Affiliated by Sant Gadge Baba Amravati University
Amravati.

Department of Botany

B.Sc.- III Year Sem- VI

(Effective from session 2014-15)

- **The examination in Botany of Third semester shall comprise of one theory paper,internal assessment and practical examination.**
- **Theory paper will be of 3 Hrs. duration and carry 80 marks.The internal assessment will carry 20 marks.**
- **The practical examination will be of 5 hours duration and carry 50 marks.**
- **Each theory paper has been divided into 6 units.**
- **The following syllabi is prescribed on the basis of 6 lecturers per week and 6 practical periods per batch per week.**
- **There shall be one question in every unit with internal choice for each of 12 marks & onecompulsory question covering all the syllabus of Semester-VI (8 marks).**

B.Sc. Part- III (Semester- VI)

Molecular Biology and Biotechnology

6S Botany

Marks: 80

Unit-I : DNA the genetic material :

1.1 Historical account – Giffith's Expt, Hershy and Chase Expt.
1.2 DNA– Chemical composition and Double Helical model,
1.3 DNA replication in Eukaryotes;
1.4 DNA Packaging - Nucleosome and Solenoid
1.5 Satellite, Repetitive DNA and Transposable element inplants (AC-DS system)

Unit-II : Gene Structure and Expression -

2.1 Concept of gene, Fine structure of Gene
2.2 Gene Expression –Central Dogma, Types of RNA, Genetic code, Ribosome as a

translation machine

2.3 Transcription in Eukaryotes – Mechanism of Transcrip-tion and RNA Processing
2.4 Translation in Eukaryotes.
2.5 Endomembrane system (Flow of Peptide)

Unit – III : Regulation of Gene Expression

3.1 Regulation of Gene Expression in Prokaryotes – Operonconcept with special reference to Lac Operon
3.2 Regulation of gene expression of Eukaryotes – BrittonDavidson Model
3.3 Protein Folding Mechanism and Structure (Primary, Secondary, Tertiary and Quaternary)
3.4 Protein Sorting – Targeting to proteins to organelles
3.5 Protein Trafficking

Unit-IV : Genetic Engineering -

4.1 Tools and techniques of recombinant DNA technology,
4.2 Restriction Enzymes – Nomenclature and Types
4.3 Cloning vectors – Plasmids, Phages, Cosmids
4.4 Gene Source- Genomic and c-DNA library.
4.5 Gene Transfer Techniques –
Direct - (1) Chemical method, (2) Electroporation, (3)Gene gun method
Indirect – Agrobacterium mediated gene transfer
4.6 Gene Amplification - _Polymerase Chain Reaction (PCR)

Unit-V : Plant Tissue Culture -

5.1 Basic aspects of plant tissue culture
5.2 Laboratory Requirement –Infrastructure,
Instruments (laminar air flow, autoclave, growth chamber),Culture Media (MS Media), Growth Hormone (Auxin, Cytokinin and Gibberellins) Sterilization Techniques
5.3 Tissue Culture Technique - Cellular totipotency, differen- tiation and morphogenesis; Callus Culture; Micro propa-gation

Unit-VI : Applications of Biotechnology -

6.1 Agriculture – Haploid plant production (Anther and Pol- len Culture); Protoplast Culture and Somatic Hybridiza- tion; Transgenic Plant - BT Cotton, Synthetic seed. Salientachievements of crop biotechnology
6.2 Industry – Fermentation Technology- Bakery Products and Alcohol Productions.
6.3 Health Care – Edible Vaccines
6.4 Conservation – Cryopreservation, Genetically Modified Organisms: - Pros and Cons

LABORATORY EXERCISE

A. Molecular biology (Major) (Any One)

1. Isolation of DNA by crude method
2. Estimation of DNA by Diphenylamine method
3. Estimation of RNA by Orcinol method

B. Molecular biology (Minor) (Any One)

1. Demonstration of DNA Electrophoresis,
2. Demonstration of double helical model of DNA

3. Demonstration of AC-DS System in Maize kernel
4. Demonstration of Centrifugation

C. Biotechnology (Any Six)

a. Working Principle and application of Autoclave
b. Working Principle and application of Laminar Air Flow
c. Cleaning and Sterilization of Glassware
d. Sterilization of Explant.
e. Inoculation of Explant.
f. Demonstration of in vitro culture techniques – anther andpollen culture.
g. Isolation of Protoplast by Mechanical Method.
h. Isolation of Protoplast by Enzymatic Method.
i.Demonstration of technique of Micropropogation.
j.Preparation of Artificial Seed.
k. Demonstration of hardening of tissue culture plant.
l.Preparation of Tissue culture media.
m. Pollen viability test.

Note: Visit to molecular biology, biotechnological research institute/industry

Practical Examination

Time : 4 hours.	**Marks : 50**
Que.1 : To perform given Molecular Biology experiment	15 Marks
Que.2 : Comment on minor molecular Biology Experiment	05 Marks
Que.3 : To perform given Biotechnology experiment	15 Marks
Que.4 : Comment on any one Biotechnology Experiment	05 Marks
Que.5 : Visit report	05 Marks
Que.6 : Class record/ and viva-voce	05 Marks

Reference Books.

1. Pradip's Botany Vol. V, Biochemistry and Biotechnology- New Millenium Edition
2. Alberts, B.Bray, D.Lewis, J.Raff, M.Roberts, K. and Watson, I.D. 1999. Molecular Biology of Cell - Garland Publishing Co. Inc New York, U.S.A.
3. Gupta, P.K. 1999 : A Text book of Cell and Molecular Biology, Rastogi Publication, Meerut, India.
4. Wolfe, S.L. 1993. Molecular and Cell Biology. Wordsworth Pub- lishing Co., California, U.S.A.
5. Fakui, K. and Nakayama S. 1996. Plant Chromosomes. Labora- tory Methods. CRC Press, Boca Raton, Florida.
6. Sharma, A.K. and Sharma, A. 1999. Plant Chromosomes : Analy- sis; Manipulation and Engineering. Harwood Academic Publish-ers, Australia.

   Bhojwani, S.S. 1990. Plant Tissue Culture : Applications and Limi- tations, Elsevier Science Publishers, New York. U.S.A.
7. P.K.Gupta Biotechnology.
8. Lea, P.J. and Leegood, R.C. 1999. Plant Biochemistry and Mo-lecular Biology. John Wiley & Sons, Chichester, England.
9. Old, R.W. and Primrose, S.B. 1989 : Principles of Gene Manipu- lation. Blackwell Scientific Publications, Oxford, U.K.
10. Vasil, I.K. and Thorpe, T.A. 1994. Plant Cell and Tissue culture,Kluwer Academic

Publications, the Netherlands.
11. Devi, P. 2000. Principles and Methods of Plant Molecular Biol-ogy, Biochemistry and Genetics, Agrobios, Jodhpur, India.
12. Smith, R.H. 2000. Plant Tissue Culture; Techniques and Experi-ments. Academic Press, New York.
13. Satyanarayan- Biotechnology.
14. An introduction to industrial Microbiology- Dr. P.K. Sivakumaar& Dr. M.M. Joe & Dr. K. Sukesh- S. Chand publication.
15. Practical Biotechnology and plant tissue culture- Prof. SantoshNagar & Dr. Madhavi Adhav- S. Chand Publication.
16. Modern practical Botany (Volume-III)- Dr. B.P.Pandey- S. Chandpublication.
17. Molecular Biology and Biotechnology- K.G. Ramawat & Dr.Shaily Goyal- S. Chand publication.
18. Comprehensive Biotechnology- K.G. Ramawat & Shaily Goyal- S. Chand publication.
19. Botany for degree students - B.P. Pandey- S. Chand publication.
20. A Textbook of Biotechnology- R.C. Dubey- S. Chand publication