stomatal movement due to osmotic changes,
- 5- To measure the size and frequency of stomata in a mesophytic leaf,
- 6- To determine transpiration/absorption ratio in plants,
- 7- To test the presence of PO<sub>4</sub> and iron in given plant tissue,
- 8- To measure the effect of substrate concentration on the activity of the enzyme catalase extracted from potato or cabbage by paper disc method,
- 9- To extract and test reducing sugars and proteins in a given plant material.
- 10- To separate plant pigments by paper chromatography,
- 11- To separate amino acids by one dimensional paper chromatography from a given mixture of two or three amino acids and out the Rf value,
- 12- To study the structure of starch grain in potato and rice,
- 13- To determine pH by paper strip and its confirmation by pH meter.

### Botany B.Sc. Part-III

Effective from session 2009-2010

There shall be three papers and a practical examination as follows:

Paper-I	Microbiology and Plant Pathology	50 Marks
Paper-II	Experimental Embryology and Marphogenesis	50 Marks
Paper-III	Soil Science, Environmental Pollution and Conservation	50 Marks
Paper-IV	Molecular Genetics and Biotechnology	50 Marks
Practical		100 Marks

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**Total**

**300 Marks**

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#### **Paper-I**

#### **Microbiology and Plant Pathology**

##### **Section-A (Microbiology)**

- a) History and scope of Microbiology.
- b) Types of Micro-organisms.
- c) Method of Isolation and Culturing of Micro-organisms; Micrometry.
- d) Nutrition of Micro-organisms: Chemoautotrophism, Photoautotrophism, Saprotrophism, Paratrophism.
- e) Elementary idea of Microbiology of soil, water and air.
- f) Application of Microbiology in Dairy, Bakery, Brewing and Medicine.

##### **Section-B (Plant Pathology)**

- a) General principles of plant pathology with special reference to symptoms of plant disease; Mode of infection; Disease resistance; Method of control of plant diseases.
- b) Study of symptoms disease cycle and control of the following plant diseases: linseed rust, late blight of potato, tikka disease of groundnut, yellow vein mosaic, bacterial blight of rice, little leaf of Brinjal, wilt of chick pea.

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### **Paper-II**

#### **Experimental Embryology, Morphogenesis and Elementary Biostatistics**

##### **Section-A (Experimental Embryology)**

- In-vitro culture technique: General principles, nutrition and hormonal requirement of excised plant parts; Sterilization; Inoculation; Maintenance of culture; Murashige and Skoog's medium for in-vitro culture.
- Elementary idea of control of fertilization sexual incompatibility and induced parthenocarpy.
- Application of experimental embryology with special reference to another and embryo culture.
- Protoplast culture; Somatic hybridization; Cell culture for metabolite production.

##### **Section-B (Morphogenesis)**

- Aims and scope of plant morphogenesis: Method of morphogenetic study.
- Characteristic feature and measurement of plant growth.
- Elementary idea of morphogenetic phenomena: Polarity; Correlation; Symmetry; Differentiation; Totipotency of plant cell.
- Photomorphogenesis: Role of light as a morphogenesis factor.

##### **Section-C (Elementary Biostatistics)**

- Introduction and Definition of Biostatistics.
- Application of biostatistics in Biology.
- Measures of Central Tendency: Mean Median and Mode.
- Measures of dispersal: Standard Deviation, Standard Error.

### **Paper-III**

#### **Soil Science, Environmental Population and Conservation**

##### **Section-A (Soil Science)**

Lithosphere, Soil forming rocks and minerals, Weathering of parent rocks: Major processes of soil formation, Different types of soil degradation; Soil conservation and reclamation problem of soil.

##### **Section-B (Environmental Population)**

Earth environmental Biosphere: Atmospheric pollution; CO<sub>2</sub> and ecosystems; Ozone depletion; Water pollution; BOD; eutrophication; Pesticides Pollution; Radioactive pollution. Problem of soil waters, Monitoring and control of pollution; Recycle of wastes and technological fix.

##### **Section-C (Conservation)**

Bioethics and conservation, Ecology vs. Economy; Natural resources; Major India biomass; Conservation of renewable resources; Causes of extinction, Endangered Indian flora; Natural reserves and Germ plasma bank.

### **Paper-IV**

#### **Molecular Genetics and Biotechnology**

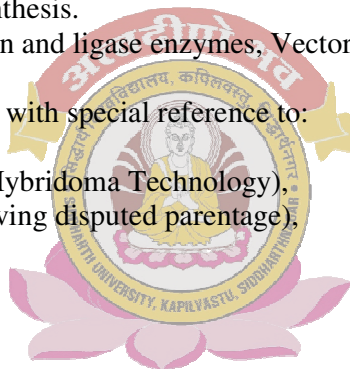
- Definition, origin, history and scope of molecular genetics and biotechnology.
- Nucleic acids as genetic material, Structure and replication of nucleic acids. Different forms of DNA and RNA.
- Genetic code, its properties. Initiation and termination co-dons.
- Gene expression: Brief idea of mechanisms of transcription and translation in prokaryotes.



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- 5- Regulation of gene expression: Operon concept, Lactose operon.
- 6- Chemical method of gene synthesis.
- 7- Recombinant DNA, restriction and ligase enzymes, Vectors viz., plasmids bacteriophages and cosmids, gene cloning.
- 8- Application of biotechnology with special reference to:
  - a) Synthesis of hormone,
  - b) Monoclonal antibodies (Hybridoma Technology),
  - c) DNA finger printing (Solving disputed parentage),
  - d) Transgenic plants.



### Practical-I Examination

Duration of Examination: 5 hrs.

Maximum Marks of Examination: 50 Marks

The Practical Examination will comprise:

- 1- Experiments:
  - (a) Perform the given microbiology experiment. Write procedure, observations and make suitable diagrams. Comment upon features of special interest 10 Marks
  - (b) Make temporary stained preparation of pathology material provided draw well labeled diagrams and identify the pathogen giving reasons, Comment up to the host pathogen relationship 10 Marks
  - (c) Perform the given experimental embryology morphogenesis experiment 05 Marks
- 2- Comment upon spots 1-5 10 Marks
- 3- Viva-voce 05 Marks
- 4- Class record 10 Marks

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**Total** **50 Marks**

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### Practical-II Examination

Duration of Examination: 5 hrs.

Maximum Marks of Examination: 50 Marks

The Practical Examination will comprise:

- 1- Experiments:
  - (a) Perform the given soil science/environmental pollution experiment. Write theory, procedure, observations and inference drawn 10 Marks
  - (b) Perform the given molecular genetics/biotechnology experiment. Write theory, procedure, observations and conclusions drawn 10 Marks
- 2- Comment upon spots 1-6 15 Marks
- 3- Viva-voce 05 Marks
- 4- Class record 10 Marks

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**Total** **50 Marks**

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### LIST OF EXPERIMENTS

#### A- Microbiology:

- 1- Demonstration of preparation of Czapek's Dox medium and potato dextrose agar medium, sterilization of culture medium and pouring;

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- 2- Inoculation in culture tubes and Petri-plates;
- 3- Gram staining of Bacteria;
- 4- Use of ocular and stage micrometer for measuring microbes;
- 5- Microscopic examination of milk and curd;
- 6- Isolation of micro-organisms from natural sources soil, water and air.

**B- Plant Pathology:**

- 1- Study of plant disease listed in the theory paper.

**C- Experimental Embryology and Morphogenesis:**

- 1- Demonstration of preparation of Murashige and Skoog's medium pouring in culture tubes and sterilization;
- 2- Inoculation of excised plant tissue in culture tissue;
- 3- Demonstration of callus from culture plant tissue;
- 4- Isolation of embryo from the given seed and its inoculation in culture tubes;
- 5- Identification of anthers containing immature spores by squash preparations.
- 6- Demonstration of apical dominance;
- 7- Plotting a sigmoid growth curve from the given data about diameter of Cucurbita fruit on different days;
- 8- Test for cell viability using TTC/Evan's blue.

**D- Soil Science, Environmental pollution and conservation exercises:**

- 1- Study of physical characteristics of soil- texture, colour etc.
- 2- Study of chemical properties of soil- Acidity, Alkalinity. Cation- exchange capacity.

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