

Department of Chemistry
Government Degree College, Baramulla (Autonomous)

Semester 2nd
Course Title: Chemistry-II
Credit: Theory: 04; Practical: 02

Major/Minor Course
Course Code: BCH22C201
Theory (04 Credits: Contact Hours: 64)

Course Objectives:

- *To introduce general trends in chemistry of p-block elements.*
- *To understand the chemical behavior of alkyl halides, alkenes, alkynes and aromatic compounds.*
- *To understand the concepts of thermodynamics.*

Learning outcomes: On completion of this course, the student should be able to comprehend various aspects of p-block elements.

- *Understand basic concepts of organic reaction mechanisms.*
- *Describe principles of thermodynamics and their application to real systems.*

Unit-I p-Block Elements **(16 Contact hours)**

Boranes: Nomenclature, Classification, Preparation, Properties, Structure and Bonding with special reference to Diborane. Higher boranes (brief idea)

Carbides: Classification, Preparation, Properties and Uses. Intercalation compounds of graphite.

Nitrogen Compounds: Preparation, properties and uses of Hydrazine, oxides and oxoacids of nitrogen.

Oxygen: Chemistry of different forms (atomic, molecular and ozone). Oxides, Fluorides and oxyacids of Sulphur: Structure & Bonding. Hydrogen Peroxide: Preparation, Properties, structure and uses.

Halogens: Comparative chemical reactivity, Properties, Structure & Bonding of hydrogen halides, Interhalogens and Polyhalides. Oxyacids of Chlorine (Structure and Bonding).

Noble gases: Isolation and importance of noble gases, Valence bond treatment of bonding in Fluorides, oxides and oxyfluorides of Xenon:

Unit II: Chemistry of Alkyl Halides, Alkenes and Alkynes **(16 Contact Hours)**

Alkyl halides: Methods of preparation (two methods) and reactions. Mechanistic details of SN1 and SN2; E1 and E2 reactions. Effects of structure of alkyl halides, nature of nucleophiles, leaving groups and solvent. Substitution versus Elimination.

Alkenes: Preparation of alkenes from alcohols and alkyl halides through elimination reaction. Hoffman and Saytzev's rules. Mechanistic details including regioselectivity and stereochemical implications of halogenation, hydrohalogenation, hydroboration, epoxidation, hydroxylation and ozonolysis.

Alkynes: Acidic character of alkynes. Catalytic and metal-ammonia reductions of alkynes.

Unit III: Aromatic Substitution Reactions **(16 Contact Hours)**

Aromaticity: Requirements of aromaticity. Huckel's rule and its significance. Explanation using molecular orbital diagram of benzene. Aromaticity of non-benzenoid compounds like pyrrole, thiophene, furan and aromatic ions (3, 5 and 7-membered rings).

Aromatic electrophilic substitution: General mechanism; formation of sigma and pi complexes. The second substitution: role of activating and deactivating groups. Mechanisms of Gattermann, Huben-Hoesch, Veils-Meir Haack and Riemer-Tieman reactions.

Aromatic nucleophilic substitution: Discussion of S_N-unimolecular, S_NAr and benzyne mechanisms.

Department of Chemistry
Government Degree College, Baramulla (Autonomous)

UNIT-IV: Thermodynamics

(16 Contact Hours)

Thermodynamic Functions: State and path functions and their differentials. Thermodynamic process, concept of heat and work. Heat capacity, heat capacities at constant volume and constant pressure and their relationship. Joule's law, Joule-Thomson coefficient and inversion temperature. Calculation of ΔU and ΔH for the expansion of ideal and non-ideal (van der Waals) gases under isothermal and adiabatic conditions. Temperature dependence of enthalpy, Kirchhoff's equation.

Bond dissociation energy and its calculation from thermo-chemical data with applications. Second law of thermodynamics: Need for the law, different statements of the law. Carnot cycle and its efficiency, Carnot theorem, Thermodynamic scale of temperature.

Concept of entropy, entropy as a function of V and T, and as a function of P and T. Clausius inequality; entropy as criteria for spontaneity and equilibrium. Entropy change in physical processes, ideal gas expansion and entropy of mixing of ideal gases.

Third law of thermodynamics: Gibbs function (G) and Helmholtz function (A) as thermodynamic quantities,

Nernst heat theorem, third law of thermodynamics, concept of residual entropy, evaluation of absolute entropy from heat capacity data. ΔG & ΔA as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change. Variation of G and A with P, V and T, Gibbs-Helmholtz equation.

Books Recommended:

1. Concise Inorganic Chemistry; J.D. Lee; 5th Edn., OUP/Wiley India Pvt. Limited, 2008
2. Chemistry of the Elements; N. N. Greenwood, A. Earnshaw; 2nd Edn., Elsevier India, 2010.
3. Principles of Inorganic Chemistry; B.R. Puri, L.R. Sharma and K.C. Kalia; 33rd Edn., Milestone Publishers & Distributors/ Vishal Publishing Co., 2017
4. Advanced General Organic Chemistry: A Modern Approach; S.K. Ghosh; 3rd Revised Edn., New Central, 2010.
5. Organic Chemistry; R.T. Morrison, R.N. Boyd, S. K. Bhattacharjee; 7th Edn., Pearson India, 2011.
6. Organic Chemistry; P.Y. Bruice; 8th Edn., Pearson Education, 2017.
7. Advanced Organic Chemistry; Dr. Jagdamba Singh and LDS Yadav; Pragati edition, 2017.
8. Principles of Physical Chemistry; B.R. Puri, L.R. Sharma and L.S. Pathania; 47th Edn., Vishal Pubs & Co, 2017.
9. Physical Chemistry; T. Engel, P. Reid, 3rd Edn., Pearson India, 2013.

Department of Chemistry
Government Degree College, Baramulla (Autonomous)

PRACTICAL: 02 CREDITS (CONTACT HOURS: 64)

Course Objectives:

- *To estimate concentrations of constituents in real samples.*
- *To prepare some important organic compounds and detect their functional groups*
- *To determine thermodynamic properties of solutions*

Learning outcomes:

On completion of the course, the student should be able to:

- *Determine concentrations of ions.*
- *Synthesize and identify functional groups in different organic compounds.*
- *Determine heat capacity, enthalpy of neutralization and enthalpy of ionization of an acid.*

Section A: Inorganic Chemistry

1. Determination of acetic acid concentrations in commercial vinegar using NaOH.
2. Determination of calcium content in chalk as calcium oxalate by permanganometry.
3. Determination of ferrous ions by redox titration (dichromate method).

Section B: Organic Chemistry

1. Functional Group Identification: Aromatic hydrocarbons, unsaturation, carboxylic acids, carbonyl compounds, phenols, alcohols, amines, amides, nitro compounds.
2. Preparation, recrystallization, percent yield and identification (melting point) of the following reactions products (Any two).*

 - (a) Bromination of Phenol/Aniline
 - (b) Benzoylation of Aniline/Phenol
 - (c) 2, 4-dinitrophenylhydrazone formation of aldehyde/Ketones

* Any other feasible single stage synthesis

Section C: Physical Chemistry

1. Determination of water equivalent of a calorimeter.
2. Determination of enthalpy of neutralization of hydrochloric acid with sodium hydroxide
3. Determination of enthalpy of ionization of acetic acid.

Books Recommended:

1. Vogel's; text book of Quantitative Inorganic Analysis (revised); Bassett, J.; Denney, R.C.; Jeffery, G. H and Mendham, J.; 6th ed.; ELBS; 2007.
2. Comprehensive Practical Organic Chemistry: Qualitative analysis Ahluwalia, V.K. & Sunita Dhingra; Universities Press, India, 2004.
3. Advanced Practical Organic Chemistry; N. K. Vishnoi; 3rd Edn; Vikas Publishing, 2009.
4. Advanced Practical Physical Chemistry; J.B. Yadav; Krishna Prakashan Media (P) Limited, 2015.

Department of Chemistry
Government Degree College, Baramulla (Autonomous)

5. Selected Experiments in Physical Chemistry; Mukherjee N.G.& Ghosh, J.N.; S. Chand & Sons.
6. Advanced Physical Chemistry Experiments; J. N. Gurtu, A. Gurtu, PragatiPrakashan, 2008.
7. Experiments in Physical Chemistry; Das, R. C, and Behra, B.; Tata McGraw Hill.

Department of Chemistry
Government Degree College, Baramulla (Autonomous)

Semester 2nd

Skill Enhancement Course

Subject: Pharmaceutical Sales Management

Course Title: PSM-II - Pharmacology and
Pharmaceutical Regulatory Affairs

Course Code: BCH22S202

UNIT 1

1.1 General Pharmacology: Introduction and scope of pharmacology, various routes of drug administration – advantages and disadvantages, general overview of absorption, distribution, metabolism and elimination (ADME).

Introduction, Definition, classification, pharmacological action, dose, indications and contraindications of the following (two examples from each class):

1.2 Drugs Acting on Nervous System

Central Nervous System – General anesthetics, Anticonvulsant drugs, Antidepressant drugs, Opioid analgesics, Non-Steroidal Anti-Inflammatory drugs (NSAIDs).

1.3 Drugs Acting on the Cardiovascular System

Antihypertensive drugs, Antianginal drugs, Antiarrhythmic drugs

1.4 Drugs acting on the respiratory system

Bronchodilators, Expectorants, Antitussive agents, Mucolytic agents

1.5 Chemotherapeutic Agents

Penicillins, Cephalosporins, Sulphonamides, Antiviral drugs, Antimalarial agents, Antineoplastic agents.

UNIT 2

2.1 Regulatory Affairs – Introduction

Introduction, brief overview of regulatory authorities and drug related legislation in India - Central Drug Standard Control Organization (CDSO).

2.2 Regulatory Affairs – Indian context

Drugs and Cosmetics Act, 1940 and its Rules 1945: Objectives, legal definitions of schedules to the Act and Rules pertaining to Import of Drugs, Sale of Drugs and Labeling and Packing of Drugs.

2.3 Indian Regulatory Requirements

Brief overview of Current Good manufacturing practices (CGMP). Organization, Responsibilities, Certificate of Pharmaceutical Product (COPP)

2.4 Regulatory Approval Process

Brief overview of approval processes and timelines involved in Investigational New Drug (IND), New Drug Application (NDA) and Abbreviated New Drug Application (ANDA)

2.5 Patents and Intellectual Property Rights (IPR)

Definition, scope, objectives, brief overview of Patents, Copyrights and Trademarks, sources of patent information

Recommended Books:

1. Introduction to Pharmacology, P.C. Dandiyā & S. K. Kulkarni
2. Handbook of Experimental Pharmacology, S. K. Kulkarni
3. A Textbook of General Pharmacology, N.S. Vyawahare & Saloni Vora
4. Essentials of Medical Pharmacology, K.D. Tripathi
5. Lippincott Illustrated Reviews: Pharmacology, Laren Whalen
6. Forensic Pharmacy, R.M. Mehta
7. A. Textbook of Forensic Pharmacy, N.K. Jain
8. Pharmaceutical Regulatory Affairs, C.V.S. Subrahmanyam & J. Thimma Setty
9. Drug Regulatory Affairs by Sachin Itkar & N.S. Vyawahare

Department of Chemistry
Government Degree College, Baramulla (Autonomous)

10. A Concise Textbook of Drug Regulatory Affairs, N. Udupa & Krishnamurthy Bhat

PRACTICAL (2 CREDITS)

Part – 1: Pharmacology

Introduction to the following topics pertaining to the experimental pharmacology, to be discussed and documented in the practical manual.

1. Introduction to experimental pharmacology.
2. Study of laboratory animals: mice, rats, rabbits.
3. Effect of analgesics using Analgesiometer.
4. Screening of anti-convulsant using Electro Convulsiometer.
5. Screening of Muscle relaxants using Rota-Rod apparatus.
6. Study of anxiolytic activity using elevated plus maze method.
7. Study of effect of drugs on isolated heart (*any 2*).

Note: Animals shall not be used for doing / demonstrating any of the experiments. The following experiments shall be carried- out / demonstrated as the case may be, ONLY with the use of software program(s) such as 'Ex Pharm' or any other suitable software.

Part – 2: Pharmaceutical Regulatory Affairs:

Prepare a brief checklist and document in the practical manual

1. Good Pharmacy Practices (GPP) – Indian Pharmaceutical association
2. Good Regulatory Practices (GRP)
3. Good Documentation Practices (GDP)
4. Indian patent application.
5. Good Drug Dispensing & Good Storage practice.

Government Degree College Baramulla

SEMESTER 1st

Multidisciplinary Course

Subject: Chemistry

Title: Chemistry in Everyday Life

CREDIT: 03 (Three)

Code: BCH22M103

CONTACT HOURS: 48

Course Objectives: This course shall impart the knowledge chemistry in day to day life. The students shall be introduced with the

- *food standards and adulterations;*
- *Pesticides and insecticides; and*
- *Environmental issues.*

Course Outcome: After completing the course, the student shall understand the;

- Food adulterations, detection and measurements and safety stands*
- Different classes of pesticides and fungicides, their uses and impacts; and*
- Air pollutants and pollution laws.*

Part 1: Theory (3 Credits)

UNIT-I Food Adulteration Practices

(16 contact hours)

Adulteration-Definition; types-intentional, incidental, metallic and packaging hazard. Causes and methods of food adulteration. General Impact on Human Health. Detection and Prevention of Food Adulteration. Mitigation measures for addressing food adulteration.

Food additives- Definition, classification, role of additives in processed foods. Safe levels of additive uses and the institutions involved in the process. Safety standards and quality control

Unit-II Pesticides & Fungicides

(16 Contact Hours)

Chemistry of Pesticides: Classification of pesticides based on use and chemical nature. Development of Pesticides. Chemical and Botanical pesticides,. Study of pesticides with respect to physical and chemical properties, formulation, degradation and metabolism of organophosphates, emamectic benzoate, chlorpyrifos, dimethoate, quinalphos.

Study of fungicides: Systematic and non-systematic fungicides. Difenaconazole, trifloxystrobin, tebuconazole, mancozeb (manganese ethylenebis(dithiocarbamate) (polymeric).

Effect of pesticides and fungicides on microorganisms, aquatic system & fertility of soil.

UNIT –II: Indoor Pollution

(16 Contact Hours)

Government Degree College Baramulla

Introduction, indoor air pollution sources, indoor pollutant levels, particle-phase, gas-phase, and biological pollutants found in indoor environments and their impact on human health, Air Pollution Acts, Model indoor pollutant emission, transport and control of pollutants, indoor pollutant control technologies and determination of their effectiveness

Books Recommended:

1. A first course in Food Analysis, A.Y. Sathe, New Age International (P) Ltd., 1999.
2. Food Safety, case studies – R. V. Bhat, NIN, 1992.
3. Domestic Tests for Food Adulterations, H. G. Christian, Forgotten books.
4. A Laboratory Manual of Food Analysis, S. Sehgal, Wiley Publishers.
5. Food Safety and Standards Act, 2006. Bare ACT, November 2020, Commercial law publishers
6. Environmental Chemistry; S.E.Manahan (6th /7th /8th/9thEdns); LewisPublishers.
7. Environmental Chemistry; 2nd edn; Colin Baird; Freeman & Co; 1991.
8. Principles of Modern Chemistry; 2nd edn; Oxtoby and Nachtrieb; Saunders College Publications; 1987.
9. Chemistry Fundamentals: An Environmental Prospective; 2nd edn; Buell and Girad; Jones and Barlett; 2013.
10. www.chemistryincontext; (American Chemical Society)
11. Cosmetic formulation, Principles and practice; Heather A. E Binson, Michael S. Roberts, Vania Rodrigues Leite-Silva, Kenneth A. Watters, CRC press (Taylor and Francis group).
12. Text book of Polymer science; Billmeyer F. W.; John Wiley and Sons; Inc.
13. Salthammer, T. and Uhde, E., Organic Indoor Air Pollutants: occurrence, measurement, evaluation, Wiley-VCH (2009)
14. Seinfeld, J. H. and Pandis, S. N., Atmospheric chemistry and physics: from air pollution to climate change, Wiley (2006)
15. Spengler, J., McCarthy, J., and Samet, J. Indoor air quality handbook, McGraw-Hill Professional (2001)
16. N. N. Melnikov: Chemistry of Pesticides (English) Springer
17. M. B. Green, G. S. Hartley, T. F. West, Chemical for Crop Improvement and Pest Management (Pergamon).
18. R. Clemlyn: Pesticides. 4) K. H. Buchel: Chemistry of Pesticides.