

**Syllabus and Course Scheme**  
**Academic year 2014-15**



***B.Sc.- Biotechnology***  
***Exam.-2015***

***UNIVERSITY OF KOTA***  
***MBS Marg, Swami Vivekanand Nagar,***  
***Kota - 324 005, Rajasthan, India***  
***Website: uok.ac.in***

# B.Sc. Biotechnology- 2015

Eligibility: 10+2 Science Biology/ Agriculture

Selection: Common Entrance Test to be conducted by University of Kota  
Scheme of Examination And Course of Study

The number of paper and maximum marks of each paper together with the minimum marks required for a pass are shown against each paper separately. It will be necessary for a candidate to pass in the theory paper as well as in practicals separately.

First Division 60% of the maximum marks prescribed at part I, II & III  
Second Division 48% Examinations, taken together.

Rest of the candidates shall be declared to have passed the examination, if they obtain the minimum pass marks in each paper viz 36% No division shall be awarded at Part I and Part II Examination.

A candidate may be allowed to appear at the Supplementary examination upto a maximum of two theory papers, provided that he has passed in all the practical examinations.

A candidate may be allowed grace marks in two theory papers upto the extent of 1% of the total marks prescribed for that examination.

## TEACHING AND EXAMINATION SCHEME FOR B.Sc. Biotechnology Part III Exam.- 2015 TEACHING AND EXAMINATION SCHEME B.SC. BIOTECHNOLOGY PART III

Paper Name (Theory)	Lecture Hrs/week	Exam hrs	Max Marks
BBT-19 Plant and Animal tissue culture	3	3	50
BBT-20 Trends in Biotechnology I	3	3	50
BBT-21 Trends in Biotechnology II	3	3	50
BBT-22 Genetic Engineering and r DNA Technology	3	3	50
BBT-23 Biotechnology of crop improvement	3	3	50
BBT-24 Industrial Biotechnology	3	3	50
<b>Total of theory papers</b>			<b>300</b>
<b>Paper Name (Practicals)</b>			
BET-25 Plant and Animal tissue culture + Trends in Biotechnology I		3	50
BBT-26 Trends in Biotechnology II + Genetic Engineering and r DNA Technology		3	50
BBT-27 Biotechnology of crop improvement + Industrial Biotechnology		3	50
<b>Total of Practical</b>			<b>150</b>
<b>Grand Total (Theory + Practical)</b>			<b>450</b>

## **BBT - 19 Plant and Animal tissue culture (Theory)**

**Min. pass marks: 18**

**Duration: 3 hours**

**Max. Marks: 50**

**Note:** Attempt any five questions, taking at least one question from each unit. Each question carries equal marks.

### **Unit-I**

Tissue culture laboratory **organization**. Concept of totipotency, Cyto-differentiation and its importance. Culture media and stock solutions. Principle and protocol and importance of organ culture, Callus culture, Cell suspension culture.

### **Unit-II**

Embryo culture. Anther culture. Plant protoplast culture. Protoplast fusion. Somaclonal and Gametoclonal variable selection. Micro propagation: Clonal propagation. Plant improvement and plant tissue culture. Preservation of plant genetic resources.

### **Unit-III**

Transgenic plants and Gene transfer methods. Selection of transformed cells. Marker and reporter genes in screening methods. RFLP, RAPD and other molecular markers.

### **Unit-IV**

Tissue culture laboratory organization. **Animal tissue culture media**. **Commonly used cell lines- their origin and characteristics**. Anchorage dependence and non- anchorage dependent cell growth. Growth kinetics of animal cells in cultures. Primary cultures. Secondary cultures. Transformed animal cells- established continuous cell lines.

### **Unit-V**

**Plant secondary metabolites and their production**. **Hairy root culture for production of useful metabolites** Applications of plants biotechnology in breeding and crop improvement. Application of animal cells cultures for studies of gene expression.

## **BBT - 20 Trends in Biotechnology – I (Theory)**

**Min. pass marks: 18**

**Duration: 3 hours**

**Max. Marks: 50**

**Note:** Attempt any five questions, taking at least one question from each unit. Each question carries equal marks.

### **Unit- I**

Techniques in molecular biology. Gene synthesis. Gene sequencing. Northern, southern and western blotting. Hybridization. Site directed mutagenesis. Molecular probes and their applications. Basic principles of protein engineering and its application.

### **Unit- II**

Immobilization of enzymes: Introduction, Methods, Analytical, medical and industrial application. Brief idea about Abzymes, Ribozymes and Synzymes. Monoclonal antibodies and their applications.

### **Unit- III**

Bioreactors: Single, batch and continuous. Loop and fluidized bed reactors. Biopesticides: Microbial, algal, fungal, bacterial, higher plants and animal based biopesticides with an emphasis on BT toxin. Biopolymers (beta hydroxy butyrate). Biopolysaccharide (Xanthium gum) Immunity to infection of disease: vaccines (attenuated and recombinant) and vaccination

### **Unit- IV**

Immunological techniques: ELISA, RIA. Autoimmune diseases: Rheumatoid arthritis, IDS, Hashimoto's thyroidities. Basic concept of single cell protein.

### **Unit- V**

Drug designing, Gene therapy. Enzyme in food processing: amylase, protease, and resins.  
Organic acid: Citric, Lactic acid.

## **BBT - 21 Trends in Biotechnology - II (Theory)**

**Min. pass marks: 18**

**Duration: 3 hours**

**Max. Marks: 50**

**Note:** Attempt any five questions, taking at least one question from each unit. Each question carries equal marks.

### **Unit- I**

Restriction mapping

Molecular marker: RAPD, RFLP, AFLP, SNP. Use of Biotechnology in forensic science. DNA finger printing. Chloroplast engineering. Mitochondria engineering.

### **Unit- II**

Human genome project: History and salient features. Arabidopsis as a model plant for genetic engineering. Stem cells: Current status.

### **Unit- III**

Recombinant vaccines: Malaria, AIDS, Fertility regulation. Antisense RNA technology.  
Gene tagging, Cassette vectors. Biology of aging. Biology of oncogenes and other retrovirus.

### **Unit- IV**

Proteomics and metabolomics. Prions.

Terminator seed technology. Seed storage proteins. Therapeutic proteins. Petro plants.

### **Unit- V**

Genetically modified food, Hazards of genetically modified food. Molecular biology of genetic disorders. Sickle cell anaemia, Down syndrome, Thalassemia, Huntington's disease. Biosensors. DNA Chips.

## **BBT - 22 Genetic Engineering and DNA Technology (Theory)**

**Min. pass marks: 18**

**Duration: 3 hours**

**Max. Marks: 50**

**Note:** Attempt any five questions, taking at least one question from each unit. Each question carries equal marks.

### **Unit- I**

Introduction and historical background of genetic engineering. Isolation and purification of DNA from bacterial, plant and animal cells.

Vectors: Plasmids, Cosmids and Phages.

### **Unit- II**

Restriction enzymes: Ligases, SL nucleases, DNA polymerase. Reverse transcriptase.

C-DNA synthesis and cloning: m-DNA enrichment reverse transcription, primers.

### **Unit- III**

Linkers, Adaptors, Blunt and Ligation. Homopolymer tailing. C-DNA library construction and screening.

Cloning and expression gene of foreign genes in prokaryotes (E.coli).

### **Unit- IV**

Cloning and expression gene of foreign genes in eukaryotes (Yeast).

Brief idea about gene cloning in plant and mammalian cells.

### **Unit- V**

Solid phase automated synthesis of DNA. Application of transposons in gene tagging.  
Application of bio informatics in search for DNA homology. Patents and Biosafety guidelines.

## **BBT -23 Biotechnology of crop improvement (Theory)**

**Min. pass marks: 18**

**Duration: 3 hours**

**Max. Marks: 50**

**Note:** Attempt any five questions, taking at least one question from each unit. Each question carries equal marks.

### **Unit- I**

The green revolution. Basic problem in development of useful crop varieties. Gene transfer through hybridization. Methods for crop improvement- cell fusion, somatic hybridization, and Engineering techniques. Gene for disease resistance.

### **Unit- II**

Application of tissue culture in increasing salt tolerance.  
Crop improvement- Tea, Coffee, and Cardamom, pepper, ginger.  
Plantation crop- Cashew, tuber. - Sweet Potato, Cassava, Colocassia, Banana, Mango, Citrus, Sugarcane, Rice.

### **Unit- III**

Application of plant tissue culture in forestry for fuel wood, forage, timber and pulp wood improvement.  
Biotechnology for Nitrogen fixation & plant productivity- Diazotropic microorganisms.  
Biological nitrogen fixation, Asymbiotic nitrogen fixation, Symbiotic nitrogen fixation.  
Nitrogen converters in soil.

### **Unit - IV**

Regulation of nitrogen fixation genes.  
Enzymes and agro-biotechnology: properties of enzymes, occurrence of enzymes, mechanism of enzyme action. Nutrient media for enzyme production. Application of enzyme action in agro-biotechnology.

### **Unit- V**

Agro-industrial biotechnology. Fermentation technology for the production of alcoholic beverages- wine, beer, whisky, organic acids, glycerol, vitamins.  
Vermitechnology- Vermiculture, Vermicomposting & Vermiwash- production & benefits.

## **BBT - 24 Industrial Biotechnology (Theory)**

**Min. pass marks: 18**

**Duration: 3 hours**

**Max. Marks: 50**

**Note:** Attempt any five questions, taking at least one question from each section. Each question carries equal marks.

### **Unit- I**

Microbiology and biochemistry of waste water treatment. Bioreactor for wastewater treatment: Anaerobic and aerobic. Removal of specific pollutants: Nitrogen, phosphorus, oil and grease, Heavy metals.

### **Unit- II**

Bioenergy production from waste – Methane, alcohol, petroleum and biodiesel. Biotechnology for pesticide industry. Tannery industry and biotechnology. Paper industry and biotechnology.

### **Unit- III**

Antibiotic penicillin production from microbes. Biotechniques for air pollution abatement and odour control: Deodourisation, bioscrubber, biobeds, biotrickling filters.

### **Unit- IV**

Biotechnology for waste treatment of food and allied industry. SCP and biomass from waste. Waste water treatment using aquatic plants. Role of Trichoderma in municipal waste composting.

### **Unit - V**

Mushroom cultivation on agro-wastes. Root zone technology for water pollution abatement. Aiming for biodegradable and eco-friendly products. Biodegradable plastics (Bioplastics).

## **PRACTICAL**

## **BBT - 25 Plant and Animal tissue culture + Trends in Biotechnology**

**Min. pass marks: 18**

**Duration: 3 hours**

**Max. Marks: 50**

Sterilization techniques for non-living, plant and animal material. Tissue culture media preparation: MS/White/Gamborg/Schenk & Hildbrandt media. Slant preparation.

Excision of embryo / ovule / Anther and their inoculation. Preparation of aseptic plant and animals. Aseptic techniques.

Inoculation of culture. Root culture. Leaf culture. Shoot tip and meristem culture. Flower bud and flower culture. Isolated ovary culture. Callus induction and regeneration. Suspension culture.

Mechanical isolation of protoplast. Enzymatic isolation of protoplast and culture. Role of macronutrients: Nitrogen, amino acids, sulphur, phosphorus, potassium, magnesium, calcium and sodium in culture media.

**PRACTICAL**  
**BBT - 26 Trends in Biotechnology II + Genetic Engineering & rDNA Technology**

**Min. pass marks: 18**

**Duration: 3 hours**

**Max. Marks: 50**

Protoplast fusion. Anther culture and Haploid production. Protein separation by electrophoresis.

Isolation of DNA from:

- (a) Bacteria (genomic)
- (b) Bacteria (Plasmid)
- (c) Virus
- (d) Plants

Digestion of DNA with restriction enzymes. Agro bacterium mediated transformation.

Fragmentation of DNA by mechanical shearing. Isolation of DNA by shot- gun method.

Insertion of gene into appropriate vector. Engineering of the plasmids. Transferring genes into mammalian cells by microinjection.

**PRACTICAL**  
**BBT - 27 Biotechnology of crop improvement + Industrial Biotechnology**

**Min. pass marks: 18**

**Duration: 3 hours**

**Max. Marks: 50**

Isolation of agriculturally useful mutants. Production of Pathogen free plants. Isolation of secondary metabolites from tissue culture:

- a) Alkaloids
- b) Phenolics

Use of haploid cultures in pharmacotoxicology. Isolation of hepatocytes.

Production of Monoclonal antibodies. Hairy root transformation. Polyacrylamide gel electrophoresis.

Tropane alkaloid production from tissue culture.

Production of transgenic crops for disease resistance.

Genetically modified crop plants production & their usefulness.