

B.Sc. Biotechnology-I

Paper II

Math's, biostatistics, Computers and Bioinformatics

Math's : The set theory properties of sub sets; linear geometric functions, the nominal theorem of integer, limits of functions (basic idea of limits of unction without analytic definition), derivatives of functions, logarithm definition & laws of logarithm, use of logarithm, use of logarithm table), differentiation, integration (general introduction, significance and application for simple algebraic and trigonometric functions).

Biostatistics: Probability calculation (classical & axiomatic definition of probability, theorem on total and compound probability), standard distribution with important properties, simple problems involving binomial, poissnand no normal variables, methods of sampling collection of data; primary & secondary data, classification & tabulation, confidence level, statistics, idea of sampling, distribution and standard error, large samples; normal tests, measurement of dispersion (measures of location and dispersion)

Computers: General introduction (characteristics, capabilities, generations), software, hardware, organic ion of hardware (input devices memory, control unit arithmetic logic unit, output divices); software; application software, languages-low level, high level). Interpreter, compiler, data processing; batch, on-line, real time (example from bio-industries, e.g. application of computers in co-ordination of solute concentration, ph, temperature, etc., of a fermenter in operation) internet application.

Bioinformatics: Application of computers in biotechnology, genome analysis sequence, primer designing, phylogenetic analysis.

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Cell Biology

Paper III:

Cell as a basic unit of living systems: The cell theory precellular evolution; artificial creation of "cell"; broad classification cell type, PLOS. Bacteria eukaryotic microbes, plant and animal cells a details classification cell types within an organism, cell, tissue, organ and organism at different levels of organization of otherwise genetically similar cells, ecological amplitude of cells in high altitude, sediments, areties, hot spring, arid brackish and freshwater environments: biochemical composition of cells.

Ultra structure of the cell membrane and cell organelles: Structure and function of cell organelles; ultrastructure of cell membrane, cytosol golgi bodies, endoplasmic reticulum (rough and smooth), mitochondria, chloroplasts, lysosomes, peroxysomes, nucleus (nuclear membrane nucleoplasm, nucleolus).

Chromosomes: Chemical composition; structural organic atoms of chromatids, centromeres, telomeres, chromatin, nucleosome organization eu- and heterochromatin; special chromosomes (e.g., polytene and lampbrush chromosomes); banding patterns in human chromosomes.

Cell division and cell cycle: mitosis and meiosis interphase and mitosis comparison of mitosis and meiosis

Cell-cell interaction: Cell locomotion (amoeboid, flagellar, and ciliary) muscle and nerve cells, cell senescence and death.

Cell differentiation: Plants and animals difference between normal and cancer cells

B.Sc. Biotechnology-I

Paper IV:

Instrumentation & Bio-analytical Techniques

Microscopy: Simple phase contrast microscopy, fluorescence and electron microscopy (TEM and SEM)

Instruments, basis principles and usage: pH meter, absorption and emission spectroscopy, principle and law of absorption and radiation, use of densitometry, fluorimetry, colorimetry, spectrophotometry (visible, uv, infrared), manometry, plarography, centrifugation, atomic absorption, IR, NMR, X-ray crystallography.

Chromatography techniques: Paper chromatography, within layer chromatography, column chromatography, gas chromatography, affinity chromatography, gel filtration, chromatography, ion exchange (paper gel etc.)

Electrophoresis: SDS polyacrylamide electrophoresis immunoelectrophoriss, isoelectric focussing.

B.Sc. Biotechnology-I

Paper I:

Biochemistry and Biophysics

Inture of biological materials : Polymeric reaction, carbohydrates, lipids, proteins, nucleotide, nucleic acid oxidation-reduction properties, pH, pK and buffering, isomerism, types of chemical bonds, and hydrophilic hydrophobic groups in biomolecules. Neurotransmitters, hormones and growth factors, high energy (ATP, GTP & Creative phosphate)

Perspectives of biological macromolecules: The repeating units in nucleic acids proteins, helicity, bending, looping pleats, salt bridges etc, and their determinants, basis for intermolecular interactions with example. Enzyme substrate and antigen-antibody reactions, salient features of biochemical reactions involved in the biosynthesis of amino acids fatty acids and nucleotides.

Bio-energetics: laws of thermodynamics (1st & 2nd laws) electrical properties of biological compartments, electrochemical gradients membrane potential, Chemiosmosis hypothesis.

Energetics of a living body: Sources of heat limit to temperature, heat dissipation and conservation Lambert Beer law, spectrophotometry and calorimetry, primary events photosynthesis, strategies of light reception in microbes, plants and animals correction of vision build generation and reception of sonic vibrations, hearing aids

Electrical properties of biological compartments: Electricity as potential signal.

Intra and intermolecular interaction in biological system : Space and charge compatibility as determinant of such interactions.

B.Sc. Biotechnology-I

Paper-I

Algae, fungi, bryophytes and pteridophytes

Unit-I: Classification, occurrence, structure, systematic position and mode of reproduction and economic importance of following general; chlanydomonas, values, oedogonicim, vaucheria, chara, saragassum, polysiphonia, nostoc:

Unit-II: Outlines of classification of fungi as systematic position, occurrence, structure and mode of reproduction in fungi, based on the following representatives & synchytrium, eurotium, morclella, agaricus and alternaria.

Unit-III: Outlines of classification and importance of boyophytes systematic position, occurrence, mospholgy, anatomy and reproductive structure in riccia, morchantia, anthocerus, development of sporophyte only)

Unit-IV: Systematic position, occurrence, mosphology, anatomy and reproductive structure of the following taxa rhynia, (quisetum, marsilia and selayinella steler system and its evolution in ptesidophytas heterospory and seed habit.

B.Sc. Biotechnology-I

Paper –II (Gymnosperms and taxonomy of angiosperms')

Unit-I: 1) General characteristics, affinities of classification of gymnosperm

2) Distribution of gymnosperms in India

3) Systematic position, occurrence of morphology and development of reproductive structure of the following taxa:-

4) Economic importance of gymnosperms.

Unit-II 1) Classification as proposed by bentham and hooker

2) Importance of herbaria and botanical gardens in India.

3) Binomial nomenclature and elementary knowledge of international code of nomenclature.

Unit-III 1) Systematic position, distinguishing character and economic importance of following families .

2) Dicotyledons

a) Polypetales, ranunculaceae, papaveraceae, caryophyllaceae, rutaceae cucurbitaceae ,
Rosaceae

apataceae

b) Gamopetales, rubiaceae, apocynaceae, asclepiadaceae, convolvulaceae acanthaceae,
leguminosaceae,

varvenaceae

c) Monochlamydeous monocotyledons poaceae, Arecaceae.

B.Sc. Biotechnology-I

Inorganic and Physical Chemistry

Unit-I

Inorganic bonds and molecules maps of simple molecules, bond energy, bond length, resonance and hydrogen bond.

Radioactivity: Natural and artificial, group displacement law, half life period, binding energy, reaction equations, isotopes, tracers, radiodating application of radioactivity.

Periodic table: Modern periodic table periodicity in properties of elements atomic radii, ionic and covalent radii, ionization energy, electron affinity, electron negativity

Ores and minerals: Principles involved in the extraction of metals iron ores, including their refining and purification. General trends in the chemistry of s block elements (Group A & IIA).

Unit II

Physical

Gases: Kinetic theory of gases, van der Waals' equation, critical constants, liquefaction of gases.

Chemical Kinetics: Velocity of a reaction, law of mass action determination of rate constant for first and second order reactions, collision theory of bimolecular reactions.

Paper II Organic and physical

Organic:- Organic chemistry is chemistry of carbon compounds. Methods of purification test of purity; qualitative and quantitative elemental analysis, determination of molecular formula. Tetrahedral concept in carbon compounds, function groups, nomenclature and isomerism.

General methods of preparation and properties of alkanes, alkenes, alkynes, halogen substituted alkanes (CH_2Cl_2 , CHCl_3 , $\text{C}_2\text{H}_5\text{Cl}$) and others.

Grignard reagent: preparation and synthetic uses ethyl alcohol, propanol; glycol, glycerol, aldehydes, ketones, formaldehyde, acetaldehyde, and acetone. Monocarboxylic acids and their simple derivatives, descriptive studies of dicarboxylic acids, viz malic, tartaric, malonic, fumaric acid. Tricarboxylic acid, citric acid and urea synthesis, geometrical and optical.

Keto-enol tautomerism; aceto-acetic ester and malic ester petroleum; fractionation cracking and synthetic petrol.

B.Sc. Biotechnology-I

Unit II

Physical

Chemical equilibrium: Reversible reactions; equilibrium law equilibrium influencing equilibrium state:

Electro chemistry: Electrolysis, laws of electrolysis, ionization specific, equivalent and molecular conductance, ionization constant common ion effect, hydrogen ion concentration, pH venue theory of acid base indicators, buffer solutions, hydrolysis of salts and solubility product simple calculations based on these concepts.

Practical's

Inorganic

Volumetric analysis: Oxidation-reduction titration using KMnO_4 and $\text{K}_2\text{Cr}_2\text{O}_7$

Iodometry titrations: Estimation of thiosulphate potassium dichromate, and copper sulphate preparation of the following: organic compounds: prussian blue from iron fillings, iron's aluminum cuprammonium salt, cuprous chloride and potassium trioxalate, atochromate.

B.Sc. Biotechnology-I

Behaviour Science

Culture and Society

Nature of Culture and its Development

Society-its characteristics

Types and organization

Genetic basis of behavior-Primate and Human

Evolution of behavior

Genetic and deviant behavior

Mechanism and development of behavior phenotypes.

B.Sc. Biotechnology-II

Paper VII: Molecular Biology

Molecular Basic of life:- (Structure of DNA) replication both prokaryotes and eukaryotes, DNA recombination molecular mechanism in prokaryotic and eukaryotic.

Insertion elements and transposons.

Organization of genetic material:- split genes, overlapping genes, pseudo genes, Cryptic genes.

Genetic code:- Properties of genetic code, Code on assignment, Chain initiation and Chain terminating codons Wobble hypothesis.

Structure of prokaryotic genes:- Prokaryotic transcription, Prokaryotic translation, Prokaryotic gene expression (lac, his, trp, catabolic repression)

Structure of eukaryotic genes:- Eukaryotic transcription, Eukaryotic translation.

Prokaryotic Gene regulation:- Operon model for regulation of lac genes: positive control of the lac operon

Eukaryotic gene expression:- Levels of control of genes expression: RNA processing transport, mRNA translation, mRNA degradation and protein degradation controls.

Molecular mapping of genome:- Genetic and physical maps, Molecular markers for genomic analysis. Genome sequencing: Methods of genome sequencing.

B.Sc. Biotechnology-II

Paper VII: Immunology

Historical perspective of immune system and immunity:- Innate and specific immunity.

The organs and cells of the immune system.

Antibody structure in relation to function and antigen- binding:-+ Types of antibodies and their structure, Isotypes idiotypes.

Measurement of antigen:- Antibody interaction, Agglutination, Immunodiffusion, immunoelectrophoresis, ELSA, RIA, Production of monoclonal antibodies.

Histocompatibility:- Structure of MHC class I, II, & III antigen & their mode of antigen presentation, MHC restriction, Antigen & antigenicity.

Humoral Immunity and clonal selection theory.

Cell – Mediated immunity.

Immunoglobins Gene:- Genetic basis of creation of antibody diversity, Effect of T-cell functions.

Immunity in infection of diseases: - Vaccines (attenuated and recombinant) and Vaccination.

Antibodies in targeting therapeutic agents.

Autoimmunity and autoimmune diseases:- Hashimoro's thyroiditis, myasthenia gravis, Rheumatoid arthritis, Pernicious anemia Asthma.

B.Sc. Biotechnology-II

Paper VI: Microbiology

History and development of microbiology:- Pasteur's experiments, Concept of sterilization, Methods of sterilization (dry heat, radium, chemical and filtration etc.), Microscopy (optical, TEM, and SEM) Concept of microbial species and strains: Growth curve, Various forms of micro-organisms (Bacteria, fungi, viruses, Protazoa, PPLOs) Nature of Microbial cell surfaces, Gram positive and gram negative bacteria, kinds of Flagella, Sero, types, Nutritional classification of micro-organisms.

Genetic homogeneity in clonal population:- Isolation of auxotroph (replica plating technique and analysis of mutations in biochemical pathways), Microbial assays for vitamins and antibiotics, Strain improvement by selection.

Control of micro organisms:- Physical agents, Chemical agent, Antibiotics and other chemotherapeutic agents.

Micro-----

Microbes in extreme environment:- The thermophiles & alkalophiles, Pathogenic microorganisms, Defence mechanism against microorganism, Symbiosis and antibiosis among microbial population N₂ fixing Bacteria Microbial in agriculture and forestry.

Industrial microbes and their uses:- Production of food (Dairy and SCP) and Drugs (Antibiotics- with special reference to penicillin & streptomycin) Fermentation products. A survey of products from micro-organism.

B.Sc. Biotechnology-II

Paper V: Genetics

Mendelian laws of inheritance.

Lethality and interaction of genes.

Multiple alleles and isoalleles

Linkage and crossing-over:- Mapping of genes, inheritance, Coincidence in pro and eukaryotes.

Sex determination in plants and animals:- Sex-linkage, Non disjunction as a proof of chromosomal theory of inheritance.

Basic microbial genetics:- Conjugation, transformation, Transduction and their uses in genetic mapping.

Concept of genes:- Classical and modern gene concepts, Pseudoallelism, Position Effect, Intragenic crossing over and complementation (Cistron, recon, and muton), Benzer's and on locus in T4 Phase.

Mutation- Spontaneous and Induced:- Chemical and Physical mutagens, induced mutations in plants, animals and microbes for economic benefit of man.

Structural and numerical aberrations involving chromosomes:- Evolution of wheat, cotton and rice, Hereditary defects- Klinefelter, Turner, Cri-du-Chat and Down syndromes.

Extrachromosomal Inheritance:- Cytoplasmic Inheritance, Mitochondrial and Chloroplast genetic systems.

Population genetics:- Hardy-Weinberg equilibrium, Gene and genotype frequencies.

B.Sc. Biotechnology-II

Botany-III

Plant Physiology, Ecology and Plant Anatomy

Unit-I

1. Diffusion, osmosis Permeability, inhibition, osmotic potential neater potential.
2. **Types of soils and neater:-** passive and active absuplies
3. Assent of sap.
4. Transpiration, closing and opening mechanism of stomata and diffusion capacity of the stomata, significance of transpiration, guttation factors affecting transpired

Unit-II&III

1. Mechanism of absorption of mineral salts.
2. Elementary knowledge of the macro-elements
3. Symptoms of mineral deficiency, hydroponics and send cultures.
4. Mechanism of translocation of solutes.
5. Photosynthesis: Importance of the process, sole of the pigments, light and dark reaction, photophosphorylative and electron transport system, path of carbon and factors affecting photosynthesis C3 C4 (kranz peat and cycle), chemosynthes.
6. **Respiration :-** Glycolsis Krebs cycle, factors effecting reaction, fermentation.

Unit-IV

1. Ecosystem with reference to forest and pond
2. Energy flow and promerivity
3. Ecological niche and biological indicators.
4. Biogeochemical cycle: carbon, nitrogen and hydrogen
5. Biotic communities
6. Ecological concept of species

Unit-V

1. Techniques for the study of plant antomy practical
2. Meristems
3. Leaf anatomy, Epidermis, stoma
4. Origin, Structure and function of the Vascular cambium
5. Structure of xylem and phloem.
6. Cock cambium activity and products
7. Root- stem transition

B.Sc. Biotechnology-II

Botany-IV

Embryology, plant pathology, plant breeding & Economic Botany

Unit-I

1. Structure of anther, Microsporogenesis and development the male gametophyte
2. Structure of ovule megasporogenesis and development the female gametophyte with particular reference polygamous type.
3. Fertilization, endosperm and embryo on grad type
4. Apomixis and polyembryony

Unit-II

1. General symptoms of fungal, bacterial & viral diseases their control.
2. Systematic position, morphology of the causal organism parasite relationship, disease cycle in the following diseases – white rust of crucifers, late blight potato, loose smut of wheat, rust of wheat, citrus canker and yellow vein disease of bhindi

Unit-III

1. Nature and objectives of plant breeding
2. General methods of plant breeding
3. Role of hybrid vigour in plant breeding Heterosis

Unit-IV

1. Economic importance with special reference to plant food cereals (Rice, Wheat, Maize) potato, sugarca legumes (pigeon pea, gram and pea) oil field plants (sarson, Til, groundnut, Cotton). Fruits (Apple, peach and Citrus).
2. Common Fibre yielding plants- Cotton, Suntenp, Jute Medicinal plants- (papaver somniferum, rauniolfua se and auopa heladona)
3. Common timber yielding plants- pinus sp. Cedars de shorea robusta, do dolbergia sisso te

B.Sc. Biotechnology-II

Chemistry-III

Inorganic:-

Acid and baser:- Elementary idea of ozronsted lourry and concept of acids and bases (Proton donor acceptor and electron donor acceptor relative strength of leurs acids bases and effect of substituent's and the solvent.

General properties of 3rd elements & coordination components:- mol compounds, werness co-ordination theory, IUPAC system of nature of coordination compounds, Discussion of Quter and orbit complexes role of tracer elements (Na, K, Mg, Ca, Fe, Zn, Cr, P, S, Cl, and I) in biological system.

General trende in the chemistry of P-block elements:- Preparation properties, uses and the structure of the following compound chlorides, hydrazine, hydroxylamine and acids, oxides and phosphorus tortaremetic hydrogen sulphide (analytical actin of oxides and oxyacids of sulphur, chloride ox acids of chlorine

Physical:-

Liquids:- Vapour pressure, variation of vapour pressure of with temperature (Clausius claperon equation) surface tension, viscosity their experimental determine and application, parachor, rheochar and their application.

Solutions:- Henery's law, raoul't's law critical solution temperature, fractional distillation and steam disti osmosis and measurement of osmotic pressure effect of on boiling point and freezing points of solutions calc of molecular weight abnormal molecular weight.

Heterogenous equilibria:- Phase rule, Phase diagrams of sulphur system, Nernst's distribution solvent extraction.

B.Sc. Biotechnology-II

Chemistry-IV

Organic:-

Carbohydrates:- Classification properties and uses, preparation of cane sugar constitution of glucose and fructose mutarotation general study of cycloalkanes arenes halogen substituted aromatic compounds simple phenols, nitro and amino compounds aldehydes and ketones, phenolic aldehydes and ketones, carboxylic acids (mono and di), Electrophilic substitutions, orientation in aromatic compounds.

Descriptive study of benzene:- Toluene Chloro, benzene nitro benzene sulphonic acid, sulphonic and phthalic acid and salicylic acid, naphthalene preparation, structure and synthesis preparation of a and b naphthylamine preparation of di & tri hydroxyphenols constitution of pyridines and quinoline

Physical:-

Chemical thermodynamics:- Energy, work, heat capacity first law of thermodynamics heat of a reaction at pressure and constant volume Hess's law, Kirchhoff's equation the second law of thermodynamics, Entropy (S), determination Entropy, changes to reversible transition process, free energy, free energy change and chemical equilibrium.

Electrochemistry:- Galvanic cells, standard electrode potential--- types of electrodes measurement of pH, (galvanic or electrochemical cell).

Photochemistry:- Lambert Beer law, law of photochemical equivalence cell, phosphorescence and fluorescence.

B.Sc. Biotechnology-III

B.Sc.- III

Biotechnology

Paper IX:

Recombinant DNA Technology

1. Introduction to gen cloning and its uses, tools and techniques, plasmids and other vectors, DNA, RNA, cDNA.
2. Restriction enzymes and other reagents techniques, laboratory requirement, safety, measures.
3. Purification of DNA from bacterial, plant and animal cells, manipulation of purified DNA.
4. Introduction of DNA into living cells and their screening.
5. Application of cloning in gene analysis (obtaining clone of a specific gene, studying gene location, structure, expression).
6. Expression of foreign genes in prokaryotes and eukaryotes.
7. Production of proteins from cloned genes: gene cloning in medicine (pharmaceutical agents such as insulin, growth hormones, plasminogen activator, clotting factors, interferon, recombinant vaccines). Gene therapy for genetic diseases.
8. Nucleic acid, oliganucleotide and immunoscreening of libraries and other probes.
9. Isolation and characterization of clones.
10. Analysis of DNA by Southern blotting.
11. Analysis of RNA by Northern blots hybridizations.
12. Analysis of proteins by Western blot techniques.
13. Dot blots and slot blots.
14. RFLP
15. AFLP
16. PCR: Basic principles ancient modification application and uses.

B.Sc. Biotechnology-III

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Biotechnology

Paper IX:

Animal biotechnology

1. General metabolism.
2. Special secondary metabolites/products (insulin, growth hormone, interferon, t plasminogen activator, activator, factor VIII etc).
3. Expressing cloned proteins in animal cells.
4. Over production and processing of chosen protein-the need to express in animal cells.
5. Production of monoclonal antibodies.
6. Growth factors promoting proliferation of animal cells: (EGF. FGF. PDGF. II. I. II.-2 NGF, crythropoietin).
7. Bioreactors for large scale culture of cells- Transplanting cultured cells)
8. Preservation and maintenance of animal cell lines. Cryopreservation and transport of animal germ plasm (i.c. semen. Ovum and ombryos).
9. Transgenic animals.
10. In vitro fertilization and embryo transfer.

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Biotechnology

Paper XII:

Environmental Industrial Biotechnology

1. Renewable and non-renewable resources.
2. Conventional fuel and their environmental impacts (firewood and animal waste, coal).
3. Modern fuels and their environmental impacts (methanogenic bacteria and binges. Microbial hydrogen production, conversion of sugars to ethanol, the gasoil experiment, solar energy converter- hopes from the photosynthetic pigments.
4. Possibility of plant based petroleum industry and cellulose degradation for exhaustible fuel.
5. Treatment of municipal wastes and industrial effluents.
6. Degradation of pesticides and other toxic chemicals by microorganism. B.thuringh and Biopesticides.
7. Enrichment of ores by microorganisms (Bioaccumulation and Biopesticides).
8. Biofertilisens (nitrogen fixing microorganisms, mycorrhiza).
9. Environmental impacts and assessment of transgenic organism.
10. Bio-assessment of environmental quality.
11. Fermentation: The Fermentation industry, selection of industrial microorganisms, production process, fermentation, media aeration, pH, temperature, batch versus contin culture, immobilized enzymes, downstream processing and product recovery, food industry waste as fermentation substrate, solid state fermentation.
12. Dairy in vitro fertilization and embryo transfer in livestock, transgenic cows, letter utilization, fermentation carry products.

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Biotechnology

Paper X:

Plant Biotechnology

1. Introduction to in vitro methods: Terms and definitions , use of growth regulators, Beginning of in vitro cultures in our country (ovary and ovule culture) in vitro pollination and fertilization, Embryo culture, embryo rescue after wide hybridization and its applications. (Endosperm culture and production of triploids)
2. Introduction to the processes of embryogenesis and organogenesis and their practical application: Clonal multiplication of elite species (Micropropagation) axillary bud, shoot-tip and meristem culture) (Haploids and their application), Somaclonal variations and applications (Treasure your exception). Practical applications of tissue and organ culture (summarizing the practical applications of all the above mentioned techniques) (Single-cell suspension, culture and their applications in selection of variants/mutants with without mutagen treatment) (of haploid culture preferable)
3. Introduction to protoplast isolation: Principles and applications. Testing of viability of isolated protoplasts. Various steps in the regeneration of protoplast. Somatic hybridization –an introduction various methods for fusing protoplasts, chemical and electrical. Use of markers for selection of hybrid cells. Practical application of hybridization (hybrids vs cybrids)
4. Use of plant cell, protoplasts and tissue culture for genetic manipulation of plant: Introduction to A, tumefaciens, tumor formation on plants using A. tumefaciens. Roots formation using A thizogenes. Practical applications of genetic transformation.
5. Transgenic plants for the production of human therapeutics, edible vaccines, herbicide insect and pest resistant stress tolerant.

B.Sc. Biotechnology-III

Syllabus for Entrepreneurship Development Course

01. Need, scope and characteristics of entrepreneurship,	
02. Identification of opportunities 03. Exposures to demand – based, resource based, service base import substitute and export promotion industries. 04. Market survey techniques. 05. Need scope and approaches for project formulation 06. Criteria for the principles of product selection and development 07. Structure of project report 08. Choice of technology, plant and equipment 09. Institutions, financing procedure and financial incentives 10. Financial ratio and their significance 11. Books of accounts, financial statements and funds flow analysis 12. Energy requirement and utilization 13. Resource Management Men. Machine and Material 14. Critical path Method (CPM) & project evaluations review Techniques (PERT) as planning tools for establishing SSI. 15. a) Creativity and innovation b) Problem solving approach. 16. Techno-economic feasibility of the project 17. Plant layout & process planning for the project 18. Quality control/Quality assurance and testing of product 19. Elements of Marketing & Sales Management 20. a) Nature of..... b) Packaging and advertising c) After sales service 21. costing and pricing 22. Management of self and understanding human behavior 23. Sickness in small scale industrial their remedial measures 24. Coping with uncertainties management and positive Reinforcement. 25. a) Licensing, registration b) Municipal bye laws and insurance coverage 26. Important provisions of factory act, sales of goods 27. a) Dilution control b) social responsibility and business ethics 28. Income tax, sales tax and excise	

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Biotechnology

Paper IX:

Genomics and proteomics

Genomics

- Genome evolution and phylogenetics
- The Origin of genomes
- Acquisition of new Genes
- DNA Sequencing chemical and enzymatic methods
- The Origins of introns
- Restriction mapping
- DNA & RNA fingerprinting
- The Human Genome

Proteomics

- Basic principles of protein structure
- Modeling of three- dimensional structure of a protein from amino acid Sequences.
- Modeling mutants.
- Evaluating protein structure
- Designing proteins.
- Analysis of nucleic acid/protein sequence and structure data. Genome and proteome data using web-based tools.