

**BACHELOR OF SCIENCE (B.SC.)  
IN  
BIOTECHNOLOGY**



**w.e.f. from June 2013**

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY,  
PATAN**

**HEMCHANDRACHARYA NORTH GUJARAT UNIVERSITY, PATAN**

**B.Sc. Programme with 144 credits**

**CBCS-Semester-Grading Pattern**

Part/Class	Subject code	Study components	Instructions Hrs / week	Examination			Credit
				Internal	University Exam	Total	
<b>Sem-V B.Sc.</b>		<b>Semester V</b>					
		<b>Core compulsory (CC) Course</b>					
	<b>CC-I-7</b>	Core Course-I (Paper-7)	3	30	70	100	3
	<b>CC-I-8</b>	Core Course-I (Paper-8)	3	30	70	100	3
	<b>CC-II-9</b>	Core Course-II (Paper-9)	3	30	70	100	3
	<b>CC-II-10</b>	Core Course-II (Paper-10)	3	30	70	100	3
		<b>Practical Core (PC) Course</b>					
	<b>PC-I-7,8,9 &amp; 10</b>	Practical Core Course-I (Paper-7,8,9 & 10)	12		200	200	6
		<b>Foundation Course (FC)</b>					
	<b>FC-31</b>	Compulsory English (L.L.)	2	15	35	50	2
		<b>Elective Course (E)</b>					
	<b>EG-31</b>	Elective ( <b>Generic</b> ) Course	2		50	50	2
	<b>ES-3</b>	Elective ( <b>Subject</b> ) Course	2		50	50	2
			<b>30</b>	<b>135</b>	<b>615</b>	<b>750</b>	<b>24</b>

Part/Class	Subject code	Study components	Instructions Hrs / week	Examination			Credit
				Internal	University Exam	Total	
<b>Sem-VI B.Sc.</b>		<b>Semester VI</b>					
		<b>Core compulsory (CC) Course</b>					
	<b>CC-I-11</b>	Core Course-I (Paper-11)	3	30	70	100	3
	<b>CC-I-12</b>	Core Course-I (Paper-12)	3	30	70	100	3
	<b>CC-II-13</b>	Core Course-II (Paper-13)	3	30	70	100	3
	<b>CC-II-14</b>	Core Course-II (Paper-14)	3	30	70	100	3
		<b>Practical Core (PC) Course</b>					
	<b>PC-I-11,12,13 &amp; 14</b>	Practical Core Course-I (Paper-11,12,13 & 14)	12		200	200	6
		<b>Foundation Course (FC)</b>					
	<b>FC-32</b>	Compulsory English (L.L.)	2	15	35	50	2
		<b>Elective Course (E)</b>					
	<b>EG-32</b>	Elective ( <b>Generic</b> ) Course	2		50	50	2
	<b>ES-32</b>	Elective ( <b>Subject</b> ) Course	2		50	50	2
			<b>30</b>	<b>135</b>	<b>615</b>	<b>750</b>	<b>24</b>

## **B.SC. BIOTECHNOLOGY**

### **SEM 5**

### **CC-I-7**

### **PAPER-7**

## **BIOPROCESS AND BIOCHEMICAL ENGINEERING**

### **UNIT-1**

- Primary and secondary screening.
- Strain Improvement : Nature of mutation, mutagenesis, isolation of mutants.
- Strain Improvement : Application of recombinant DNA technique in strain construction.
- Techniques for preservation and storage of cultures.

### **UNIT-2**

- Fermenter and bioreactor : Design and types of various fermenters.
- Introduction to Aeration and agitation.
- Basic concept of growth.
- Batch, fed-batch and continuous culture operations, chemostat and turbidostat.
- Starter culture, its importance and preparation.

### **UNIT-3**

- Introduction and types of fermentation media
- Raw materials used in fermentation media.
- Media optimization.
- Sterilization of media, air and equipments.

### **UNIT-4**

- Overview of downstream processing.
- Fermentation economics.
- Fermentation process of alcohol.
- Fermentation process of antibiotic (penicillin).

### **REFERENCES**

- L.E. Casida. Industrial Microbiology by.

- Stanbury and Whitaker. Principles of fermentation technology.
- Sikyta. Methods in Industrial microbiology. Ellis Hardwood Ltd.
- Krysman. Product recovery in bioprocess technology.
- T.K. Ghose. Bioprocess computation in biotechnology, Ellis Hardwood Ltd.
- Demain et al. (ED) 1999. Manual of industrial Microbiology and Bio technology. Asin Press.
- Doran (D). Bioprocess Engineering Principles; Academic Press, 1998.
- Cooney, A.E. Humphrey, Comprehensive Biotechnology : The principles and Regulation of Biotechnology in Industry, Agriculture and Medicine. Vol.2, Pergamon Press, 1985.

**B.SC. BIOTECHNOLOGY****SEM 5****CC-I-8****PAPER-8****MOLECULAR GENETICS****UNIT-1**

- Overview of nucleic acids.
- Alternative forms of DNA.
- Genomic organization of prokaryotic and eukaryotic cells.
- DNA as genetic material : Experimental evidences - Transformation principles, Viruses, Watson and Crick Model.
- Concept of central dogma.

**UNIT-2**

- Enzymes involved in DNA replication.
- Process of replication : Initiation, Elongation and Termination.
- Replication of entire DNA molecule; Distinguishing features of DNA replication between prokaryotes and eukaryotes.

**UNIT-3**

- Types of RNA molecules.
- Transcription-Initiation; RNA polymerase; elongation and termination, the distinguishing features of the processes in prokaryotes and eukaryotes.
- RNA Processing
- The genetic code

**UNIT-4**

- Translation-Initiation, elongation and termination of translation.
- Post translational modifications.
- Regulation of gene expression, lac-operon.
- Transposable elements : Structure and mechanism of transposition, and Transposable elements.
- RNA interference : a mode of gene regulation.

**REFERENCES**

- Lewin B. (2000) Gene VII IRL Press, Oxford University Press Oxford.
- Watson, J.D., Hopkins, Roberts, Stiez, Weiner. (1987) Molecular Biology of the Gene. (4<sup>th</sup> Ed) The Benjamin/Cummings Publishing Co. Inc. California.
- Davis, D.B. Dulbecco, R., Risen, H.N, Ginsberg. H.S., (1990) Microbiology, (4<sup>th</sup> Ed) Harper & Row Publishers, Singapore.
- T.A. Brown Genome.
- S.B. Primrose Principle of gene manipulation .

## **B.SC. BIOTECHNOLOGY**

### **SEM 5**

### **CC-I-9**

### **PAPER-9**

## **Principles of Biotechnology Applied to Plants**

### **UNIT-1**

- Principles of tissue culture : Historical perspectives and development of plant tissue culture techniques.
- Cell growth and differentiation – morphogenesis.
- Concepts of totipotency of cells.
- Laboratory requirements for tissue culture.

### **UNIT-2**

- Culture media : preparations / constituents and concepts of sterilization.
- Preparation, Isolation and selection of explants.
- Liquid cell suspension cultures; Pollen culture and protoplast culture production and uses of haploids.

### **UNIT-3**

- Gene transfer techniques using Agro bacterium.
- DNA mediated gene transfer, basics of GMO.
- Transgenic plants.
- Crop improvement (viral resistance, insect resistance, microbial resistance, herbicide, tolerance and stress resistance).

### **UNIT-4**

- Preservation techniques of germplasm.
- Plant tissue culture and secondary metabolite production.
- Production of synthetic seeds.
- BT cotton.



## REFERENCES

- H.S. Chawla. Introduction to Plant Biotechnology
- Iganacimatha. Basic biotechnology.
- Das and Mookerjee. Outline of biology.
- David Bourgaize. Biotechnology, Demystifying the concepts. Alp. 2000 .
- Eric. S. Grace. Biotechnology unzipped : Promises and realities .
- Cohn and Stumph. Outline of Biochemistry, Wiley eastern.
- Miglani. Dictionary of plant genetics and molecular biology. Viva Books.
- Iganacimatha. Appl. Plant Biotechnology.
- K.K. De. Plant tissue culture .
- Radint and Bhojwani. Plant and tissue culture.
- Dixon and Gonzales. Plant cell culture. A practical approach. IRL press.
- Verpoorte, R. (Ed.) 2000. Metabolic engineering of plant secondary metabolism.
- Bernard, R. Glick and Pasternak . Molecular biotechnology .
- Bulter and Dawson. Cell culture.

## **B.SC. BIOTECHNOLOGY**

### **SEM 5**

### **CC-I-10**

### **PAPER-10**

## **Principles of Biotechnology Applied to Animals**

### **UNIT-1**

- Animal Tissue Culture: History and Scope of Animal Tissue Culture.
- Culture media, Natural and chemically defined media, Serum and Serum free media, other supplements in media and their use.
- Primary cultures: Primary Cultures, Cell lines and Its Maintenance.
- Finite and Continuous cell lines, Tissue Disaggregating by Mechanical and Enzymatic methods, Subculturing.

### **UNIT-2**

- Secondary Culture – transformed animal cells and continuous cell lines.
- Organ Culture : Methods of Organ culture, utility of organ culture, Culture of adult organs.
- Cryopreservation and transport of animal tissue and cell lines.
- Bioreactors: Bioreactor for large scale culture of cells.

### **UNIT-3**

- Expression vector for Animal cell.
- Expression of Cloned proteins in animal cell.
- Overproduction and downstream processing of the expressed proteins.
- Cloning : Overview, Methods of Cloning, Application and Ethics, *In vitro* fertilization and embryo transfer, Application.

### **UNIT-4**

- Hybridoma Technology : Hybridoma and monoclonal antibodies, Production, Methods, Types of Monoclonal Antibodies & Applications.
- Vaccines: Production of Vaccines in animal Cells, Methodology, Application and limitation.
- Transgenic animals: Techniques for the production of Transgenic Mice, Fish and sheep, Products produced from Transgenic Animals.

- Stem Cell Technology: Overview and Types of Stem Cell, Characteristics of Stem Cell, Application of Stem cell in Therapy.

## REFERENCES

- Iganacimatha. Basic biotechnology.
- Das and Mookerjee. Outline of biology.
- Roy and De. Cell biology.
- David Bourgaize. Biotechnology, Demystifying the concepts. Alp. 2000.
- Eric. S. Grace. Biotechnology unzipped : Promises and realities .
- Jan kav. Introduction to Animal physiology. Viva Books .
- Babinnk and philips. 1989. Animal Biotechnology. Pergamonn.
- Gibert. Developmental biology.
- Jenklus N. 1999. Animal cell biotechnology. Methods and protocols Human a press.
- Butler and Walter, 1997. Animal cell cultures and technology : The basics. IRL press .
- Masters JRW (ED.) Animal cell culture : A practical approach. 2000. OUP.
- Elements of Biotechnology : P.K. Gupta.
- Molecular biotechnology : Bernard, R. Glick and Pasternak.
- Animal cell culture : Morgan.
- Cell culture : Bulter and Dawson.

**B.Sc. BIOTECHNOLOGY**  
**Elective Course (EC)(Subjective)**  
**Semester- 5**  
**Paper : ECOLOGY AND ECOSYSTEMS**

**UNIT-1**

- Terrestrial Biomes – Grasslands and Forests.
- Aquatic Biomes – Freshwater and Saline water.
- Biogeochemical Cycles – Carbon and Nitrogen cycle.
- Interaction Within, Between and Among Populations.

**UNIT-2**

- Experimental Ecosystem Models – Batch system, Flow-Through system.
- Experimental Ecosystem Models – Microcosms.
- Microbes within Macro-communities.
- Structure and Function of some Microbial Communities.

**B.Sc. BIOTECHNOLOGY**  
**Elective Course (EC)(Subjective)**  
**Semester- 5**  
**Paper : INDUSTRIAL BIOTECHNOLOGY**

**UNIT-1**

- Fermentation processes of Amylase .
- Fermentation processes of Protease.
- Fermentation processes of Citric acid.
- Fermentation processes of Streptomycin.

**UNIT-2**

- Fermentation processes of L-Lysine.
- Fermentation processes of Vitamin-B<sub>12</sub>.
- Mushrooms.
- Single Cell Protein.

**B.Sc. BIOTECHNOLOGY**  
**PRACTICAL CORE COURSE**  
**(PAPER-7, 8, 9 & 10)**  
**SEMESTER-5**  
**LIST OF EXPERIMENTS**

1. Isolation, Screening and characterization of Amylolytic microbes and Enzymes.
2. Isolation, Screening and characterization of Proteolytic microbes and Enzymes.
3. Isolation, Screening and characterization of Lipolytic microbes and Enzymes.
4. Screening of antibiotic producing microorganisms by Crowded Plate Technique.
5. Screening of antibiotic producing microorganisms by Wilkin's method.
6. Bioassay of Penicillin.
7. Optimization of medium parameters for the production of Biomass.
8. Optimization of medium parameters for the production of Enzyme (Amylases).
9. Typical fermentation of Alcohol.
10. Typical fermentation of Gluconic acid.
11. Isolation of antibiotic resistant mutant(s) bacterium by direct selection (Gradient Plate Technique)
12. Isolation of antibiotic resistant mutant(s) bacterium by indirect selection (Replica Plate Technique)
13. Sterility testing.
14. Sterilization and related techniques used in tissue culture.
  - Autoclaving
  - Hot Air Oven
  - Filter Sterilization
  - Surface sterilization
  - Laminar Air Flow.
15. Preparation of Media and media composition.
16. Introduction of explants for Callusing.
17. Characterization of Callus.
18. Sub culturing of Callus.
19. Isolation of genomic DNA from bacterial cells.
20. Isolation of plasmid DNA.

**B.SC. BIOTECHNOLOGY****SEM 6****CC-I-11****PAPER-11****Fundamentals of Immunology****UNIT-1**

- Innate and Acquired immunity.
- Interrelationship between Innate and Acquired immunity.
- Characteristics of the immune response.
- Cells & Organs involved in the immune response.

**UNIT-2**

- Antigens : Foreignness, High molecular weight, Chemical complexity, Degradability, Haptens.
- Antigens : Primary and Secondary responses.
- Antigenicity and Antigen binding site, Epitopes recognized by B -cells and T-cells.
- Major classes of antigens, Immunogenic adjuvant.

**UNIT-3**

- Antibody structure and functions.
- Structural features and biological properties of IgG, IgM, IgA, IgD & IgE.
- Generation of antibody diversity.
- Monoclonal antibody.

**UNIT-4**

- Antigen-antibody Interactions : Lattice Hypothesis, Agglutination and Precipitation.
- Antigen-antibody interactions : *In vivo* and *In vitro* interactions between Ag & Ab.
- T-Cell generation, activation and differentiation.
- B-Cell generation, activation and differentiation.

**REFERENCES**

- IM Roitt, J. Brostoff and DK Male (1993) . Immunology. BMP, London.
- J. Kuby (1991). Immunology . Freeman and company.
- A.K. Abbas, A.H. Uchtman, J.S. Pober (1994). Cellular Molecular immunology - W.B. Saunders Co. Philadelphia.
- V.R. Muthukkaruppan, S. Baskar and F. Sinigaglia (1986) . Hybridome techniques : A Laboratory Course - Macmillan India Limited.
- V.E. Cells (1994). Cell Biology Vol-I Immunology to III - Academic Press.
- Jacqueline Sharon. Basic Immunology by.



**B.SC. BIOTECHNOLOGY****SEM 6****CC-I-12****PAPER-12****GENETIC ENGINEERING****UNIT-1**

- Mechanisms of gene transfer (Processes gene recombination); Transformation, Transduction and Conjugation.
- Proteins and enzymes involved in r-DNA technologies.
- Cloning vectors : Plasmids, Phages, Cosmids, YACs.
- Application of linker, adaptor and homopolymer tail in joining diverse DNA molecules.

**UNIT-2**

- Sanger's method for DNA sequencing.
- Automated DNA sequencing.
- Pyrosequencing.
- Microarray based sequencing.
- Chemical and automated DNA Synthesis.

**UNIT-3**

- Southern blotting, Western blotting, Northern blotting.
- Colony blotting, Dot blotting.
- Hybridization and detection of probe using autoradiography (FISH).
- Cloning strategies: Construction of genomic and cDNA library.
- Screening of Gene in library.

**UNIT-4**

- Introduction to genome mapping: use of RFLP, SNP and AFLP.
- Chromosome walking.
- Applications of rDNA technology: Gene therapy, Expression of therapeutic proteins, Forensic science.
- Polymerase chain reaction techniques: Basic PCR technique, Variation of PCR techniques and Applications of PCR.

**REFERENCES**

- Lewin B. (2000) Gene VII IRL Press, Oxford University Press Oxford.
- Watson, J.D., Hopkins, Roberts, Stiez, Weiner. (1987) Molecular Biology of the Gene. (4<sup>th</sup> Ed) The Benjamin/Cummings Publishing Co. Inc. California.
- Davis. D.B. Dulbecco, R., Risen, H.N, Ginsberg. H.S., (1990) Microbiology, (4<sup>th</sup> Ed) Harper & Row Publishers, Singapore.
- T.A. Brown. Genome.
- S.B. Primrose. Principle of gene manipulation.
- William Bains. Biotechnology from A to Z
- Molecular biotechnology, 2nd Ed. Blackwell
- Mickios and Freyer. DNA science. A first course in recombinant DNA
- Mitchell. Introduction to Genetic Algorithms. Prentice -Hall

**B.SC. BIOTECHNOLOGY****SEM 6****CC-I-13****PAPER-13****Environmental Biotechnology****UNIT-1**

- Pollution and contamination of natural components of environment : Define pollution and contamination; sources of pollutants.
- Transport and fate of contamination in the environment.
- Isolation and screening of microbes degrading contamination (pollutants) : selective and enrichment cultivation techniques.
- Biodegradation : Definitions -Ready biodegradability, Ultimate biodegradation, Inferential biodegradability, Recalcitrant compound, Anthropogenic compounds (Xenobiotics).

**UNIT-2**

- An overview of selected compounds : Petroleum hydrocarbons; Alken es, Cycloalkeanes, Aromatics, Polycyclic, Aromatics & Pesticides.
- Transformation of pesticides - DDT (Dechlorination) to DBP and Biomagnification.
- Reductive dechlorination of PCE & TCE.
- Reductive dechlorination of Petroleum hydrocarbons.

**UNIT-3**

- Water purification-Dwelling supply and Municipal Supply.
- Microbiological analysis of drinking water.
- Role of indicator organisms, W.H.O . microbiological standards for drinking water.
- Physical, chemical & Biological properties of Wastewater.
- Primary & Secondary treatment, (Biological oxidation processes) & Tertiary treatment process.
- Treatment of solid wastes (Anaerobic digestion and composting).

**UNIT-4**

- Bioremediation: types and overview of bioremediation of air, soil and water.
- Biofertilizers.
- Bioplastics.
- Bioleaching and MEOR (Microbially enhanced oil recovery).

## REFERENCES

- Atlas, R.M. (1997) Principles of Microbiology. (2nd ed.). Win. C Brown Publishers. Dubuque.
- Prescott, L.M., Harley, J.P., Klein. DA., (2002) Microbiology (5<sup>th</sup> Ed Y McGraw Hill. International Ed.
- Tortora, G.J., Funke, B.R., Case, C.L. (2001) Microbiology: An Introduction. (7th Ed). Benjamin Cummings N.Y.
- Atlas & Bartha. Microbial Ecology.
- Bruce E. Rittmann and Perry L. Mccarty. Environ mental Biotechnology: Principles and application, McGraw- Hill International.
- Christson. Manual of Environmental Microbiology, ASM press.
- Eugenia J. Olguin, Gloria Sanchez and Elizabeth Hernandez. Environmental Biotechnology and Cleaner Bioprocess, Taylor and Francis.
- Martine Alexander. Biodegradation and Bioremediation.
- Peter Morris (Editor), Riki Therivel. Methods of Environmental Impact Assessment.
- Arciwala, S. J. Waste water treatment for pollution control . Tata McGraw-Hill Publications, New Delhi.
- APHA. Standard Methods for the Examination of Water and Wastewater 22nd Ed. (2012).

## **B.SC. BIOTECHNOLOGY**

### **SEM 6**

### **CC-I-14**

### **PAPER-14**

## **Analytical Techniques in Biotechnology**

### **UNIT-1**

- Concept of Good Laboratory Practice and Quality Management.
- Analysis: Steps of Analysis.
- Basic Aspects of Qualitative Analysis.
- Basic Aspect of Quantitative Analysis.

### **UNIT-2**

- Mass Spectroscopy, MALDI.
- Light microscopy Differential interference contrast microscopy.
- Electron microscopy: TEM and SEM.
- Atomic force microscopy and Confocal scanning laser microscopy.

### **UNIT-3**

- Introduction to Bioinformatics: History and Overview, Scope of Bioinformatics In Biotechnology, Bioinformatics and Internet.
- Components of Bioinformatics : Biological Databases (DNA Database, Protein Database), overview of Biological sequence analysis - ( Pair wise and Multiple Alignment), Biological Software - Rasmol.
- Human Genome Project.
- Overview of Bioinformatics Application: Phylogenetic, Pharmacogenomics (Drug Discovery), Crop Genomics (Agroinformatics), Metabolomics , Chemoinformatics

### **UNIT-4**

- Biosensors : Principles and definition, characteristics of Ideal biosensors.
- Basic measuring procedure, Biochemical components of biosensors.
- Applications of Biosensors.
- Immobilization: Basic concept of immobilization in biotechnology, Principles and mechanism of Immobilization, Methods of Immobilization.
- Bioreactor for Immobilization: Bioreactor and their Types.

## REFERENCES

- Wilson & Walker. 1995. Principles and techniques of practical Biochemistry. Cambridge Univ. Press.
- Davidson V.L. & Sisman. 1993. Biochemistry.
- Blood et al. 1996. Laboratory DNA Science. Benjamin.
- Boyer, 2001. Modern Experimental biochemistry, 3/e, Addison.
- Becker. 1996. Biotechnology : A laboratory course. Alp.
- Plummer. An introduction to practical Biochemistry.
- J. Jayaraman, Lab Manual in Biochemistry.
- Tinoco land et al. 1995. Physical chemistry Principles and applications in biological Sciences, Prentice -Hall.
- Switzer and Gauthy. 1995. Experimental Biochemistry. W H Freeman.
- Voet Donald. 1999. Fundamentals of Biochemistry.
- Athel Cornish Bowder. 1999. Basic mathematics for biochemistry. OUP.
- Elliott & Elliot, 2001. Biochemistry and molecular biology, OUP.
- Sidman and Moore, 2000. Basic laboratory methods for biotechnology, Longman.
- Bioinformatics – Managing Scientific Data, Zoe' Lacroix and Terence Critchlow.
- Bioinformatics – Sequence, Structure and Databanks, Des Higgins & Willie Taylor.

**B.Sc. BIOTECHNOLOGY****Elective Course (EC)(Subjective)****Semester- 6****Paper : DYSFUNCTIONAL IMMUNITY****UNIT-1**

- Primary Immunodeficiency : Severe Combined Immunodeficiency (SCID).
- Secondary Immunodeficiency : AIDS.
- Organ Specific Autoimmune Diseases : Grave's disease and Pernicious anemia.
- Systemic Autoimmune Diseases : Multiple sclerosis and Rheumatoid arthritis.

**UNIT-2**

- Immediate Hypersensitivity.
- Delayed Hypersensitivity.
- Oncogenes and Cancer Induction.
- Cancer Immunotherapy.

**B.Sc. BIOTECHNOLOGY**  
**Elective Course (EC)(Subjective)**  
**Semester- 6**  
**Paper : DAIRY BIOTECHNOLOGY**

**UNIT-1**

- Nutritional value of Milk.
- Pasteurization of Milk.
- Biochemical Types of Microorganisms in Milk.
- Pathogenic Types of Bacteria in Milk.

**UNIT-2**

- Starter Cultures used in dairy industry.
- Fermented dairy products.
- Cheese production.
- Types of Cheese.



**B.Sc. BIOTECHNOLOGY**  
**PRACTICAL CORE COURSE**  
**(PAPER-11, 12, 13 & 14)**  
**SEMESTER-6**  
**LIST OF EXPERIMENTS**

1. To study water sampling techniques and sample preservation.
2. Determination of Total Solids (TS), Total Dissolved Solids (TDS) and Total Suspended Solids (TSS).
3. Estimation of Dissolved Oxygen (DO) from the given water sample.
4. Estimation of Biological Oxygen Demand (BOD) from the given water sample.
5. Estimation of PO<sub>4</sub>-P from the given water sample.
6. Estimation of NO<sub>3</sub>-N from the given water sample.
7. Estimation of NO<sub>2</sub>-N from the given water sample.
8. Estimation of Chloride from the given water sample.
9. Estimation of Sulfate from the given water sample.
10. Bacteriological analysis of water by Most Probable Number (MPN) technique.
11. Isolation of non-symbiotic nitrogen fixers from soil.
12. Isolation of symbiotic nitrogen fixers.
13. Study of air microflora.
14. Total count of White Blood Cells (WBCs).
15. Total count of Red Blood Cells (RBCs).
16. Differential Count of White Blood Cells (WBCs).
17. Estimation Hemoglobin by Sahli's Method.
18. Blood grouping
19. WIDAL test (Slide Test)
20. Agarose electrophoresis of DNA.
21. Preparation of competent cells and transformation of plasmid DNA.
22. Quantification of DNA by spectrophotometry.
23. Usage of NCBI resources for Biological Information.
24. Immobilization of enzyme.
25. Immobilization of cells.