

Objectives:

- **To bring awareness about the environment and its resources**
- **To Study the various concepts for conservation of the environment**

Unit I :- ENVIROMENTAL SCIENCE-I

- Concepts & types of resources.
- Current status of major resources: Water, Land, mineral, biological resources.
- Need for conservation of resources.
- Energy - Conventional and nonconventional energy resources.
- Land: Land use pattern and optimization; metal and non- metal resources
- soil as resource, soil Erosion
- Concept of sustainable development
- Environmental Organizations & Agencies-CITES, EPA, IUCN & MAB.

UNIT II: ENVIRONMENTAL SCIENCE –II

- Air: Components of air and their significance; common air pollutants, their sources, effects.
- Greenhouse gases and global climate change, Common water pollutants, their sources, effect
- mining and its effect
- Agricultural practices and their polluting effects;
- Types of solid wastes, strategies of solid waste management.
- Noise Pollution : Sources, types & effects of pollutants
- Environmental Laws in India: Water Prevention & Control of Pollution Act 1974, Air Prevention & Control of Pollution Act 1981, Environment Protection Act 1986 & Biological Diversity Act 2002.

rules, D,L and R,S systems of nomenclature. Geometric Isomerism - Determination of configuration of geometric isomers. E and Z system of nomenclature.

Topic-4-: Alkanes:

07 Hrs

Methods of formation (Koble reaction, Corey - House reaction and decarboxylation of carboxylic acids) Physical properties and chemical reaction of alkanes.

Alkene: Nomenclature of alkenes, methods of formation, mechanism of dehydration of alcohols and dehydrohalogenation of alkylhalides. The Saytzeff rule, Hofmann elimination, physical properties and relative stabilities of alkenes. Chemical reaction of alkenes - mechanisms involved in hydrogenation, electrophilic and free radical addition, Markownikoff's rule, hydroboration and oxidation with KMnO_4 . Polymerization of alkenes with one example each.

Topic-5- Arenes and Aromaticity:

03 Hrs

Nomenclature of benzene derivatives. The aryl group. Aromatic nucleus and side chain structure of benzene : molecular formula and Kekule structure. Resonance structure, MO Picture.

Aromaticity : The Huckel rule, aromatic ions Aromatic electrophilic substitution : General pattern of the mechanism (Nitration, halogenations and Sulphonation) and Friedel Crafts reaction.

Topic- 6- Alkyl and Aryl halides:

03 Hrs

Polyhalogen Compound : Chloroform, Carbon tetrachloride. Methods - formation of aryl halides, nuclear and chain reaction.

Paper Code- 102201

Lab Course

2 Credits, 50 Marks (30 Hrs)

2 Hrs/Week

Unit 1

Inorganic Volumetric Analysis:

- 1) Preparation of 0.1 N NaOH solution and its standardization by given succinic acid.
- 2) Standardization of NaOH solution by 0.1 N oxalic acid solution.
- 3) Estimation of Ferrous ion (Fe^{2+}) from the solution using supplied KMnO_4 solution.
- 4) Estimation of Sodium Carbonate and Sodium Bicarbonate from the given sample using 0.1 N HCL Solution.

Unit 2

Organic Qualitative Analysis:

Nature, Elemental Analysis, Functional group, physical constant of :

Benzoic acid. Acetone, β -naphthol, m-nitroaniline,

Naphthalene, Acetanilide, Methyl Acetate, nitrobenzene.

SEMESTER-I

PAPER-I

: - **Algae, Fungi, Lichens, Bacteria, Viruses.**

Subject Code: - [104101]

- (1) **Algae**: -General characters of algae, structure, life cycle systematic position of *Nostoc* and *Zygnema*, Economical importance of algae.
- (2) **Fungi**: -General characters of fungi, structure, life cycle and Systematic position of *Rhizopus* and *Aspergillus*, Economical importance of Fungi.
- (3) **Lichens**: - Classification, structure, nature of association, forms of thalli, methods of reproduction, Economical importance and ecological significance of lichens.
- (4) **Bacteria**: -Occurrence, Characteristics, Classification, Morphological forms, Ultrastructure, growth, Reproduction and Economical importance of bacteria.
- (5) **Viruses** : - Occurrence, Characteristics, Classification, Morphological forms, Ultrastructure, Multiplication and Economical importance of Viruses. TMV- Structure and multiplication.

PAPER-II

Subject Code:- 104102

Morphology, Taxonomy and Anatomy:-

- (1) **Morphology**: - Typical plant, Types of inflorescence (Racemose, Cymose, and Special types) , Floral morphology, Symmetry of flower, Parts of flower, Modification of calyx, corolla, aestivation, Placentation, Floral formula.
- (2) **Taxonomy** :- (Angiosperms)

**Systems of Classification, Artificial, Natural and Phylogenetic,
Binomial Nomenclature.**

Bentham and Hookers system of classification upto order (family) with respect to the following prescribed families Annonaceae, cruciferae, malvaceae, Leguminosae (All the three sub families), Asteraceae, Solanaceae, Acanthaceae, Euphorbiaceae, Liliaceae

(3) Anatomy:-

**Introduction of various tissue system in plants Epidermal tissue system-
Epidermal outgrowth Stomata (Typical Dicot and monocot Stomata)
study of the primary structure of Dicotyledonous and
Monocotyledonous stem, root and leaf.**

Practical Syllabus of Botany (F.Y.B.Sc) Sem-I

Total of 20 practicals

Sub. Code: 104201

1) ALGAE:-

**study of stages in the life cycle of nostoc & zygnema.
Economic Importance of Algae**

2) Fungi:-

study of stages in the life cycle of Rhizopus & Asoergillus.

3) Lichens:- Study of Crustose, Foliose and Lichens.

4) Bacteria:-

Study of Forms of Bacteria, Gram Staining of Bacteria.

Practical-II

➤ **Morphology**

1)Inflorescence Racemose, Cumose and Special Type

**2) Flowers - Typical Flower, Hypogynous and Perigynous, Aestivation,
Types of Calyx and Corolla**

**3)Typical Stamen, Adhesion and Cohesion, Typical, Carpel and
Placentation.**

➤ **Angiosperms**

**Annonaceae, Malvaceae, Leguminosea, Asteraceae, Solanaceae,
Acanthaceae, Euphorbiaceae**

➤ **Anatomy**

- 1) **Study of Meristematic and Permanent Tissues**
- 2) **Study of Epidermal Outgrowths**
- 3) **Study of typical Stomata**
- 4) **Study of Primary Structure in Roots, Stem and Leaves**

First Year- First Semester

Paper 105101

Animal Diversity and Physiology

30 Lectures, 2 credits

Objectives

- To study the invertebrate classification.
- To understand some of the specialized features of each invertebrate Phylum
- To get a basic knowledge of the working of the various physiological systems within the animal kingdom

UNIT I: DIVERSITY OF ANIMAL KINGDOM – I (15 Lectures)

General characteristics upto classes with examples:

Phylum- Protozoa- Skeleton and Reproduction in Protozoa

Phylum- Porifera- Spicules, Canal system and Reproduction in Porifera

Phylum- Coelenterata – Polymorphism, Corals and Coral reefs in Coelenterata

Phylum- Platyhelminthes- Parasitic adaptations in Helminthes

Phylum – Aschelminthes- Life cycle of Ascaris

Phylum – Annelida- Reproduction in Annelida

Phylum- Arthropoda- Metamorphism in insects

Phylum- Mollusca – Foot and Shell in Mollusca

Phylum – Echinodermata – Water Vascular System in Starfish

UNIT II : BASIC ANIMAL PHYSIOLOGY (15 Lectures)

Locomotion – Cilia, Flagella, Pseudopodia, Parapodia, Striated Muscle Fiber

Nutrition – Modes of Nutrition , intracellular and Extracellular Digestion, Incomplete and complete Digestion

Excretion – Contractile Vacuole, Nephridium, Flame cells, Antennary Gland, Nephron

Circulation- Open, Closed Single and Double Circulation, Types of hearts based on structure and function

Respiration – Skin, Gills and Lungs

Nervous System – Nerve Plexus, Structure of neuron, Mammalian brain

Reproduction – Hermaphroditism, Asexual and sexual Reproduction, Parthenogenesis.

Paper 105102

Animal Diversity, Ecology and Biodiversity

2 credits

Objectives

- To study the vertebrate classification
- To understand some of the specialized fetures of each vertebrate class
- To study the interactions between animal and the environment

UNIT I: DIVERSITY OF ANIMAL KINGDOM II

15 Lectures

General Characteristics of the vertebrates classes with example :

Class – Pisces – Swimbladder in fishes

Class – Amphibia – Parental care in Amphibians

Class – Reptilia – Adaptive Radiation in Reptiles

Class – Aves – Types of beaks and feet in birds

Class – Mammelia – Aquatic Mammal and their adaptation

UNIT II : ECOLOGY AND BIODIVERSITY

15 Lectures

ECOLOGY

Types of Ecosysytem

Energy Flow

Food Chain & Food Web

Biogiochemical cycles: Water , CO₂ , Nitrogen and Phosphate

BIODIVERSITY

Definations of biodiversity

Benefits and conservation of biodiversity

Factors affecting of biodiversity

PRACTICAL 105201

(Based on course 105101 & 105102)

2 Credits

1) Animal Classification

Protozoa :Amoeba, Euglena, Paramoecium, Plasmodium

Porifera: Leucosolenia, Bath Sponge,

Coelenterata: Hydra, Liver Fluka, Tap Worm

Nimathelminthes: Ascaris (Male & Female)

Annelida: Nereis, Earthworm and Leech

Arthropoda: Crab, lobster, Lepisma, beetle, dragonfly, butterfly,

Spider, centipede, millipede

Mollusca: Chiton, Dentalium, Pila, bivalve, Sepia, Nautilus

Echinodermata: Starfish, brittle star, Sea urchin, sea cucumber, feather star

Pisces :Chondrichthyes – Shark, Sting ray, Electric Ray

Osteichthyes – Bombay duck, Mackerel, Pomfret, Rohu

Amphibia : Frog Toad, Caecilian, salamander, Siren

Reptilia: Chameleon, Calotes/ Gecko, turtle, tortoise, snake, crocodile,

Phrynosoma

Aves :Kite, duck, Owl

Mammalia :Hedgehog, Bat, Guinea pig

2. Mounting of Spicules from Sponge

3. Nutritional apparatus in animals

4. Respiratory organs in vertebrates.

5. Circulation system – Types of Hearts

6. Excretory system – L.S. and T.S. of kidney

7. Mounting of Septal nephridium and setae

8. Determination of pH of soil.

9. Estimation of Dissolved Oxygen in the water sample

10. Estimation of Hardness of water in the water sample

F.Y.B.Sc. Semester-II

Women's Issue-I

Paper Code- 200101

Credits 2

Objectives- To Understand new and emerging women's issues in india.

-To empower to deal with these issues & problems.

1) Introduction & Social Construction of Gender:

Socialization of the girl child, Patriarchy and gender disparity.

Propagation of stereotypes through advertisements, films & media.

2) Issues affecting the quality of life of women:

Health Issues of women: Nutrition, Female mortality rate, sex selection and Female foeticide.

Problems of women education: access and retention.

Gender inequality in academic achievement.

3) Violence against Women:

Violence within the home: girl child abuse, women abuse in the family.

Sexual harassment at workplace.

Girl & Women Trafficking.

4) Feminism & Empowerment:

Concept of Feminism.

Types of Feminism.

Empowerment of women: Meaning & Significance.

Education for empowerment and development of women.

First Year- Second Semester

Paper Code- 202101

Physical Chemistry

2 Credits, 50 Marks (30 Hrs)

03 Hrs/Week

Topic -1 -Gaseous State:-

06 Hrs

Postulates of kinetic theory of gases, kinetic gas equation, Deduction of Gas Laws : Boyles Law, Charles Law, Graham Law of diffusion, Avogadro's hypothesis, deviation from ideal behaviour, van der Waals equation of state. Critical Phenomena : PV isotherms of real gases.

Topic-2- Chemical Kinetics and Catalysis :-

12 Hrs

Chemical Kinetics and its scope, rate of reaction, factors influencing the rate of reaction rates. Derivation of rate law and characteristics of simple chemical reactions - zero order, first order, second order, Pseudo first order, half life. Effect of temperature on rate of reaction. Arrhenius equation, concept of activation energy.

Catalysis : Definition, types, and characteristics of catalysis, homogeneous, heterogeneous. Catalysis - Enzyme catalysis and its application.

Topic-3-Liquid State :-

03 Hrs

intermolecular forces, structure of liquids (a qualitative description). Difference between solids, liquid and gases. Liquid Crystals: Classification, structure of nematic and cholesteric phases.

Topic-4- Solid State:-

06 Hrs

Types of solids, Amorphous, crystalline and difference between them, Miller Indices. Laws of crystallography - (i) Law of constancy of interfacial angles (ii) Law of rationality of indices (iii) Law of symmetry. Symmetry elements in crystals. X-ray diffraction by crystals. Derivation of Bragg equation.

Topic-5- Colloidal State :

03 Hrs

Definition of colloids, classification of colloids. Solids in liquids (sols) : properties - kinetic, optical and electrical; stability of colloids, protective action. Hardy - Schulze Law. Liquids in liquids (emulsions) : types of emulsions, preparation. Liquids in Solids (gels) : classification, general applications of colloids.

Topic -1 : Chemical Bonding: 12 Hrs

Covalent Bond- Valence theory and its limitations, various types of hybridisation and shapes of simple inorganic molecules and ions, BeCl_2 , BF_3 , SiCl_4 , PCl_5 , SF_6 , IF_7
Valence Shell electron repulsion theory (VSEPR) for shapes of NH_3 , H_2O , SF_4 , ClF_3 and ICl_2^- .

Ionic Bond: Formation of ionic bond, Lattice energy (Born Lande equation), Born Haper cycle, solvation energy (Numerical problems expected), solvation energy Fajans rules.

Topic No-2: Chemistry of P block elements and noble gases :

Comparative study of elements Gr.13-17 elements: trends in periodic properties, allotropy, Inert pair effect.

Chemical properties of the noble gases, chemistry of Xenon , structure and bonding in Xenon compounds.

Topic No-3: Theory of Qualitative Analysis :

Solubility product and common ion effect. Use of borax, cobalt nitrate, sodium carbonate, hydrogen sulphide, ammonium chloride and yellow ammonium sulphide.

Detection of following acid radicals in presence of each other: CO_3^{2-} and SO_3^{2-} , NO_2^- and NO_3^- , Cl^- , Br^- and I^-

F.Y.B.Sc. Semester –II**Lab Course****Paper Code -202201****Credits-2****Unit-I****Physical Chemistry**

- 1) Viscometer: To determine viscosity of given liquid (Water or ethanol by viscometer).
- 2) Taglamometer: To determine surface tension of a given liquid.
- 3) To determine percentage composition of a $\text{BaSO}_4 + \text{NH}_4\text{Cl}$ gravimetrically.
- 4) To determine loss on drying (LOD) of detergent, Salicylic acid.

Unit-II**Organic Qualitative Analysis:**

Semi Micro Qualitative Analysis: Identification of two cations and two anions in the given mixtures.

Minimum seven mixtures to be done

Cations : Pb^{2+} , Cu^{2+} , Fe^{3+} , Cr^{3+} , Al^{3+} , Mn^{2+} , Zn^{2+} , Ni^{2+} , Ca^{2+} , Ba^{2+} , Sr^{2+} , Mg^{2+} , NH_4^+ , K^+ .

Anions: Cl^- , Br^- , I^- , SO_4^{2-} , NO_3^- , NO_2^- , CO_3^{2-} .

SEMESTER-II

PAPER-I : - Bryophyta, Pteridophyta, Gymnosperms and Ecology.

- (1) **Bryophytes**:- General characters, Structure, Life cycle, Systematic position & alternation of generation in *Riccia*.
- (2) **Pteridophytes** :- General characters, Structure, Life cycle, Systematic position & alternation of generation in *Nephrolepis*.
- (3) **Gymnosperms**:- General characters, Distinguishing characters of cycadophyta & coniferophyta, Structure, Life cycle, Systematic position & alternation of generation in *Cycas*, Economic importance Gymnosperms.
- (4) **Ecology**:- Structure, Functions & Types of Ecosystem., Food chain., Food web, Ecological pyramids, Productivity in an Ecosystem (Terrestrial/Pond), Energy Flow in an Ecosystem.

PAPER-II :- Physiology, Biochemistry, Biotechnology and cytogenetics.

- (1) **Physiology**:- Plant water interaction: Structure & Properties of water, Polarity of water, Osmosis, Plasmolysis & imbibitions, Water Potential. Water Transport – Ascent of sap, Transpiration, Enzyme – Nature of enzyme, Classification, Mode of Action, Enzyme Specification and inhibition.
 - (2) **Biochemistry** : Classification, Structure and Functions of Carbohydrates, Proteins and Lipids.
 - (3) **Biotechnology**: DNA- Structure, Replication and Recombination. DNA Structure & Replication (Prokaryotic and Eukaryotic), Recombination, Cloning Vectors.
 - (4) **Cytogenetics** : Prokaryotic and Eukaryotic cell Ultrastructure & Functions of the cell wall, Plasma Membrane Ultrastructure & Functions of the Cell organelles : Mitochondrion and Chloroplast. Ultrastructure & Functions of the Nucleus, Chromosome Cell division- Mitosis
- Mendelian Principles**- Mendel's Laws Intralocus (Allelic) Gene interaction. Interlocus (Non allelic) Gene interaction- Non Epistatic interaction. Epistatic interaction- Recessive Epistasis, Duplicate Recessive Epistasis, Dominant Epistasis, Duplicate Dominant Epistasis.
- Sex Determination**: Chromosomal Sex Determination Heterogametic male - XX-XY (Man, Drosophila, Melandrium), XX-XO (Grasshopper, Dioscorea, Vallisneria)
- Heterogametic female – ZW-ZZ (fowl), ZO-ZZ (Butterflies), Haplodiploidy in Hymenoptera, Gynandromorphs.

F.Y.B.SC [SEMESTER-II] PRACTICAL SYLLABUS-2016

(Subject Code:-204201)

Practical -I

- (1) **Bryophytes**: Study of stages in the life cycle of *Riccia*.
- (2) **Pteridophytes**: Study of stages in the life cycle of *Nephrolepis*.
- (3) **Gymnosperms**:- Study of stages in the life cycle of *Cycas*.
- (4) **Ecology**:- Study of any one natural ecosystem and preparation of a report on the same.

Practical -II

- (1) **Physiology :-**
 - (i) Immobilization of enzymes and study of activity of enzyme amylase.
 - (ii) Effect of substrate concentration on amylase activity.
 - (iii) Determination of solute potential by plasmolytic method.
- (2) **Biochemistry**:- Qualitative Tests for Carbohydrates, Proteins and Lipids.
- (3) **Biotechnology**: - Photomicrograph of DNA, RNA and Plasmids.
- (4) **Cytology :-**
 - (i) Study of micrograph of cell, cell wall, Chloroplast and Mitochondria and Nucleus.
 - (ii) Study of Mitosis.
- (5) **Genetics :-**
 - (i) Study of Human karyotypes.
 - (ii) Study of Gynadromorphs.

First Year- Second Semester

Zoology Course 205101

GENETICS, BIOCHEMISTRY AND EVOLUTION

2 CREDITS

Objectives

- To study the basics of genetics
- To understand the biochemistry within the animal system
- To study how the animal evolved

UNIT I : GENETICS AND BIODIVERSITY(15 Lectures)

Genetics

Genes and Gene Concept

Mendelian Genetics – Monohybrid and Dihybrid Crosses

Epistasis

Multiple Alleles : With respect to ABO blood groups

Human Pedigree

Chromosomal and Physical Aberrations – Inversion, Translocation, Deletion

Biochemistry

Definition, Classification, Structure and Biological Rple of:

Proteins

Carbohydrates

Lipids

UNITII : EVOLUTION

(15 Lectures)

Evolution

Concept of evolution

Origin of life on earth

Origin of Prokaryotic and Eukaryotic cells

Variations, Mutations, Natural selection

Concepts of species and speciation

Micro and Macro evolution

Ecological niche

Zoology Course 205102

BASIC EMBRYOLOGY AND BIOTECHNOLOGY

2 CREDITS

BASIC EMBRYOLOGY

Fertilization

Types of eggs: Microlecithal, Mesolecithal, Macrolecithal, Lsolecithal, Telolecithal and Centrolecithal.

Types of cleavage

Blastulation and Gastrulation

Types of blastula / blastulation, Sea Urchin, Amphibians and Birds

Types of gastrula / gastrulation in Amphioxus, Sea Urchin, Amphibians and Birds

BASIC BIOTECHNOLOGY

Basic Biotechnology

Concept of biotechnology,

Fundamentals in laboratory techniques in biotechnology: Safe handling of instruments,

Strilization technique, Chromatography and Electrophoresis technique.,

Food biotechnology,

Enzyme technology,

Environmental biotechnology

PRACTICAL 205201

(BASED ON COURSE 205101 AND 205102)

2 CREDITS

- 1.Extraction and qualitative detection of nucleic acids : DNA (SDS-NaCl extraction), RNA (Phenol extraction)
2. Qualitative tests for proteins, lipids and carbohydrates.
- 3.Introduction to basic laboratory safety practices, precautions and safety rules
4. Handling of common laboratory equipments
5. Separation of amino acids by paper chromatography
6. Separation of lipids by thin layer chromatography
7. Separation of pigments by adsorption chromatography
8. Effect of Papain (Raw papaya extract) as a meat tenderizer
- 9.To evaluate the quality of milk by methylene blue reduction method
10. Study fossils (Trilobite, Ammonite, Lingula and Limulus)

Objectives:

- **To Know the demographic profile of women in india**
- **To Understand the present situation and changes in the status of women**

I) Demographic Profile of Women in India:

Sex-Ratio, Health, Education and Employment

II) Women and Work:

- A) Women in the unorganized sector
- B) Women in the organized sector
- C) Legal provisions for the protection of working women

III) Women and Development:

- A) Governmental Policies & strategies for women's development
- B) Role of voluntary organization & NGO's in women's development

IV) Towards Change:

- A) A National Policy for Empowerment of Women – 2001
- B) The role and importance of media in portraying women.

Alcohols:

Definition : Monohydric Alcohols: Methods of formation by reduction of Aldehydes, Ketones, Carboxylic Acids and Esters (one eg. each) Acidic nature reaction of Alcohols. Dihydric Alcohols: Methods of formation of ethylene Glycol - nitration method and From Alkenes using OsO_4 , Chemical reaction of ethylene Glycol - nitration, Acylation, Oxidation (Using $\text{Pb}(\text{OAc})_4$ without Mechanism Pinacol-Pinacolone rearrangement, Trihydric Alcohols: Preparation of Glycerol from propane, Reaction of Glycerol.

Phenols:

Preparation of phenols from Chlorobenzene, cumene and Benzene Sulphonic Acid, Physical properties, Acidic Nature of phenol, Resonance stabilization of Phenoxide ion. Reaction of phenols-Electrophilic Aromatic Substitution, Acylation, Carboxylation (Without Mechanism) Reaction with Mechanism- Fries rearrangement, Claisen Rearrangement, Gatterman Synthesis and Reimer Tiemann Reaction.

Aldehydes and Ketones :-

Aldehydes: Preparation of aldehyde from Acid Chloride, Gattermann-Koch synthesis Ketones- Preparation of nitriles and from Carboxylic Acid Physical properties of Aldehydes and Ketones. Mechanism of Nucleophilic addition to Carbonyl Group with particular emphasis on Benzoin, Aldol-Knoevenagel condensation, Mannich Reaction. Use of Acetals as Protecting Groups. Oxidation of aldehydes using Chromium Trioxide, Baeyer-Villiger Oxidation of Ketones.

Carboxylic Acid:

Acidity Of carboxylic acid, Effect of substituent on acid strength, preparation of acetic acid from nitriles, from acid chloride, Anhydride, Ester and Amide. Physical properties and reaction of carboxylic acid-synthesis of Acid Chloride, Ester and Amide, Hell-Volhard-Zelinsky Reaction. Reduction using LiAlH_4 , Mechanism of Decarboxylation, Hydroxy Acids- Malic, Tartaric and Citric Acid. Method of formation and Chemical reaction of Acrylic Acid.

Organic Compounds of Nitrogen:

Preparation of Nitroalkanes and Nitroarenes. Chemical reaction of Nitroalkanes, Nitration of Benzene and their reduction in Acidic, Basic and Neutral media. Amines- Basicity of Amines, Amines salt as PTC. Preparation of Alkyl and Aryl Amines (Reduction of Nitro Compounds, Nitriles) Reductive Amination, Hoffmann Bromamide Reaction. Reaction of Amines- Electrophilic aromatic Substitution in Aryl amines, Reaction of amines with Nitrous Acids.

Thermodynamics: I

Definition of Thermodynamic Terms: System, Surrounding types of systems, intensive and extensive properties. Thermodynamic process, concept of heat and work. Work done in reversible and irreversible process, concept of maximum work (W_{max}), Numerical problems. First law of thermodynamics: Statement, Definition of internal energy and Enthalpy. Heat capacity, heat capacities at constant volume pressure and their relationship. Calculation of W , q , du and dH for the expansion ideal gas under isothermal and adiabatic conditions for reversible process, Numerical problems, Hess's law of heat summation and its application.

Thermodynamics: II

Second law of thermodynamics: Need for law, different statement of law. Carnot Cycle and its efficiency, Numerical Problems. Carnot Theorem. Concept of Entropy: Definition, Physical significance, entropy as a State Function, Entropy change in physical change, entropy as criteria of Spontaneity & Equilibrium Entropy change in ideal gases. Gibbs and Helmholtz Function: Gibbs Function (G) and Helmholtz Function (A) as Thermodynamic Quantities. A and G as criteria for Thermodynamic Equilibrium and spontaneity, their Advantages over Entropy change. Variation A with P , V and T .

Chemical Equilibrium:

Equilibrium Constant and Free Energy. Thermodynamical Derivation of law of mass Action. Le Chatelier's Principle. Reaction Isotherm and Reaction Isocore. Clapeyron Equation, Clausius-Clapeyron Equation and its Application.

Paper Code- 302201**Lab Course****3 Credits, 75 Marks (45 Hrs)**

3Hrs/week

Organic Chemistry**Unit 1**

- 1) Organic Derivatives : Preparation, crystallization and physical constant :-
- 2) Methyl derivative of aniline.
- 3) Nitroderivative of Salicylic acid.
- 4) Hydrolysis derivative of ethyl benzoate.
- 5) Bromo derivative of cinnamic acid.
- 6) 2-4 DinitrophenylHydrazone derivative of acetone.

Physical Chemistry

Unit 2

- 1) To determine heat of neutralization (H_n) of NaOH and HCl.
- 2) To determine the equilibrium constant for the reaction : $KI + I_2 \rightleftharpoons KI_3$
- 3) Determine molecular mass of the polymer Polyvinyl Alcohol (PVA) from viscosity measurement.
- 4) To investigate the reaction between potassium persulphate and KI of equimolar concentration ($a=b$)
- 5) Chemical kinetics- To Determine the specific reaction rate of the hydrolysis of methyl acetate catalyzed by hydrogen ions at room temperature.

Zoology Course 305101

PARASITOLOGY

3 CREDITS

Objective

- To Study the importance of parasitology and epidemiology in our day to day life
- To understand the life cycle of a parasite and its modes of transmission
- To Study various parasitic adaptations

UNIT I : INTRODUCTION TO PARASITOLOGY AND PROTOZOAN PARASITOLOGY (15 Lectures)

- **Introduction, Scope and Branches of Parasitology**
- **Types of Parasites:** Ectoparasites, Endoparasites, Monogenetic, Digenetic, Temporary, Permanent, Extracellular, Intracellular, Facultative, Accidental
- **Types of hosts:** Definitive, Intermediate, Paratenic, Reservoir.
- Morphology, Life cycle, Mode of infection, Pathogenicity, Control measures, Prophylaxis of Protozoan Parasites – **Entamoeba histolytic, Plasmodium vivax, Trypanosoma gambiense, Leishmania donovani.**

UNIT II : HELMINTH PARASITOLOGY - 15 (Lectures)

Morphology, Life cycle, Mode of infection, Pathogenicity, control measures, Prophylaxis of Helminth Parasites : *Ascaris lumbricoides*, *Taenia solium*, *Wuchereria bancrofti*, *Ancylostoma duodenale*.

UNIT III: EPIDEMIOLOGY

(15 Lecture)

- Introduction & scope of epidemiology
- Dynamics of disease transmission Reservoir, route of transmission, incubation,
- Epidemiology communicable diseases – diagnosis, transmission, Prevention Control measures and Treatment of Swine flu, Tuberculosis, Malaria – National Malaria Control Program, Rabies, Dengue, Leptospirosis.

CELL BIOLOGY AND INSTRUMENTATION

3 CREDITS

Objectives

- To Study the various cell organelles.
- To understand the importance of water and buffers.
- To get a basic knowledge of the working and application of various instrument used in biological studies.

UNIT I: CELL BIOLOGY

CELL BIOLOGY

Plasma membrane:-

Structure, composition and function, fluid mosaic model, membrane fluidity, permeability, membrane transport – passive diffusion, facilitated transport, active transport, exocytosis and endocytosis.

Endoplasmic Reticulum :- Structure, types and functions of ER

Golgi complex:- Structure and functions.

Lysosome :- Primary and secondary lysosomes.

Mitochondria :- Structure and functions.

Nucleus and Nucleolus chromosomes.

WATER , pH, BUFFERS

Chemical bonds –

Covalent bond , Single ,coordinate,multiple,Pola ,non polar, Peptide , Disulphide, glycosidic bonds.

Non covalent bond : Ionic or Electrostatics,Hydrogen bonds,Hydrophobic interactions, Van Der Waal'S interactions.

Water: Molecular structure of of water ,Tetrahedral geometry,Hydrogen bond,flickering , clusters ,macromolecular associations.

Physical and chemical properties of water: Density,Specific heat, Heat of vaporization,Heat of fusion ,Surface tension,Hydrogen bond with solutes,interaction with nonpolar compounds,Water as a reactant and interactions with charged solutes,

Ionization of Water : Kw ion product of water,pH , pH scale, Dissociation of weak acid and weak base , pKa, Henderson Hasselbalch equation.

Titration curve of weak acid.

Buffers of biological system

Instrumentation / Tools and techniques of biology: Principle and uses of autoclave, Centrifuge,Balance.

Principle and working of pH meter.

Principle ,working ,and application of Spectrophotometer and colorimeter; Beers – Lambert’s law and selection of filters.

Chromatography :- Principle and Application – i)Paper ii)Thin Layer iii) Ion exchange iv)Gas v)Adsorption.

Electrophoresis: Principle and Application –Agarose and SDS- Polyacrylamide.

Principle of different types of microscope:-a) Simple b)Compound c)Phase contrast d)Electron e)Fluorescence f)Confocal

Practical 305201

Based on courses 305101 and 305102

3 credits

1. Identification of Protozoans parasites : Entamoeba , Plasmodium , Trypanosom , Leishmania.
2. Identification of Helminth Parasites: Ascaris lubricoids, Taenia solium , Wuchereria bancrofti, Ancylostoma duodenale
3. Parasitic modification- Scolex and proglottid of tape worm
4. Identification of Permanent slides or Photograph of swine flu, Tuberculosis
5. Temporary Preparation of mounting of mouth parts of mosquito
6. Study of electron micrograph of ultrastructure of mitochondria , Endoplasmic reticulum, Golgi body, Nucleus and Lysosomes.
7. Study of Chromosome Morphology using temporary squash preparation of onion root tip
8. Study of polytene chromosomes: Temporary preparation of salivary glands, chromosomes of chironomous/ Drosophila
9. Study of osmosis using RBC's
10. Preparation of Buffers of different pH using Henderson- Hasselbalch equation
11. Preparation of Titration Curve
12. Determination of pKa of weak acid
13. To Study working and principle of various instruments: pH meter, centrifuge, Balance, Colorimeter/Spectrophotometer. (If the instrument are not available, photograph can be shown)
14. Selection of filters for Colorimeter/Spectrophotometer and determination of the concentration of unknown sample.

Faculty Name – B.Sc.

Course Name: B.Sc.

Scheme: Semester IV

	Subject	L	Cr	P/T	D	TP	TW	T
	Language Skills	2	2		1.15	35	15	50

Semester IV

Title of the Paper: Intermediate English Language Skills for Science & Technology

Computer Code No:

Objectives:

- To be able to listen to short extracts on topics of general English and areas of science
- To be able to speak for an extended period of time on familiar and unfamiliar topics in general science.
- To be able to skim and scan topics of general science
- To be able to write instructions and describe scientific processes and also instruction manuals of technological products.

Learning Outcomes:

At the end of the course students will be able to-

- Give a talk or follow a talk on familiar and unfamiliar topics of science and keep up formal and informal conversations on a fairly wide range of topics.
- Students will be able to scan and skin fairly high level texts and understand detailed instructions and advice.
- Students will be able to make extensive lecture notes and design instructions manuals.

Course Materials:

Note: The text book to be used will be the same as used in semester 4 and 5. Selected portions have been indicated for most units.

Unit 1: Listening Skills

Note: The teacher may choose the selected passages from the prescribed text or recommended texts to design listening activities for making lecture notes. The teacher is also recommended to use the audio CD's from the recommended books for giving listening practice to the students.

Text: English for students of Science by Roy & Sharma PC, 1996, Orient Black Swan

Note: The prescribed text is for focused use. The teachers are strongly recommended to supplement their material from real life and scientific texts.

The recommended lessons are:

- a) Year of 2050
- b) Mushroom of Death
- c) Miracle of Grass

d) Human Environment

Unit 2: Speaking Skills

Speaking Skills: Giving short speeches using accurate expressions

Unit 3: Reading

Skimming and Scanning from the above mentioned lessons and exercises given in the lessons:

Unit 4: Writing Skills

- Describe scientific processes from experimental conducted by the student in science course.
- Learning to understand and write instruction manuals for technological product ex how to use camera, music system etc.

Evaluation scheme:

Internal	15 marks
a) Details: Listening & Speaking Skills	10 marks
b) Testing for grammatical accuracy in writing (Do as Directed, correct usage of grammar etc)	05 marks

External	35 marks
a) Unused Comprehension Passage (includes grammar from recommended text)	15 marks
b) Writing Instructions	10 marks
c) Describing a process	10 marks

Required Reading:

1. Comprehension Connections: Bridges to Strategic Reading by Tanny McGregor Published February 7th 2007 by Heinemann Educational Books
2. Deeper Reading by Kelly Gallagher Published January 1st 2004 by Stenhouse Publishers
3. Reading with Meaning (Paperback) by Debbie Miller Published January 1st 2002 by Stenhouse Publishers
4. The Longman Writer: Rhetoric, Reader, Research Guide, and Handbook (8th Edition) Judith Nadell (Author), John Langan (Author), Eliza A. Comodromos (Author)
5. Seeing and Writing 3 Donald McQuade (Author), Christine McQuade (Author)

Second Year- Fourth Semester

Paper Code- 402101

Inorganic Chemistry

3 Credits, 75 Marks (45 Hrs)

3 Hrs/week

Molecular Orbital Theory (MOT)

10 Hrs

Condition for the formation of molecular orbitals Linear Combination of atomic orbitals methods to obtain molecular orbitals. (LCAO- MO) approach, application of (LCAO-MO) approach to the formation of :Homonuclear diatomic molecules: H₂,He₂,N₂,O₂,F₂,Ne₂. Calculation of bond order and Correlation with stability , bond length and bond energy and magnetic properties of all the molecules mentioned. bond order in O₂,O₂⁺,O₂⁻,O₂²⁻. Heteronuclear diatomic molecules and molecular ion : CO,NO,CN⁻. MO diagrams with explanation of bond order, stability, and magnetic behaviour.

Chemistry of Transition elements: 5 Hrs

Definition and general characteristic of transition element. Chemistry of transition element (3d) with reference to: electronic configuration,atomic size, ionization potential, oxidation states, colour and magnetic property, formation of coordination compounds and applications.

Coordination Compounds 15 Hrs

Distinction between double salts and coordination compounds Werner's theory and its experimental verification Effective atomic number (EAN) rule. IUPAC nomenclature, isomerism in coordination compounds: Structural: Ionization Hydrate, Linkage and coordination position isomerism. Stereoisomerism : Geometrical and optical isomerism with reference to coordination number four and five bonding in coordination compounds based on valence bond theory (VBT) application to 4,5,6. coordinate complex electroneutrality principle and back bonding.

Gravimetric Analysis 10 Hrs

Definition and types of gravimetric analysis Precipitation gravimetric solubility consideration : Common ion effect, diverse ion effect, pH, temperature and nature of solubility, controlling particle size. Treatment of precipitates in gravimetry : Digestion, filtration and washing, drying and ignition use of Reagent in gravimetric analysis

Acid Base Concept

Different classification of acid and bases such as Arrhenious, Bronsted- Lowry, Lewis, solvent system and Lux flood, concepts, Pearson's hard soft acid base(HSAB) principle.

Paper Code- 402102

Physical Chemistry

3 Credits, 75 Marks (45 Hrs)

3 Hrs/week

Phase Equilibrium: 15 Hrs

Statement and meaning of the terms- phase , component, degree of freedom, derivation of phase rule equation. Phase equilibria of the one component system: Water system phase

equilibria of two component system : solid- liquid equilibria, simple eutectic pb- Ag. system, desilverisation of lead. solid solution : Compound formation with congruent melting point (Mg-Zn) and incongruent melting point (FeCl₃-H₂O) system, freezing mixture, acetone- dry ice , liquid-liquid mixture, Raoult's law and Henry's law. Ideal and non-ideal system: Azotropes, HCL- H₂O and ethanol- water system. Partially miscible liquids: Phenol- water, tri methyl amine- water, nicotine- water system, lower and upper consolute temperature. effect of impurity on consolute temperature.

Electrochemistry- I

15 Hrs

Electrical transport : conduction in metals and in electrolyte solution : specific conductance and equivalent conductance, measurement of equivalent conduction, variation of equivalent and specific conductance with dilution. Numerical Problems. Kohlrausch's law and its application. weak and strong electrolytes. Ostwald's dilution law , its use and limitation. transport number: Definition, determination by Hittorf's method and moving boundary method. conductometric titration: types and its advantages.

Electrochemistry- II

15 Hrs

Types of reversible electrodes: gas- metal ion, metal- metal ion, metal- insoluble salt anion and redox electrodes. Nernst equation, derivation of cell, E. M.F. and single electrode potential, standard hydrogen electrode, reference electrode, standard electrode potential, sign conventions, electrode-chemical series its significance, electrolytic and galvanic cells, table and irreversible cells, conventional representation of electrochemical cells E.M.F. of a and its measurement, calculation of thermodynamic quantities of cell reactions (G, H and K). definition of pH, pK_a-determination of pH using SHE and Glass electrode by potentiometer and Buffer- Acidic and basic buffers, mechanism of Action, Henderson-Hasselbalch Action.

Paper Code- 402201

Lab Course

3 Credits, 75 Marks (45 Hrs)

3 Hrs/week

Unit 1 – Inorganic

Gravimetric Estimation:

Estimation of Barium gravimetrically as Ba-Sulphate

Estimation of Ferrous gravimetrically as Fe₂O₃

Estimation of Zinc gravimetrically as Zinc Pyrophosphate (Zn₂P₂O₇)

Estimation of Barium gravimetrically as Ba-Chromate (BaCrO₄)

Estimation of Nickel gravimetrically as Ni-DMG

Unit 2 - Physical Chemistry

To determine normality and strength of HCL using (0.1N) NaOH solution conductometrically.

To determine normality and strength of acetic acid using (0.1N)NaOH solution conductometrically.

To determine normality and strength of acetic acid using (0.1N)NaOH solution by pH-metrically

pH metric titration; Henderson's Equation.

SY B Sc Fourth Semester
Zoology Course 405101
APPLIED ZOOLOGY
3 CREDITS

Objectives

- To Study the insects of economic importance.

- To understand the importance of breeding animal and their uses.
- To Learn how piggery and poultry farms are maintained for commercial purposes.

STUDY OF INSECTS OF ECONOMICS IMPORTANCE

15 Hrs

1.Honey Bee: Social life, communication, life history, apiculture and importance

Lac Insect : Life cycle, Lac culture and composition and uses of lac.

Silk moth : Life history, sericulture and economic importance

Termite: Social Life, Life cycle, damage caused and control

Aphids : Life history and control measures

Rice weevil: Life cycle and control measures

ANIMAL HUSBANDRY AND DAIRY SCIENCE

15 Hrs

Present Status of animal husbandry in india.

Goat Farming: Importance of goat farming (Milk,Meat,Skin,Hair & manure), various breeds- Jamnapari, Beetal, Black Bengal ans Toggenberg. Nutrition, prevention and treatment of dieases

Cattle farming : Classification of breeds (Milch, dual porpose and drought), various breeds of cattle- Sahiwal, khillari, Brown –swiss, Murrah, Jafferabadi, jersey, Holstein Breeding and Measurment of buffaloes

Dairy Science: Composition of milk, Milk Products and Methods of preservation of milk.

Vermiculture : Scope, methodology and importance

PIGGERY AND POULTRY

Poultry: Definition, Nomenclature and breeds of fowl, Housing and equipments, Hatching of eggs (Natural and Artificial hatching), Raising of broilers and Poultry diseases

Emu farming

Pggery: Scope of pig farming and its contribution to national economy, pig farming, Housing and Pig meat(pork).

SY B Sc Fourth Semester

Zoology Course 405102

CURRENT TRENDS IN ZOOLOGY

3 CREDITS

Objectives

- To understand the basic concepts of molecular biology.
- To understand the trends of biotechnology.
- To understand the basic concepts of biostatistics.

BASIC MOLECULAR BIOLOGY

15 Hrs

DNA Replication:

Mechanism of Replication in prokaryotes and Eukaryotes

Transcription

Transcription in prokaryotes and Eukaryotes

Translation :

Genetic Code : Properties, fetures and wobble hypothesis

Structure and chemical camposition of prokaryotic and eukaryotic ribosome

Mechanisms of Protein Synthesis Amynoacylation of tRNA activation of tRNA and

Recognition of tRNA

Translation in Prokaryotes, polysomes and coupled transcription translation in Eukaryotes, modification of released protein

ADVANCED BIOTECHNOLOGY

15 Hrs

- 1.Recombinant DNA technology
2. Restriction enzyme
3. Properties & Types of Vectors: Plasmid pBR322 phage vector & cosmid
- 4.DNA cloning
5. Construction of DNA library Gene Library & cDNA Library
- 6.Southern blotting technique
7. DNA Sequencing : Maxam & Gilbert technique, sanger's techniques
8. Transgenic animal
9. Proteins produced by gene manipulation insuline & human growth harmone
10. Biohazards of recombinant DNA Technology

BIOSTATISTICS

15 Hrs

- 1.Introduction to biostatistics
Data collection and sampling techniques
2. Descriptive statistics
 - i. Discriptive Statistical Summeries Mean, Mode, Median, Variance, Standard Deviation.
 - ii. Graphic Representation
Histogram Frequency Polygon ,Percentiles,
3. Random Variable
- 4.Discrete distribution
5. Continuous distribution
6. Coefficient of Variance
- 7.Measures of dispersion

- 8. Hypothesis Testing
- 9. Regression & Correlation
- 10. Z Test, T-Test, Chi Square Test,
- 11. Theories of probability

Practical 405201

BASED ON COURSES 405101 and 405102

3 credits

- 1. Economically important insects:**

Life cycle of Honey Bee and Bee hive

2. Mounting of Honey Bee:

a. Mouth parts and legs of honey bee

b. Sting apparatus

3. Life cycle of Silk moth

4. Identification : Castes of termites, Aphids and Rice weevil

5. Animal Husbandry (Animal Types)

a. Poultry –Layers (Leg Horn), Broiler

b. Goat- Jamunapari, Surati

c. Cattle: milk breeds- Sahiwal

d. Dual purpose breeds- Hariyana,

e. Draught purpose- Khillari

f. Buffalo: Murrah and Jaffrabadi

6. Colorimetric estimation of protein in hens eggs (country /farm)- Biuret/Folin-Lowry method (Standard graph to be provided)

7. Preparation of paneer froms milk.

8. To measure the density of milk by Lactometry

9. To Find adulterantes in the milk (Starch/ Urea)

10. Estimation of RNA by Orcinol method

11. Estimation of DNA by Diphenylamine method

12. Isolation of genomic DNA and checking its purity by horizontal gel electrophoreses

13. Problems in biotechnology based on theory.

14. Problems in molecular biology based on theory.

15. Problems in biostatistics- graphical representation standard deviation of the given data.