

Biochemistry and Biophysical Techniques

Unit I

1. Biological Material-Introduction,properties,differences from non – living.
2. Organic and Inorganic compounds-In biological cells
Carbohydrate,Lipids (Chemical structure, nature , properties and importance)
3. Organic Compounds—In biological cells-Protein and amino acids,Nucleic acids(Chemical structure, nature ,properties and importance).
4. Peptidoglycan,Signal molecules etc.
5. Carbon is most suitable for the formation of bio-organic molecules.

Unit II

1. Enzymes : chemical nature ,properties, characteristics, nomenclature and classification .
2. Non protein enzymes.
3. Energy mechanisms of enzyme action.
4. Purified enzymes and their application in industries ,food processing, medicine , diagnostics and production of new compounds as research tools.

Unit III-

Biophysical techniques:

1. Lambert – Beer's law, its application in colorimetry and spectrometry.
2. Separation of macromolecules by paper and gel electrophoresis.
3. Paper chromatography,thin layer and ion exchange chromatography.

Unit-4-

1. Structural organization of nucleic acids, Watson and Crick model of DNA, Clover leaf model of RNA, bonds and linkages involved in stabilization of the structure, role of nucleic acids.
2. Structural organization of proteins- Alfa helix, sheets, loops, salt bridges, hydrophilic and hydrophobic interaction in proteins.
3. Nature of biochemical reactions underlying synthesis and degradation, role of enzymes in such reactions.

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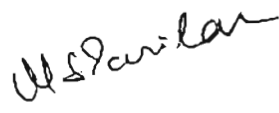

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Unit V Physical methods of studying biological structures:

1. EEG 2. ECG 3 UltraSound 4. NMR –Imaging
2. Physical methods of imaging intact biological structure: X- Ray, CAT-Scan, Optical Filters.

References

1. Fundamental of biochemistry 3 rd edition by D.Voet,JG Voet ,CW Pratt ,John Wiley and sons.
2. Principles of Biochemistry 5 Th edition by Nelson ,Cox and Lehninger,WH Freeman & company
3. Biochemistry by Zubey,Macmillan Publishing Company,New York.
4. Biochemistry Techniques : Theory and practice by Robyet and White.
5. Physical Instrumental Analysis by Skoog ,Hollar and Nieman.
6. Biochemistry C.J. Pelistia
7. Clinical Biochemistry Luxton
8. Fundamental Of Biochemistry J.L.Jain
9. Biochemistry Stryer

B.Sc . I Semester Biotechnology -Practicals



1. Study of Instrunments and Appratusses-
Microscope,Micrometer,Autoclave,Hot Plate, Vortex Shaker, Hot Air Oven ,Incubator,
,Laminar Air Flow, Centrifuge andSpectrophotometer.
- 2 Paper Chromatography (Separation of pigments, amino acids).
- 3 Qualitative estimation of proteins.
- 4 Qualitative estimation of sugars.
- 5 Quantitative estimation of proteins.
- 6 Quantitative estimation of sugars.
- 7 Estimation of urea in blood serum.
- 8 Estimation of ketones, bile salts in urine.
- 9 Estimation of kreatinine in blood serum.
- 10 Estimation of cholestrol, triglycrides, HDLC, LDL, VLDL from blood serum.

B.Sc. I Semester Scheme of Practical Examination Biotechnology

Time: -3hrs

Max marks: -50

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|---|----|
| 1. Qualitative estimation of proteins/sugars. | 06 |
| 2. Quantitative estimation of proteins/sugars. | 08 |
| 3. Quantitative estimation of various factors in in urine/ blood serum. | 08 |
| 4. Separation of pigments/ amino acids by paper chromatography | 08 |
| 5. Spotting | 10 |
| 6. Viva-voce | 05 |
| 7. Sessional | 05 |

Ms. Parul D. D.

**BSc.II Semester
Biotechnology
2015-2016**

M.M.-85

Microbiology and Microbial Techniques

Unit-I

1. History of Microbiology-Antony Von Leeuwenhoek, Louis Pasteur, Robert Koch, Edward Jenner, Joseph Lister.
2. Bacterial Nomenclature-Classification, Systems of Classification-Whittaker Five Kingdom classification.
Cell structure of prokaryotes, eukaryotes, archaeobacteria, eubacteria, fungi, PPLO, Viroids, Viruses, Prions.
3. Bacterial Species and Strains.
4. Staining techniques-Simple, Differential and Structural.

Unit-II

1. Size, shape and arrangement of bacteria cell structures -internal and external to cell wall
2. Protoplasts, sphaeroplast, spores, cyst
3. Bacteria nutrition-nutritional classes of microorganism-thermophiles, alkalophiles etc.
4. Microbiological media and its types

Unit -III

1. Cultivation of microorganisms.
2. Growth curve of bacteria, conditions affecting growth.
3. Batch and continuous cultivation of microorganism.
4. Diauxic growth and synchronous growth.

Unit-IV

1. Spontaneous generation Vs biogenesis.
2. Microscopes and microscopy-Bright field, Phase contrast, Transmission electron and Scanning electron microscope.
3. Nitrogen fixing organisms and their role.
5. Biochemistry of nitrogen fixation.
6. Symbiotic association.




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Unit-V

1. Quantitative measurement of bacterial growth by cell mass, cell count and cell activity techniques.
2. Bacteriological analysis of water.
3. Antimicrobial drugs- characteristics, determination of level of antimicrobial activity, mechanisms of vaccines, factors affecting effectiveness, drug resistance
4. Antibiotic sensitivity test

References

- 1 Pelczar ,M Jr Chan, ECS and Kreig M.R.,(Recent Edition), Microbiology,McGraw Hill
- 2 Prescott,L.M., Harley, J.P. and Klein,D.A.,2002, Microbiology,McGrawHill
- 3 Atlas,R.M. 1987, Microbiology,Fundamental and Applications, Prentice Hall
- 4 Black ,J.G.(2002) Microbiology :Principals and explorations,fifth edition,John Wiley & Sons
- 5 Tortora ,G.J Funcke,B.R. and case ,C.L.2006,Microbiology –An introduction VIIth edition, Pearson Education ,New Delhi
- 6 Cappuccino,J.G. and Sherman,N.2004. Microbiology-A laboratory manual,Pearson Education,New Delhi
- 7 Microbiology - Powar
- 8 Microbiology- Purohit S.S.
- 9 Microbiology- Desai, J.D.
- 10 Industrial Microbiology- Casida
- 11 Microbiology- Smith and Devid
- 12 Microbiology- Danginwala
- 13 Microbiology an evolving science Slonczewski Foster
- 14 Dignostic Principles and Practice Persing and White
- 15 Essentials of Medical Microbiology Volk and Kadner




 Ms. Daxta

**B.Sc .II Semester
Biotechnology -Practicals**

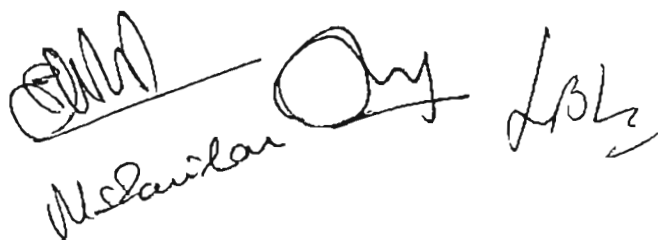
1. Isolation method Study of Permanent slides-
 - (a) Algae – Anabaena, Nostoc, Chlorella
 - (b) Fungi- Aspergillus, Penicillium , Yeast, Mucor , Rhizopus
2. Cell structure of microbes.
3. Simple staining of bacterial samples.
4. Identification of Bacteria by Gram staining, Negative staining, Endospore Staining, Metachromatic granule staining
5. Preparation of Media - Nutrient Agar, Nutrient Broth, Potato-Dextrose Agar etc. Techniques-streaking, pouring , spreading etc.
6. Study of colony characteristics.
7. Motility of microbes by Hanging Drop method.
8. Qualitative bacteriological analysis of water
9. Most Probable Number(MPN) of microbes.

**B.Sc. II Semester
Scheme of Practical Examination
Biotechnology**

Time: -3 hrs

Max marks: -50

1. Identification of bacteria by staining.	10
2. Isolation by bacteria by streak plate/pour plate technique.	10
3. Motility of microbes	06
4. MPN test	08
5. Spotting	05
6. Viva-voce	06
7. Sessional	05



 Ms. Parvati Ms. Anjali Ms. Anjali

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**B.Sc. III semester
Biotechnology
2015-2016**

M.M-85

Paper : Cell biology , Genetics and Molecular Biology

Unit I

1. Inter phase nucleus , ultra structure .
2. Nuclear envelop .
3. C value paradox ,Satellite DNA.
4. Structure and ultrastructure chromosome.
- 5 Euchromatin & heterochromatin , repetitive DNA sequences .
- 6 Cell cycle .
- 7 Genetic regulation of cell cycle.
- 8 DNA replication .

Unit II

1. Mitosis .
2. Meiosis .
3. Spindle fibre formation .
4. Mechanism of cytokinesis in plant and animal cell .
- 5 Genetic consequences of meiosis .
- 6 Cell biology of fertilisation .
- 7 DNA metabolism in meiosis .
- 8 Synaptonimal complex .
- 9 Linkage and crossing over .

Unit III

1. Mendelian laws of inheritance .
2. Chromosomal aberrations .
3. Polyploidy .
4. Evolution of chromosomes in Primates .
5. Human chromosomal abnormalities .
6. Banding techniques .
7. Genetic Maps .

Unit IV

- 1 Genetic code .
- 2 DNA Sequencing and genetic engineering .
- 3 Transcription in prokaryotes .
- 5 Transcription in eukaryotes .
- 6 Eukaryotic m - RNA biosynthesis .

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- 7 Genetic ribosomes , ribosomal proteins.
- 8 The nucleus and RNA biogenesis.
- 8 Transfer RNA , protein synthesis.

Unit V

1. Gene regulation in prokaryotes.
2. Gene organization in eukaryotes.
3. Retrovirus and cellular oncogenes.
4. Polytene and Lamp brush chromosomes.
5. General characteristics of cell differentiation.
6. Localization of cytoplasmic determinants in eggs.
7. Nucleocytoplasmic Interaction.

Reference:

- | | |
|--|---------------------------|
| 1. Cell Mol. Bio. | D. Robertis - |
| 2. Cell and Mol. Bio. | P.K. Gupta - |
| 3. Cell Biology - | Darnel |
| 4. Cell and Mol. Bio. | Ajay Paul - |
| 5. Molecular Cell Biology:J Darnell,H Lodish and Baltimore scientific American book ,inc,USA | |
| 6. Genetics: Analysis and principles: Brooker R.J,Benjamin /Cummings, Longman.inc | |
| 7. The Cell and Molecular Approach:Geofrey M.Copper,ASM Press DC,USA | |
| 8. Principles of cell & molecular biology:Gardner,E.J.,M.T.Simons & D.P.Snustad Inc. | |
| 9. Gene VI & VII | Lewin,B.Oxford University |
| 10 Cell and Mol. Bio. | Robertis |
| 11 Cell and Mol. Bio. | P.K. Gupta |
| 12 Cell and Mol. Bio Ajay Paul | |
| 13 Cell and Molecular Biology | Carp |
| 14 Molecular Biology Gene Analysis | T.A. Brown |
| 15 Cell Biology A Laboratory hand book I-IV Jolio E. Celis | |
| 16 Introduction to molecular biology | P. Paoella |
| 17 Cell Biology Pollard | |
| 18 Essential Cell Biology Elbert | |
| 19 Essintials of Genetics Klug and Cummings | |



 Uskandar ALB

B.Sc . III Semester
Biotechnology -Practicals

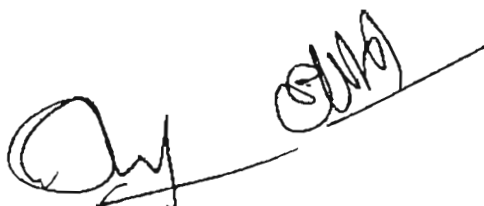
1. Cytological preparation-
 - a. Fixation, dehydration and staining (mitosis).
 - b. Squash in stain (study of cell division in plant/animal)
 - c. Embedding and sectioning.
2. Cell counting method-
 - a. Haemocytometer
3. Measurement of cells and chromosomes with micrometer(ocular and stage micrometer)
4. Separation of cell types of blood.
- 5 Separation of organelles-
 - a. Method of cell lysis- rupture/osmotic/chemical.
 - b. Enzymatic lysis of the cell followed by centrifugation.
 - c. Mechanical rupture of cell-ultrasonic vibration.
 - d. French pressure cell lysis followed by centrifugation.
- 6 Extraction of cellular material-
 - a. Extraction in saline buffer
 - b. Extraction in solvents
 - c. Precipitation from extract
- 7 Study of cell division meiosis in plant and animal tissue.
- 8 Study of polytene chromosome/bar bodies/ mitochondria

Scheme of Practical Examination
Biotechnology

Time: -3hrs

Max marks: -50

1 Paraffin embedding /Micrometry/Cell Counting	10
2 Meiosis/Mitosis/Barr Bodies/Polytene chromosome	10
3 Protein/Chlorophyll extraction and estimation	10
4 Separation of cell organelles by differential centrifugation	10
5 Spotting	10
6 Viva-voce	05
7 Sessional	05



**B.Sc. IV Semester
Biotechnology
2015-2016**

M.M.-85

Paper - Fermentation Technology, Biostatistics and Computer

Unit I Fermentation technology

1. Introduction of fermentation technology.
2. Component parts of fermentation process-agitation, aeration, pH, temperature, dissolved oxygen.
3. Sterilization of fermentor
4. Inoculum development and media preparation.
5. Harvesting and product recovery.
6. Fermentor and its types.

Unit II Industrial applications

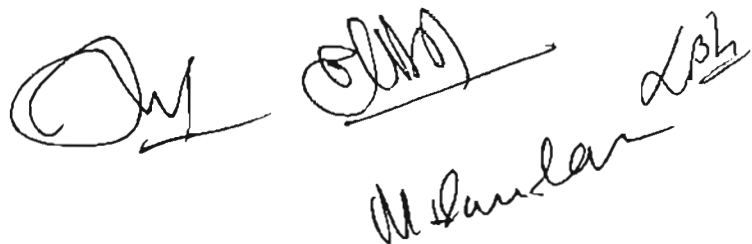
1. Production of solvents-Ethyl alcohol
2. Production of antibiotics-Penicillin
3. Production of organic acids-Acetic acids
4. Production of amino acids-Glutamic acid
5. Production of vitamins-Riboflavin

Unit: III- Biostatistics

1. Concept of random experiment, random events, type of events, classical definition of probability. Simple problems, laws of addition & multiplication of probabilities.
2. Conditional probabilities & application. Sample & population. Random sampling through random numbers.
3. Type of sampling, random & non random sampling methods.

Unit: IV Biostatistics

1. Collection presentation and analysis of data, Type of data, diagrammatic representation of data through bar & pie diagrams, graph of statistical data, frequency polygon, frequency curve & histogram.
2. Measure of central tendency –Mean, Median, Mode of raw & frequency data. Measure of dispersion. Definition of range, variance, standard deviation, Coefficient of variance, partition values, quartile & quartile deviation


M. Sankar Das

Unit: V Computers

1. Digital and analog computers, structure of computer, Input/Output devices, Computer memory –RAM, ROM, Hard disk, Pen drive, Computer software, Operating system-DOS, UNIX, Window, their simple commands.
2. Introduction of MS office, working with MS-Word, MS-Excel, MS-Power point, Internet-www, E-mail, Chatting.

Reference:

- | | |
|--|---------------------|
| 1. Biostatistics | Saras Publication |
| 2. Biostatistics | S. Prasad |
| 3. Biostatistics | Norman |
| 4. Fundamentals of computers | P.K.Sinha |
| 5. Fundamentals of computers | V.Raja Raman |
| 6. Introduction to computer DOS | Ajeet Singh |
| 7. Industrial Microbiology | L.E.Casida |
| 8. Industrial Microbiology | Agrawal and Parihar |
| 9. Microbiology | P.D.Sharma |
| 10. Biotechnology | H. K. Das |
| 11. Biotechnology- Fundamentals and applications | Purohit |




U. Parihar LBK

B.Sc. IV Semester
Biotechnology –Practicals

Fermentation Technology– Exercises based on syllabus.

1. Screening and isolation of antibiotic producing microorganisms from soil.
2. Screening and isolation of enzymes (amylase) producing organisms from soil.
3. Bioassay of antibiotic.
4. Determination of minimal inhibitory concentration (MIC).
5. Isolation of mutants by replica plate technique.

Biostatistics –Exercises based on syllabus.

1. Find the Probability from data provided using addition and multiplication theorems.
2. Apply Random sampling in material provided and represent the results in graphs and histogram.
3. Calculate the Mean, Median and Mode from data provided.
4. Calculate the Mean deviation, Standard deviation and Quartile deviation from data provided.
5. Calculate the Dispersion from various data.

Computers -Exercises based on syllabus.

1. Prepare the Power Point presentation using different types of customization.
2. Make a Word document using different commands.
3. Editing and inserting the data according to instructions in given data.
4. Preparation of charts and tables in WINDOW.
5. Make a work sheet in MS-Excel.
6. Apply different types of arithmetical functions in Excel.
7. Make the directory in MS-DOS using internal and external commands.
8. Make your e.mail address and sending an e.mail.
9. Prepare html form.
10. Working with World Wide Web.


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B.Sc. IV Semester
Scheme of Practical Examination
Biotechnology

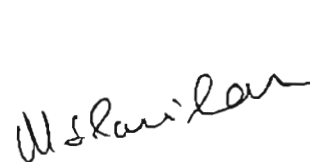
Time: -3hrs

Max marks: -50

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| 1. Screening and isolation of antibiotic producing/ enzymes (amylase) producing microorganisms from soil. | 05 |
| 2. Bioassay of antibiotic/ Determination of minimal inhibitory concentration (MIC)/ Isolation of mutants by replica plate technique. | 10 |
| 3. Probability / Mean/ Median/ Mode. | 05 |
| 4. Mean deviation/ Standard deviation/ Quartile deviation / Dispersion. | 05 |
| 5. Power Point presentation / Word/ MS-Excel. | 05 |
| 6. MS-DOS/ e.mail/ html. | 05 |
| 7. Spotting | 05 |
| 8. Viva-voce | 05 |
| 9. Sessional | <u>05</u> |
| | Total 50 |









B.Sc. V Sem.
Biotechnology
2015-2016

14

M.M. -85

Paper - Recombinant DNA, Plant and Animal Biotechnology

UNIT: -I

- (1) Recombinant DNA technology.
- (2) Restriction endonucleases – types, nomenclature and recognition sequences.
- (3) Vectors.
- (4) Chemical synthesis of genes.
- (5) Gene Libraries.
- (6) Gene amplification - PCR - apparatus, types, principle and applications.

UNIT: -II

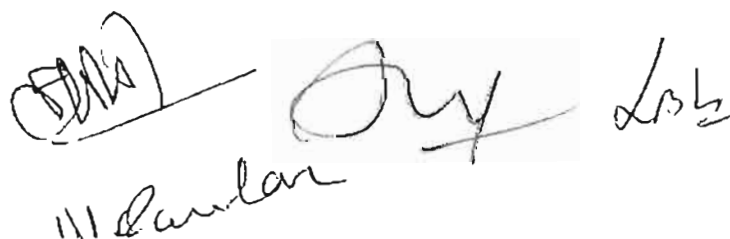
- (1) Animal tissue culture.
- (2) Hybridoma technology and Monoclonal antibodies.
- (3) In vitro fertilization and embryo transfer in human.
- (4) Transgenic animals.
- (5) Cell culture products.
- (6) DNA finger printing.

UNIT: -III

- (1) Plant tissue culture- general techniques, nutrient media, Callus.
- (2) Cloning and regeneration.
- (3) Anther, meristem, ovary and embryo culture.
- (4) Somatic hybridization.
- (5) Somaclonal variation.
- (6) Transgenic plants.

UNIT: -IV

- (1) Immobilization of enzyme.
- (2) Uses of enzymes in solution.
- (3) Biofertilisers and biocontrol agents.
- (4) Biotransformation and bioleaching.
- (5) Biodegradation of xenobiotic compounds.
- (6) Single cell protein.




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UNIT: -V

- (1) Gene therapy.
- (2) Forensic medicine.
- (3) Northern hybridization and DNA microarray.
- (4) Disease prevention (vaccines).
- (5) Disease diagnosis.
- (6) Disease treatment.

References: -

- (1) Molecular Biotechnology – Bernard R. Glick and Jack J. Pasternak
- (2) Plant cell, tissue and organ culture – O.N. Gamborg
- (3) Gene Biotechnology - S.N. Jogdanad
- (4) Biotechnology and Genomics - P.K. Gupta
- (5) Plant Tissue Culture - K.G. Ramawat
- (6) Biotechnology - B.D. Singh
- (7) Principles of gene manipulation, Old & Primrose
- (8) Gene Cloning: An introduction, Brown
- (9) Genes and Genome (1991), Singer & Berg
- (10) Genome – T.A. Brown
- (11) Principles of Gene manipulation and Genomics - Primrose and Tywman
- (12) Plant tissue culture by Raazdan
- (13) Plant tissue culture by Bhojwani



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List of Practicals
B.Sc. V Semester

1. DNA Extraction from plant tissue.
2. DNA Extraction from animal tissue.
3. DNA Extraction from bacterial cell.
4. RNA Extraction from animal tissue.
5. RNA Extraction from plant tissue.
6. Amplification of genetic material through PCR.
7. Quantitative estimation of DNA and RNA.
8. Separation of protein by Gel Column Chromatography.
9. DNA agarose gel electrophoresis.
10. Protein electrophoresis (SDS-PAGE)

B.Sc. V Semester
Scheme of Practical Examination
Biotechnology

Time: -3hrs

Max marks: -50

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|--|----|
| 1. Isolation of DNA/RNA from Plant/Animal tissue/Bacterial cell. | 10 |
| 2. Separation of Protein by Gel Column Chromatography / Amplification of genetic material through PCR. | 10 |
| 3. Quantitative estimation of DNA or RNA/ separation of DNA or Protein by gel electrophoresis. | 10 |
| 4. Spotting | 10 |
| 5. Viva-voce | 05 |
| 6. Sessional | 05 |




U. Bairan

L. B. B.

Paper - Immunology and Immunological techniques

UNIT: -I

- (1) Introduction and history.
- (2) Normal flora of human body.
- (3) Infection and its types.
- (4) Mechanism of pathogenesis.
- (5) Organs of immune system.
- (6) Cells of immune system-
T-cells- its types and receptors.
B-cells- its receptors.
- (7) The complement system, mode of activation, classical and alternative pathway.

UNIT: -II

- (1) Immunity- Innate and acquired (active and passive).
- (2) Immunity- Humoral and cell mediated.
- (3) Host defense mechanism- First, second and third line of host Defense.
- (4) Antigens- properties, types and adjuvants.
- (5) Immunoglobulins- structure, types, properties and functions
- (6) Antibodies- generation.

UNIT: -III

- (1) Major Histocompatibility Complex.
- (2) Hypersensitivity.
- (3) Auto immune diseases.
- (4) Immune response- primary and secondary.
- (5) Antigen- antibody reaction, precipitation, agglutination, flocculation and immunofloresence.
- (6) Latex and Haemagglutination, ELISA, RIA, ODD and RID.

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UNIT: -IV

- (1) Tolerance.
- (2) Transplantation immunology.
- (3) Immunodeficiency diseases.
- (4) Development of Cancer.
- (5) Causes of Cancer.
- (6) Tumor viruses.
- (7) Oncogenes and protooncogenes.

UNIT: -V

- (1) Bioenergetics.
- (2) Isotopes, radioactivity and biological uses of radioactivity.
- (3) Nuclear magnetic resonance.
- (4) X-ray crystallography.
- (5) Isoelectric focusing and 2-dimensional gel electrophoresis.

References: -

1. Immunology - Janis Kuby
2. Essentials of Immunology - Ivann Roitt et al
3. Principles of Immunology - N.V. Shashtri
4. Immunology - Saras Publication
5. Biophysics - Upadhyay and Nath
6. Basic Biophysics For Biologist - M..Daniel
- 7 Immunology - Janis Kuby
- 8 Essentials of Immunology - Ivann Roitt et.al
- 9 Principles of Immunology - N.V. Shashtri
- 10 Immunology - Saras publication
- 11 Immunology: An introduction by Tizzart



 Usman Khan

List of Practicals
Biotechnology
B.Sc. VI Sem

1. Double Immunodiffusion (Ouchterlony Immunodiffusion).
2. Radial Immunodiffusion.
3. Latex Agglutination.
4. WIDAL Test.
5. VDRL Test.
6. Sandwich dot ELISA.

B.Sc. VI Semester
Scheme of Practical Examination
 Biotechnology

Time: -3hrs

Max marks: -50

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|--|----|
| 1. Double Immunodiffusion (Ouchterlony Immunodiffusion)/
Radial Immunodiffusion test. | 10 |
| 2. Sandwich dot ELISA/ Latex Agglutination test. | 12 |
| 3. WIDAL Test/ VDRL Test | 08 |
| 4. Spotting | 10 |
| 5. Viva-voce | 05 |
| 6. Sessional | 05 |

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