

Second Year Semester-III

Paper Code- 302101

Organic Chemistry

3 Credits, 75 Marks (45 Hrs)

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, Amine 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

2 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.

Zoology Course 305102

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

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,Polar ,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 water ,Tetrahedral geometry,Hydrogenbond,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) Ionexchange 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 chironomid/ 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 05 marks
(Do as Directed, correct usage of grammar etc)

External 35 marks

- a) Unused Comprehension Passage 15 marks
(includes grammar from recommended text)
- 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 andmagnetic 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, ionuization potential, oxidation states, colour and magnetic property, formation of coordination compounds and applications.

Coordination Compounds

15 Hrs

Distinction between double salts and coordinationscompounds Werner's theory and its experimental verification Effective atomic number (EAN) rule. IUPAC nomenclature, isomerism in coordination coumpounds: 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, temprature and nature of solubility, controlling particle size. Treatment of precipitates in gravimetry : Digestion,filtration and washing, dring and ignition use of Reagent in gravimetric anylsis

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- dryice , liquid-liquid mixture, Raoult's law and Henry's law. Ideal and non-ideal system: Azeotropes, 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 cell 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.

6. 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

7. 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

8. 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

9. 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, features and wobble hypothesis

Structure and chemical composition of prokaryotic and eukaryotic ribosome

Mechanisms of Protein Synthesis Aminoacylation 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 insulin & human growth hormone
10. Biohazards of recombinant DNA Technology

BIOSTATISTICS

15 Hrs

- 1.Introduction to biostatistics
Data collection and sampling techniques
2. Descriptive statistics
 - i. Descriptive Statistical Summaries 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

