4. BOTANY

Scheme

Min. Pass Marks: 36		Max Marks: 100
Paper I	3 hrs. Duration	Max. Marks 33
Paper II	3 hrs. Duration	Max. Marks 33
Paper III	3 hrs. Duration	Max. Marks 34
Practical Min. Marks: 18	4 hrs, duration	Max. Marks 50

Duration of examination of each theory paper- 3 hours
Duration of examination of practical's- 4 hours

Note:

1. There will be 5 questions in each paper. All questions are compulsory. Candidate has to answer all questions in the main answer book only.
2. Q. No. 1 will have 18 very short answer type Questions (not more than 20 words) of half marks each covering entire syllabus.
3. Each paper is divided into four units. There will be one question from each unit. These Q. No. 2 to 5 will have internal choice.

Paper-I
Cell Biology, Genetics and Plant Breeding
(2 hrs /week)
Unit-1

Cell organelles and Nuclear material: Ultrastructures and functions of different cell organelles (cell wall, plasma membrane, nucleus, mitochondria, chloroplast, ribosome, peroxisomes, Lysosome, Golgi bodies and Endoplasmic Reticulum). Chromatin structure & Chromosome organization: eukaryotic and prokaryotic. Chromosome morphology; specialized types of chromosomes (Sex chromosomes, lampbrush Chromosome, Polytene chromosome); transposons.

Unit-2

Cell divisions: Cell cycle, mitosis: stages, structure and functions of spindle apparatus; anaphasic chromosome movement; Meiosis: its different stages- Meiosis I, Meiosis II, synaptonemal complex, chiasmata formation and crossing over.

Basis of genetic material: Griffith's transformation experiment and The Hershey and Chase blender experiment to demonstrate DNA as the genetic material. **Concept of Gene**: *Neurospora* genetics: one gene one enzyme hypothesis;
An idea about Prokaryotic and eukaryotic structure of gene – operon concept, exons and introns.

Extra nuclear genome: mitochondrial and Chloroplast genome, plasmids;
Chromosomal aberrations: Deletion, duplication, translocation, inversion, Aneuploidy and polyploidy.

Unit-3

Genetic inheritance: Mendel's laws of inheritance and their exceptions; allelic (incomplete and co-dominance, lethality) and non-allelic interactions (complementary genes, epistasis and duplicate genes). Quantitative inheritance : grain color in wheat, corolla length in *Nicotiana tabacum*.
Cytoplasmic inheritance-maternal influence, shell coiling in snails, Kappa particles in *Paramaecium*, Multiple allelism : ABO blood groups in men

Unit-4

Plant Breeding : Introduction and objectives of plant breeding; general methods of plant breeding- in self-pollinated, cross-pollinated and vegetatively propagated crop plants :Introduction and acclimatization, selections, hybridizations, hybrid vigour and inbreeding depression. Role of mutation and polyploidy in plant breeding. Famous Indian and international plant breeders and their contribution. National and International agricultural research institutes.

Plant breeding work done on wheat and rice in India, Green revolution

Suggested Laboratory Exercises.

- Study of cell structure from Onion, *Hydrilla* and *Spirogyra*.
- Study of cyclosis in *Tradescantia* spp.
- Study of plastid for pigment distribution in Lycopersicom, Cassia and Capsicum.
- Study of electron microphotographs of eukaryotic cells for various cell organelles.
- Study of electron microphotographs of virus, bacteria and eukaryotic cells for comparative study of cellular organization.
- Study of different stages of mitosis and meiosis in root-tip cells and flower buds respectively of onion.
- To solve genetic problems based upon Mendel's laws of inheritance: Monohybrid, Dihybrid, Back cross and test cross.
- Permanent slides/photographs of different stages of mitosis and meiosis, sex chromosomes, polytene chromosome and salivary gland chromosomes,
- Emasculation, bagging & tagging techniques
- Cross pollination techniques

Suggested Readings:

- Choudhary, H.K. (1989). Elementary Principles of Plant Breeding. Oxford and IBM Publishing Co., New Delhi.
- Gupta, P.K. (2009). Cytology. Genetics. Evolution, and Plant Breeding, Rastogi Publications, Meerut.
- Miglani, GS. (2000). Advanced Genetics, Narosa Publishing House, New Delhi.
- Russel, PI. (1998). Genetics. The Benejamins/Cummings Publishikng Co., Inc. U.S.A.
- Shukla, R.S and Chandel, P.S. (2000). Cytogenetics. Evolution and Plant Breeding, S. Chand & Co. Ltd., New Delhi
- Singh, R.B. (1999). Text Book of Plant Breeding, Kalyani Publishers, Ludhiana.
- Dnyansagar, VR. (1986) Cytology and Genetics, Tata McGraw-Hill Pub. Co. Ltd. New Delhi.
- Roy SC. and De. KK (1999). Cell Biology. New Central Book Agency (P) Ltd. Calcutta.

Verma, PS. and Agarwal, VK (2012). Cell Biology, Genetics, Molecular Biology, Evolution and Ecology. S. Chand and Co. Ltd. New Delhi

Paper II

Microbiology, Mycology and Plant Pathology

(2 hrs /week)

Unit-1

Microbiology: Meaning and Scope, history and development in the field of microbiology. Concept of quorum sensing and biofilm

Eubacteria: general account, occurrence, morphology (structure, shapes), flagella, pili, nutritional types, endospore, reproduction (binary fission, transformation, conjugation, transduction), economic and biological importance.

Mycoplasma: occurrence, morphology, reproduction and importance.

Unit-2

Virus: General characteristics and importance Structure of TMV and Pox virus, Structure and multiplication of Bacteriophage.

Fungi: General characters, occurrence, thallus organization, reproduction, economic importance. Classification of fungi (Alexopoulos and Ainsworth's).

Plant diseases: Biotic and abiotic diseases, important symptoms caused by fungi, bacteria, viruses and MLOs (blights, mildews- downy and powdery, rusts, smuts, canker, mosaic, little leaf, galls etc.).

Unit-3

Brief account, structure, importance and life history and/or disease cycle and control of the following:

Albugo and white rust; *Sclerospora* and Downy mildew/Green ear disease of Bajra; *Aspergillus*; *Claviceps* and Ergot; *Peziza*.

Unit-4

Brief account, structure, importance and life history and/or disease cycle and control of the following:

Puccinia and Black rust of wheat ; *Ustilago* and loose smut of wheat and covered smut of barley; *Agaricus*, *Alternaria* and early blight of potato

Suggested Laboratory Exercises:

1. Study of bacteria using curd or any other suitable material, Gram's staining of bacteria.
2. Study of Mycoplasma, TMV, Poxvirus, bacteriophage (photographs/ 3-D models)
3. Study of symptoms of plant diseases Downy mildew of Bajra, Green ear of bajra, Powdery mildew, mosaic of bhindi

4. Study of specimen, permanent slides and by making suitable temporary slides: *Albugo*- white rust; *Sclerospora*- downy mildew, green ear; *Aspergillus*; *Claviceps*- ergot; *Ustilago*- loose smut of wheat, covered smut of barley. *Puccinia- Black rust of wheat*; *Agaricus*; *Peziza* and *Alternaria*- early blight of potato. ✓ visit a local Botanical Garden / Hill
5. Media preparation: potato dextrose agar, Nutrient agar ✓ Study of Plant in Farmers field / Agricultural Stations.
6. Culture techniques of fungi and bacteria.

Suggested Books:

Alexopoulos, C.J. and Mims, C.W.: Introductory Mycology, John Wiley and Sons, New York. 2000

Dube, H.C. :Fungi, Rastogi Publication, Meerut, 1989.

Sarabhai, R C. and Saxena, R.C.: A text book of Botany, Rastogi Publication, Meerut, 1990.

Sharma, O.P.: Fungi, Today and Tomorrow Printers and Publishers, New Delhi, 2000.

Vashihsta, B.R. Botany for Degree Students -Fungi, S. Chand & Co., New Delhi, 2001.

Bilgrami, K.S. and Dube, H.C.: A text book of Modern Plant Pathology, Vikas Publications, New Delhi 2000.

Biswas, S.B. and Biswas, A.: An Introduction to Viruses, Vikas Publications, New Delhi. 2000.

Clifton, A.: Introduction of Bacteria, McGraw Hill Co. Ltd., New York, 1985.

Madahar, C.L.: Introduction of Plants Virus, S. Chand and Co., New Delhi, 1978.

Palzar M.J Jr. Chan, E.C.S. and Krieg, N.R. : Microbiology, McGraw Hill Edu.. Pvt. ltd., London 2001.

Purohit, S.S.: Microbiology, Agro. Bot. Publication, Jodhpur 2002.

Sharma, P. D.: Microbiology and Pathology, Rastogi Publication. Meerut, 2003.

Singh, V. and Srivastava V. : Introduetion of Bacteria, Vikas Publication, 1998.

Cappuccino. J. and Sherman, N.: Microbiology· A Laboratory Manual (10th Ed.). Benjamin Cummings, 2013.

Aneja, K.R.. Experiments in Microbiology, Plant Pathology and Biotechnology New Age International (P) Ltd., Publishers, New Delhi 2003.

Mehrotra, R.S. and Aggarwal, Ashok: Plant pathology, Tata McGraw-Hill Education, 2003.

Paper III
Algae, Lichens and Bryophyta
(2 hrs/week)

Unit-1

General characters, Classifications (Smith). Diverse Habitat. Range of thallus structure, photosynthetic pigments and Food reserves. Reproduction (Vegetative, Asexual, Sexual). Types of the life cycle: Economic importance.

Unit-2

Type Studies
Cyanophyceae – *Oscillatoria, Nostoc*
Chlorophyceae-*Volvox, Chara*
Xanthophyceae-*Vaucheria*.
Phaeophyceae-*Ectocarpus*
Rhodophyceae-*Polysiphonia*

Unit-3

General characters, Origin, and evolution of Bryophtya. Classification (Eichler); Habitat, Range of thallus structure, Reproduction (Vegetative and Sexual); Alternation of generations; Economic importance.

Type Studies: Hepaticopsida - *Riccia, Marchantia*

Unit-4

Type Studies: Anthocerotopsida- *Anthoceros*; Bryopsida- *Funaria*

Lichens- General characters, habitat, Structure, reproduction and economic and Ecological importance of lichens.

Suggested Laboratory Exercises

1 Study of class work material by making suitable temporary slides and study of permanent slides of: *Oscillatoria, Nostoc, Volvox, Chara, Vaucheria, Ectocarpus, Polysiphonia*.

2 Study of external morphology and preparation of suitable sections of vegetative/reproductive parts of *Riccia, Marchantia, Anthoceros, Funaria*.

3 Study of lichens.

Suggested Readings

Bold, H.C. Alexopoulous. C.J. and Delevoryas, T Morphology of Plant and Fungi (4th Ed.) Harper & Foul Co., New Work, 1980.

Ghemawat, M.S., Kapoor, J.N. and Narayan, H.S.. A text book of Algae, Ramesh Book Depot, Jaipur, 1976.

Gilbart, M.Smith: Crypogamic Botany, Vol. I & II (2nd Ed.) Tata McGraw Hill. Publishing Co. Ltd., New Delhi, 1985

Kumar, H.D.: Introductory Phycology, Affiliated East—West Press, Ltd. New York, 1988.

Puri. P.: Bryophytes, Atmaram & Sons. Delhi, Lucknow, 1985.

Sarabhai. R.C. and Saxena, R.C.: A text book of Botany. Vol I & II, Ratan Prakashan Mandir, Meerut, 1980.

Singh, V., Pande, P.C. and Jain, D.K.. A text book of Botany, Rastogi, & Co., Meerut, 2001.

Vashista, B.R.: Botany for Degree Students (Algae, Bryophytes) S. Chand & Co., New Delhi, 2002.

BOTANY PRACTICAL EXAMINATION B. Sc PART-I

SKELETON PAPER

M.M. 50 TIME: 4 Hours

S.No.	Practical	Regular	EX.NC
1(a)	Prepare the acetocarmine stained slide of the material "A" provided to you. Draw a well labelled diagram of any one stage of nuclear division. Identify it giving reasons.	5	5
1(b)	Comment and solve the problem on Genetics allotted to you along with reasons.	5	5
2	Make suitably stained glycerine-preparation of any one alga from the given mixture "B". Draw its labelled diagrams; assign it to its systematic position giving reasons.	5	5
3	Make suitable preparation of the reproductive structure of material "C"(Fungi). Draw labelled diagrams. Identify giving reasons.	5	5
4	Make suitable stained preparation of material "D" (Bryophyta (vegetative/ reproductive). Draw labelled diagrams. Identify giving reasons.	5	5
5	One Microbiology experiment for comments. Or Gram's staining.	5	5
6	Comment upon spots (1-5)	10	
7	Viva-Voce	5	
8	Practical record	5	-
	TOTAL	50	50