

# SPACES DEGREE COLLEGE

## B.Sc. Biochemistry Semester wise Syllabus

Skill Enhancement Courses (SECs) for Semester -V,  
From 2022-23(Syllabus-Curriculum)  
Structure of SECs for Semester-V

*(To choose One pair from the Four alternate pairs of SECs)*

Univ. Code	Course 6&7	Name of the Course	Th. Hrs. / Week	IE Marks	EE Marks	Credits	Prac. Hrs./ Wk	Marks	Credits
	6A	Clinical Biochemistry	3	25	75	3	3	50	2
	7A	Haematological and Immunological Techniques	3	25	75	3	3	50	2

OR

Univ. Code	Course 6&7	Name of the Course	Th. Hrs. / Week	IE Marks	EE Marks	Credits	Prac. Hrs./ Wk	Marks	Credits
	6B	Food Technology	3	25	75	3	3	50	2
	7B	Food Microbiology	3	25	75	3	3	50	2

OR

Univ. Code	Course 6&7	Name of the Course	Th. Hrs. / Week	IE Marks	EE Marks	Credits	Prac. Hrs./ Wk	Marks	Credits
	6C	Genetic Engineering	3	25	75	3	3	50	2
	7C	Bioinformatics	3	25	75	3	3	50	2

Note: \*Course type code: T: Theory, L: Lab, P: Problem solving

\*Note: FIRST and SECOND PHASES (2 spells) of APPRENTICESHIP between 1st and 2nd year and between 2nd and 3rd year (two summer vacations)

\*Note: THIRD PHASE of APPRENTICESHIP Entire 5th / 6th Semester

**Note-1:** For Semester-V, for the domain subject Biochemistry, any one of the three pairs of SECs shall be chosen as courses 6 and 7, i.e., 6A & 7A or 6B & 7B or 6C & 7C. The pair shall not be broken (ABC allotment is random, not on any priority basis).

**Note-2:** One of the main objectives of Skill Enhancement Courses (SEC) is to inculcate field skills related to the domain subject in students. The syllabus of SEC will be partially skill oriented.

Hence, teachers shall also impart practical training to students on the field skills embedded in the syllabus citing related real field situations

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**B.Sc. Biochemistry Semester wise Syllabus**

<b>B.Sc</b>	<b>Semester – V (Skill Enhancement Course- Elective)</b>	<b>Credits:4</b>
<b>Course: 6A</b>	<b>Clinical Biochemistry</b>	<b>Hrs/Wk:4</b>

## UNIT - I

### **Introduction:**

Organization of Clinical laboratory. Introduction to instrumentation and automation in Clinical biochemistry laboratories, safety regulations and first aid. General comments on specimen collection, Type of specimen for biochemical analyses. Precision, accuracy, quality control, precautions and limitations.

## UNIT - II

### **Basics of Hepatic and Renal physiology:**

Evaluations of biochemical changes in liver and kidney diseases, Liver function tests (LFTs), Renal function tests (RFTs), GFR. Diagnostic biochemical profile.

## UNIT - III

### **Glucose metabolism**

Digestion, absorption and assimilation of carbohydrates. Enzymes and hormones (Insulin, Glucagon) in regulation of blood glucose levels. Clinical significance of variations in blood glucose levels, disorders - Diabetes mellitus, Insulin resistance

## UNIT - IV

**Lipid profile:** Lipids, fats, Triglycerides, cholesterol, fatty acids, PUFAS. Digestion and absorption of lipids. Composition and functions of lipoproteins. Clinical significance of elevated lipoproteins.

### **Exercises**

Estimation of triglycerides, cholesterol, LDL, VLDL and HDL cholesterol.

## UNIT - V

**Cardiovascular diseases:** Basic cardiovascular physiology, biochemical symptoms associated with cardiovascular diseases and their evaluation. Involvement of enzymes in diagnosis of heart diseases including Aspartate transaminase, Isoenzymes of creatine kinase and lactate dehydrogenase and troponin.

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<b>B.Sc</b>	<b>Semester – V (Skill Enhancement Course- Elective)</b>	<b>Credits:1</b>
<b>Course: 6A</b>	<b>Clinical Biochemistry Lab</b>	<b>Hrs/Wk:2</b>

1. Collection of blood, separation of plasma, serum and their storage
2. Estimation of bilirubin (direct and indirect method)
3. Estimation of serum transaminases (AST, ALT) and serum alkaline phosphatases (ALP)
4. Quantitative determination of serum urea and creatine
5. Use of urine strips / dip strip method for urine analysis
6. Estimation of blood glucose by glucose oxidase - peroxidase method
7. GTT (Glucose Tolerance Test)
8. Estimation of cholesterol
9. Estimation of creatine kinase (CK)
10. Estimation of LD

### Suggested readings

1. Medical laboratory technology a procedure manual for routine diagnostic tests. Volume 1, Mukherjee, K.L, Tata Mc Graw hill publishing Company Limited, (New Delhi). ISBN 9780070076594/ISBN-978007007663
2. Medical laboratory technology a procedure manual for routine diagnostic tests. Volume 2, Mukherjee, K.L, Tata Mc Graw hill publishing Company Limited,(New Delhi). ISBN 9780070076648
3. Medical Biochemistry 2005, 2 nd Edition, Bayner, J.W, and Dominiak, M.H, Elsevier, Mosby Ltd (Philadelphia). ISBN-0/7234/3341/0
4. Experimental Biochemistry, A student companion (2005), Rao, B.S, and Deshpande, V., IK international Pvt.Ltd(NewDelhi) ISBN-8188237/41
5. Clinical diagnosis and management by Lab methods (John Bernard Henry, W.B. Saunders Company, 1984).
6. Clinical Biochemistry – S. Ramakrishnan and Rajiswami.
7. Clinical chemistry in diagnosis and treatment–Joan F.Zilva and P.R.Pannall (Lloyd-Luke Medical Books,

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<b>B.Sc</b>	<b>Semester – V (Skill Enhancement Course- Elective)</b>	<b>Credits:4</b>
<b>Course: 7A</b>	<b>Haematological and Immunological Techniques</b>	<b>Hrs/Wk:4</b>

## UNIT - I

### **Introduction**

Organization of Clinical Immunology laboratory. Introduction and maintenance of clinical Immunology laboratory; hazards in clinical laboratory; units; 'normal range', reference values. Factors affecting reference values quality control in laboratory – use of external and internal standards; use of WHO standards.

## UNIT - II

### **Composition of blood and Lymph**

Plasma and cells-RBC, WBC, platelets, blood clotting, plasma proteins, separation and applications, plasma therapy. Lymph.

## UNIT - III

### **Advanced diagnostic methods**

Identification of viral, bacterial and other diseases - ELISA, Western blot, RT-PCR, Tissue Histopathology, fixing, staining (H&E) and microtome sections

## UNIT - IV

### **Auto immunity**

Introduction, Auto recognition, classes of auto immuno diseases. (Hashimoto disease, thyrotoxicosis, Systemic lupus erythematosus, Autoimmune haemolytic anaemia, Rheumatoid arthritis).

## UNIT - V

### **Immunoglobulins (Igs)**

Types of Igs, nature and structure of Igs –Light chain, heavy chain and functions. Adjuvants, Antibody production, enzymatic cleavage of Igs, Haptens.

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<b>B.Sc</b>	<b>Semester – V (Skill Enhancement Course- Elective)</b>	<b>Credits:1</b>
<b>Course: 7A</b>	<b>Haematological and Immunological Techniques Lab</b>	<b>Hrs/Wk:2</b>

1. Determination of human blood groups
2. Differential Leucocyte count in human peripheral blood by Leishmans staining
3. Separation of mononuclear cells from human peripheral blood
4. Determination of Erythrocyte Sedimentation Rate (ESR)
5. Determination of Packed Cell Volume (PCV)
6. Estimation of Haemoglobin (Hb) by Sahlis acid hematin method
7. Detection of HCG by latex agglutination inhibition test
8. Widal test
9. Ouchterlony double immuno diffusion
10. Single Radial Immunodiffusion

## REFERENCE BOOKS

1. Essential Immunology - By I. Roitt, Publ: Blackwell
2. Immunology - By G. Reeve & I. Todd, Publ: Blackwell
3. Abbas AK, Lichtman AH, Pillai S. Cellular and Molecular Immunology. Saunders Publication, Philadelphia
4. Goldsby RA, Kindt TJ, Osborne BA. Kuby's Immunology. W.H. Freeman and Company, New York
5. Ronald Hoffman, Edward J. Benz Jr., Leslie E. Silberstein, Helen Heslop, Jeffrey Weitz, John Anastasi - Hematology: Basic Principles and Practice, Elsevier Health Sciences, 2012
6. Betty Ciesla, Hematology in Practice, F.A. Davis, 2011.

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<b>B.Sc</b>	<b>Semester – V (Skill Enhancement Course- Elective)</b>	<b>Credits:4</b>
<b>Course: 6B</b>	<b>Food Technology</b>	<b>Hrs/Wk:4</b>

**UNIT-I**

**Food Regulations and Standards**

Sampling methods - Sample preparation for analysis; Statistical evaluation of analytical data - Official Methods of Food Analysis. Moisture in foods - determination by different methods - ash content of foods, wet, dry ashing, microwave ashing methods; Significance of Sulphated Ash, water soluble ash and acid insoluble ash in foods determination of dietary fibre and crude fibre.

**UNIT-II**

**Analysis of major food components**

Determination of total fats in foods by different methods; Analysis of oils and fats for physical and chemical parameters, Quality standards, and adulterants; different methods of determination of protein and amino acids in foods; determination of total carbohydrates, starch, disaccharides and simple sugars in foods.

**UNIT-III**

**Processing and preservation of foods**

Blanching, pasteurization, sterilization, microwave heating. Low Temperature-refrigeration, freezing, dehydro-freezing. Food irradiation. Processing and preservation by drying, concentration and evaporation. Non-thermal methods like High pressure, pulsed electric field, hurdle technology. Use and application of enzymes and microorganisms in processing and preservation of foods.

**UNIT-IV**

**Environmental contaminants and drug residues in food:**

Fungicide and pesticide residues in foods; heavy metal and their health impacts; use of veterinary drugs (e.g. Malachite green in fish and  $\beta$ -agonists in pork); other contaminants in food, radioactive contamination of food, Food adulteration and potential toxicity of food adulterants. Endocrine disrupters in food.

**UNIT-V**

**Fermentative food Products**

Foods: Processes for preparing fermented products including Yogurt (curd) and other Traditional Indian Products like idli, dosa, dhokla, shrikhand, Soya based products like soya sauce, natto, Cheese.; Alcoholic Beverages based on fruit juices (wines), cereals (whisky, beer, vodka,), sugar cane (rum) Process description, quality of raw materials, fermentation process controls.

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<b>B.Sc</b>	<b>Semester – V (Skill Enhancement Course- Elective)</b>	<b>Credits:1</b>
<b>Course: 6B</b>	<b>Food Technology Lab</b>	<b>Hrs/Wk:2</b>

1. Titratable Acidity in foods.
2. Determination of proteins, fats and carbohydrates
3. Methods for Processing and preservation of foods
4. Determination of Glucose content by enzymatic method (amylase, invertase)
5. Qualitative detection of adulterants in foods
6. Wine preparation from fruit juices and molasses
7. identification of microbial strains in yogurt
8. MBRT of milk

## Reference Books

1. A first course in food analysis By A. Y. Sathe.
2. Hand book of analysis and quality control for fruit & vegetable products By S. Ranganathan.
3. Handling and storage of food grains by S. V. Pingale.
4. Food science chemistry & experimental food By Dr. M. Swaminathan.
5. Food chemistry by William Hogland Meyer.
6. Food adulteration By Thankamma Jacob.
7. Food Microbiology by William C. Frazier.
8. Preservation of Fruits and Vegetables by Giridharilal.

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<b>B.Sc</b>	<b>Semester – V (Skill Enhancement Course- Elective)</b>	<b>Credits:4</b>
<b>Course: 7B</b>	<b>Food Microbiology</b>	<b>Hrs/Wk:4</b>

## UNIT I

History and development of Microbiology-Importance and significance of microorganisms in food science. Bacterial growth curves, Factors affecting the growth of microorganisms in food – Intrinsic and Extrinsic parameters

## UNIT II

Determination of microorganisms and their products in food: Sampling, sample collection, transport and storage, sample preparation for analysis. Microscopic and culture dependent methods- Direct microscopic observation, culture, enumeration and isolation methods; Chemical and Physical Methods-Chemical, immunological and nucleic acid-based methods;

## UNIT III

### **Protection and preservation of Foods:**

Chemical, Modified atmosphere, Radiation in foods from the microbiological angle. Indicators of water and food safety and quality: Microbiological criteria of foods and their Significance.

## UNIT IV

Food spoilage: characteristic features, dynamics and significance of spoilage of different groups of foods - Cereal and cereal products, vegetables and fruits, meat poultry and sea foods, milk and milk products, packed and canned foods.

## UNIT V

**Food borne diseases:** *Bacterial borne diseases* (Staphylococcal intoxication, Botulism, Salmonellosis, Shigellosis, Enteropathogenic *Escherichia Coli Diarrhoea*, *Clostridium Perfringens gastroenteritis*, *Bacillus cereus Gastroenteritis*). *Mycotoxins:* Aflatoxicosis, Deoxyvalenol Mycotoxicosis, Ergotism. Drug resistance - phenomena and mechanism.



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<b>B.Sc</b>	<b>Semester – V (Skill Enhancement Course- Elective)</b>	<b>Credits:1</b>
<b>Course: 7B</b>	<b>Food Microbiology Lab</b>	<b>Hrs/Wk:2</b>

1. Preparation of common laboratory media and special media.
2. Bacterial count by standard plate method (SPC )
3. Isolation and Identification of bacteria
4. Gram's staining
5. acid-fast staining
6. Microbiological analysis of typical processed foods
7. Coli form test
8. Microbiological analysis of food born bacterial pathogens

### Text books and reference materials

1. Prescott LM Harley JP and Klein DA (2006). Microbiology (7th edition)McGraw Hill, Newyork.
2. Frazier, W.C. (1988) Food Microbiology, Mc Graw Hill Inc. 4th Edition.
3. Vijaya Ramesh,K. (2007) Food Microbiology. MJP publishers, 2007
4. Yasmine Motarjemi and Martin Adams. (2006) Emerging Food bornepathogen- Wood Head Publishing England.
5. Arun, K Bhunia. (2008) Food borne microbial pathogens: Mechanismsand pathogenesis. Springer.
6. Thomas J. Montville, Karl R. Matthews, Kalmia E. Kniel (2012). Food Microbiology: An Introduction, American Society for Microbiology.
7. Dubey, R.C. and Maheswari, D.K. (2008) Text book of Microbiology. S Chand Publishing.

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<b>B.Sc</b>	<b>Semester – V (Skill Enhancement Course- Elective)</b>	<b>Credits:4</b>
<b>Course: 6C</b>	<b>Genetic Engineering</b>	<b>Hrs/Wk:4</b>

**UNIT -I**

**Basics of Genetic engineering**

Introduction, historical perspective, basics of cloning, Vectors, Restriction enzymes, plasmids PBR 322, PUC vector, Cosmids, YACs, cDNA libraries.

**UNIT -II**

**Genetic Engineering in Animals**

Gene transfer methods in Animals. Transfection. Microinjection, Embryonic-stem cells Gene transfer and Retro-virus Gene transfer methods to create transgenic animals. Applications of transgenic animals in agriculture, medicine and pharmaceuticals.

**UNIT -III**

**Genetic engineering in Plants**

Manipulation of Plant Genes-Electroporation, Shotgun method, *Agrobacterium* mediated gene transfer. Applications in Crop improvement, disease and pest resistance, tolerance to environmental stress. Genetically engineered foods.

**UNIT- IV**

**Genetic engineering in Microorganisms**

Gene transfer methods in microorganisms - transformation, transduction and conjugation. Transposons.

**UNIT- V**

**Genetic engineering-Environment**

Bioremediation Biodegradation, Biofuels and Bioplastics from genetically engineered rape oil seed and other crops as substitutes for fossil fuels, Biosensors.

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<b>B.Sc</b>	<b>Semester – V (Skill Enhancement Course- Elective)</b>	<b>Credits:1</b>
<b>Course: 6C</b>	<b>Genetic Engineering Lab</b>	<b>Hrs/Wk:2</b>

1. PCR
2. Restriction mapping
3. CaCl<sub>2</sub> mediated transfection
4. Restriction Fragment Length Polymorphism (RFLP)
  
5. Random Amplified Polymorphic DNA (RAPD)
6. Plasmid isolation from E. coli

### Suggested books

1. Genes and Probes, A Practical Approach Series (1995) by Hames and SJ Higgins; Oxford
2. Gel Electrophoresis of Nucleic Acids, A practical Approach (1990) by D Rickwood and BD Hames. Oxford Univ. Press.
3. Genetics by Gardinar
4. Biotechnology by U.Satyanarayana

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<b>B.Sc</b>	<b>Semester – V (Skill Enhancement Course- Elective)</b>	<b>Credits:4</b>
<b>Course: 7C</b>	<b>Bioinformatics</b>	<b>Hrs/Wk:4</b>

**UNIT- I**

**Scope of Bioinformatics**

No. of Hours:6

Genomics, structural and functional genomics, genome annotations, gene production approaches and tools. DNA microarray and computational analysis tools. Computer aided drug design and systems biology.

**UNIT- II**

**Biological data bases**

No. of Hours:6

Introduction to biological databases. Primary, secondary and composite databases, NCBI, EBI, Nucleic acid databases (Gene Bank), EMBL, DDBJ, NDB) protein database, (PIR, Swissport, TrEMDL, PDB) Metabolic databases (KEGG, EcoCyc).

**UNIT -III**

**Sequence Alignments:**

Similarity, identities and homology. Concept of alignment pairwise sequence alignment, gaps, gap-penalties, scoring matrices, PAM 250, BLOSUM62, Local and Global Sequence alignment, multiple sequence alignment, progressive alignment, Logarithm alignment. Application of multiple sequence alignment- CLUSTAL W, BLAST-blastn, blastp and blastx

**UNIT- IV**

**Genome projects**

General introduction to genome projects (rice and *Mycobacterium tuberculosis* genome project). Special emphasis on Human Genome Project (HGP). Science behind HGP, benefits of HGP, genetic testing standard, quality and commercialization.

**UNIT- V**

**Proteomics**

Introduction, principle, technique of swiss- 2D PAGE data base. Gel analysis, post gel analysis, MALDITOF. Significance and applications of proteomics in modern biology.

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<b>B.Sc</b>	<b>Semester – V (Skill Enhancement Course- Elective)</b>	<b>Credits:1</b>
<b>Course: 7C</b>	<b>Bioinformatics Lab</b>	<b>Hrs/Wk:2</b>

1. Searching data from Biological data bases
2. Demonstration on Nucleic acid and protein databases
3. Simple and multiple Sequence alignment
4. Searching structural data from PDB
5. Database search using BLAST
6. SDS-PAGE
7. IEF (2-D gel analysis)
8. Demonstration of MALDI -TOF

### Suggested books

1. Genome Mapping: A practical approach. Dear P (Editor). 1st Ed. 2000. Oxford University.
2. Developing Bioinformatics Skills. Alfonso Valencia and Blaschke. L (2005) Oreilles
3. Bioinformatics sequence, structure and data banks ed. By Des Higgins Willie Taylor (2006).
4. Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins" (Andreas D. Baxevanis, B. F. Ouellette), Paperback, 2nd ed., 470 pp., ISBN: 0471383910, Publisher: Wiley, John & Sons, Inc.Pub.
5. David W. Mount, Bioinformatics: Sequence and Genome Analysis, 2nd edition, Cold Spring Harbor Laboratory, 2004.
6. Introduction to Bioinformatics by T.K. Altwood and D.J Parry-Smith (Pearson Education Asia1999).

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**MODEL QUESTION PAPER**  
**PAPER-6A Clinical Biochemistry**

(w.e.f. 2022-23)

**Time: 3 hours**

**Max.Marks: 75**

SECTION-A

Answer any five questions.

[5X5=25M]

1. Specimen collection
2. GFR
3. Diabetes mellitus
4. PUFAS
5. Lactate dehydrogenase
6. Glucagon
7. Renal function tests (RFTs)
8. Quality control

SECTION-B

Answer all the questions.

[5X10=50M]

9. a) Write about instrumentation and automation in clinical biochemistry laboratories.  
(OR)  
b) Write a detailed note on specimen collection and types of specimens for biochemical analyses.
10. a) Write an essay on Liver function tests (LFTs).  
(OR)  
b) Write an essay on evaluations of biochemical changes in liver and kidney diseases
11. a) Write about digestion, absorption and assimilation of carbohydrates  
(OR)  
b) Write about the role of glucagon in regulation of blood glucose levels
12. a) Write a detailed note on digestion and absorption of lipids.  
(OR)  
b) Write an essay on clinical significance of elevated lipoproteins.
13. a) Write a detailed note on involvement of enzymes in diagnosis of heart diseases.(OR)  
b) Write an essay on heart physiology.

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**MODEL QUESTION PAPER**  
**PAPER-7A: Haematological and Immunological Techniques**

(w.e.f. 2022-23)

**Time: 3 hours**

**Max. Marks: 75**

SECTION-A

[5X5=25M]

Answer any five questions.

1. Hazards in clinical laboratory.
2. WBC.
3. Western blot.
4. Thyrotoxicosis.
5. Haptens.
6. Plasma proteins.
7. Microtome.
8. Structure of Igs.

SECTION-B

[5X10=50M]

Answer **ALL** the questions.

9. a) Write an essay on Introduction and maintenance of clinical Immunology laboratory.(OR)  
b) Write in detailed note on quality control in laboratory.
10. a) Write an essay on blood clotting.  
(OR)  
b) Write an essay on plasma therapy.
11. a) Write a detailed note on ELISA.  
(OR)  
b) Write an essay on RT-PCR.
12. a) Write an essay on Systemic lupus erythematous.(OR)  
b) Write an essay on autoimmune hemolytic anemia.
13. a) Write a detailed note on Antibody production.(OR)  
b) Write an essay on Types of Igs, nature and structure of Igs.

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**MODEL QUESTION PAPER**  
**PAPER- -6B FOOD TECHNOLOGY**

(w.e.f. 2022-23)

~~Time: 3 hours~~

~~Max. Marks: 75~~

SECTION-A

[5X5=25M]

Answer any five questions.

1. Microwave ashing method.
2. Analysis of oils and fats
3. Pasteurization
4. Endocrine disrupters in food
5. Shrikhand preparation
6.  $\beta$ -agonists in pork
7. Microorganisms in food processing
8. Determination of dietary fibre

SECTION-B

[5X10=50M]

Answer all the questions .

9. a) Write an essay on Significance of Sulphated Ash, water soluble ash and acid insoluble ash in foods

(OR)

- b) Write in detailed note on determination of Moisture in foods.

10. a) Write an essay on Determination of total fats in foods by different methods.(OR)

- b) Write an essay on determination of total carbohydrates, starch, disaccharides and simple sugars in foods.

11. a) Explain various Non-thermal methods used in Processing and preservation.

(OR)

- b) Write an essay on Use and application of enzymes and microorganisms in processing and preservation of foods.

- 12a) Write a detailed note on Food adulteration and potential toxicity of food adulterants.

(OR)

- b) Write an essay on heavy metals in food and their health impacts.

- 13.a) Write a detailed note on preparation of Alcoholic Beverages based on fruit juices (wines),cereals.

(OR)

- b) Write an essay on Processes for preparing fermented products including Yogurt (curd) and other Traditional Indian Products



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**MODEL QUESTION**  
**PAPER PAPER-7B: FOOD**  
**MICROBIOLOGY**

(w.e.f. 2022-23)

**Time: 3 hours**

**Max. Marks: 75**

**SECTION-A**

[5X5=25M]

Answer any five questions

1. Bacterial growth curves.
2. Nucleic acid based methods.
3. Indicators of water and food safety and quality.
4. Food spoilage in Cereal and cereal products.
5. Botulism.
6. Radiation in foods.
7. Immunological methods in Determination of microorganisms.
8. Ergotism.

**SECTION-B**

[5X10=50M]

Answer all the questions.

9. a) Write an essay on Bacterial growth curves.(OR)  
b) Write in detailed note on Factors affecting the growth of microorganisms in food – Intrinsic and Extrinsic parameters
10. a) Write an essay on Microscopic and culture dependent methods (OR)  
b) Write about Determination of microorganisms and their products in food Chemical and Physical methods.
11. a) Write a detailed note on Indicators of water and food safety and quality. (OR)  
b) Write an essay on Radiation in foods from the microbiological angle.
12. a) Write an essay on characteristic features, dynamics and significance of spoilage of vegetables and fruits. (OR)  
b) Write an essay on characteristic features, dynamics and significance of spoilage of meat poultry and sea foods.
13. a) Write an essay on Drug resistance - phenomena and mechanism (OR)  
b) Write an essay on Staphylococcal intoxication, Salmonellosis, Shigellosis

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**MODEL QUESTION PAPER PAPER-**  
**6C GENETIC ENGINEERING**

(w.e.f. 2022-23)

**Time: 3 hours**

**Max. Marks: 75**

SECTION-A

[5X5=25M]

Answer any five questions

1. PUC vector.
2. Microinjection.
3. Shotgun method.
4. Transposons.
5. Biosensors.
6. Genetically engineered foods.
7. Applications of transgenic animals in agriculture.
8. YACs.

SECTION-B

[5X10=50M]

Answer all the questions.

9. a) Write an essay on Restriction enzymes.(OR)  
b) Write in detailed note on cloning Vectors
10. a) Write an essay on Gene transfer methods in Animals (OR)  
b) Write about Applications of transgenic animals in agriculture, medicine and pharmaceuticals.
11. a) Write a detailed note on Applications of Genetic engineering in Crop improvement, disease and pest resistance,. (OR)  
b) Write an essay on *Agrobacterium* mediated gene transfer and Electroporation.
12. a) Write an essay on transformation, transduction and conjugation. (OR)  
b) Write an essay on Transposons.
13. a) Write an essay on Biofuels and Bio plastics from genetically engineered plants(OR)  
b) Write an essay on Bioremediation and Biodegradation

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**MODEL QUESTION PAPER**  
**PAPER-7C BIOINFORMATICS**  
(w.e.f. 2022-23)

Time: 3hours

Max. Marks:75

SECTION-A

[5X5=25M]

(Answer any five questions .

1. DNA microarray.
2. DDBJ.
3. CLUSTAL W.
4. Benefits of HGP.
5. MALDITO
- F.6. PAM
- 250.
7. Swiss port.
8. Genetic testing.

SECTION-B

[5X10=50M]

Answer all the questions.

9. a) Write an essay on Computer aided drug design.  
(OR)  
b) Write in detailed note on structural and functional genomics
10. a) Write an essay on protein databases  
(OR)  
b) Write about Metabolic databases (KEGG, EcoCyc).
11. a) Write a detailed note on Concept of alignment and its applications,.  
(OR)  
b) Write an essay on BLAST-blastn, blastp and blastx
12. a) Write an essay on Human Genome Project (HGP).  
(OR)  
b) Write an essay on *Mycobacterium tuberculosis* genome project).
13. a) Write an essay on Significance and applications of proteomics in modern biology.  
(OR)  
b) Write an essay on Introduction, principle, technique of swiss- 2D PAGE data base