

Department of Chemistry  
Government Degree College, Baramulla (Autonomous)

Semester 3<sup>rd</sup>

Major/Minor Course

**Subject: Chemistry**

**Course Title: Chemistry-III**  
**Credit: Theory: 04; Practical: 02**

**Course Code: CHM322M**  
**Contact Hours: (64Th + 64Pr)**

*Course Objectives:*

- *To understand the basic concepts and principles of solid state chemistry by exploring synthesis, structure, chemical bonding, physical properties and applications of various solid materials.*
- *To understand the fundamental processes that must occur while mixing of solutions such as energy, enthalpy and entropy.*
- *To understand heat transfer rates associated with processes involving phase changes and reactions.*
- *To understand the fundamental aspects of transition and inner transition elements.*
- *To understand the chemical behaviour of Alcohols, Ethers, Epoxides and Phenols compounds.*

*Learning outcomes:*

*After the successful completion of the course the student shall be able to;*

- *Comprehend and correlate the crystalline structure with bonding, different defect structures and different aspects which affect the material properties*
- *Understand the principles of thermodynamics and their application to solutions. The students shall comprehend the basic terms in phase diagram, interpret the stability regions by using different pressure-temperature system in one and two systems.*
- *Understand the electronic configuration of d-block elements and its effect on colour and magnetic properties, catalytic properties of d-block elements and their industrial applications. Recognises the difference between d- block elements and f-block elements, Lanthanide contraction and its consequences, Colour properties, Lanthanides separation.*
- *Understand structural/functional differences between alcohol, ethers, epoxides and phenols, recognise their properties, and comprehend their preparatory methods, and mechanism of their reaction.*

**Part 1: Theory (4 Credits)**

**Unit I: Solid State**

(16 Contact hours)

Space lattice, unit cell and its types, calculation of number of atom per unit cell. Tetrahedral voids and octahedral voids calculations. Packing efficiency (without derivation).

Symmetry elements in crystals, Lattice planes and Miller indices. X-ray diffraction by crystals, derivation of Bragg's equation and its application. Interplanar distances in terms of miller indices. Determination of crystal structure by Laue's method and powder method. **Point defects**

Department of Chemistry  
Government Degree College, Baramulla (Autonomous)

**Unit II: Thermodynamics of solutions and Chemical Equilibria** (16 Contact hours)

Thermodynamics of ideal solution: Free energy change of mixing, Enthalpy, Volume and Entropy change of mixing, Non-ideal solutions, Concept of activity and activity coefficient, Chemical potential and its variation with pressure and temperature, Gibbs-Duhem equation  
Thermodynamics of colligative properties: Elevation of boiling point and depression of freezing point.

Statement and meaning of the terms: phase, component and degree of freedom. Gibbs phase rule, phase equilibria of one component system – water, CO<sub>2</sub> and S systems. Phase equilibria of two component system: solid liquid equilibria, simple eutectic (Pb-Ag) system, Nernst distribution law- applications.

**Unit III: d-Block Elements, Lanthanides and Actinides** (16 Contact hours)

Transition Elements: Introduction, general trends in the physical and chemical properties with special reference to electronic configuration, variable valency, colour, magnetic and catalytic properties. Stability of various oxidation states (Latimer diagrams) for Mn, Fe and Cu.  
**Reactivity of group 11 and 12 elements.** A brief description about the ability of d-block elements to form coordination compounds.

Lanthanides and Actinides: Electronic configurations, oxidation states, colour, magnetic properties, lanthanide contraction, separation of lanthanides.

**Unit IV: Chemistry of Alcohols, Ethers, Epoxides and Phenols** (16 Contact hours)

Alcohols: Monohydric alcohols: Methods of formation by reducing aldehydes, ketones, carboxylic acids and esters; Reactions: Esterification, acetylation, Oxidation by KMnO<sub>4</sub>, K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>, PCC and PDC. Bouvealt-Blanc Reduction; Relative reactivity of 1°, 2°, 3° alcohols.  
Dihydric alcohols: Oxidation by periodic acid and lead tetraacetate.

Ethers and Epoxides: Method of formation; Acid-base catalyzed ring-opening reactions of epoxides, Reactions of epoxides with alcohols, ammonia derivatives and LiAlH<sub>4</sub>; Cleavage of ethers using acids.

Phenols: Preparation; Acidity and factors effecting acidity, Ring substitution reactions, Kolbe's-Schmidt Reaction, Fries and Claisen rearrangements with mechanism.

**Books Recommended:**

1. Concise Inorganic Chemistry; J.D. Lee; 5thEdn., OUP/Wiley India Pvt. Limited, 2008

Department of Chemistry  
Government Degree College, Baramulla (Autonomous)

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; 8<sup>th</sup> 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.
10. Solid State Chemistry; Dipak Kumar Chakrabarty , 2nd Edn. New Age International (P) Ltd., 2018
11. Solid State Chemistry and Its Application; R. West, Wiley India Pvt Ltd, 2007
12. Atkins Physical Chemistry, Peter Atkins, Julio de Paula, James Keeler; 11<sup>th</sup> Edn. Oxford University Press, 2018

## Part 2: Laboratory Course (2 Credits)

### **Course Objectives:**

- *To prepare different complexes.*
- *To detect and purify organic compounds by different methods.*
- *To understand physical states of a substance under different conditions.*

### **Learning outcomes:**

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

- *Synthesize different metal complexes.*
- *Learn techniques of separation and identification*
- *Construct the phase diagramme and calculate Critical temperature.*

### **Inorganic Chemistry**

#### **Preparation of following coordination compounds of transition metals (Any Three)**

1. Potassium trisoxalatoferate (III)- $K_3[Fe(C_2O_4)_3]$
2. Tetraamine Copper Sulphate  $[Cu(NH_3)_4]SO_4$
3. Potassium trisoxalatochromate (III)
4. Trithiourea copper (I) sulphate monohydrate

### **Organic Chemistry**

1. Separation and identification of compounds in a binary mixture (water and Bicarbonate Separation) (4 Mixtures)

Department of Chemistry  
Government Degree College, Baramulla (Autonomous)

**Section C: Physical Chemistry**

1. Determine the refractive index of liquids using refractometry. (Any two)
2. Determine percentage composition of binary liquid mixture using refractometry.
3. Determination of the critical solution temperature and composition of the phenol water system
4. An Educational/Industrial tour

**Books Recommended**

1. Advanced Practical Physical Chemistry, J. P. Yadav, Krishna Publications, 2022
2. Advanced Practical Organic Chemistry, N. K. Vishnoi, 3<sup>rd</sup> Edn. Vikas Publication House, 2009
3. Vogel's Textbook of Practical Organic Chemistry, Brain S. Furniss, Antony J. Hannaford, Peter W. G. Smith and Austin R. Tatchel; 5<sup>th</sup> Edn. Pearson 2003

**3<sup>rd</sup> SEMESTER  
PHARMACY  
(PHARMACEUTICAL SALES MANAGEMENT)  
SKILL ENHANCEMENT COURSE (SEC)**

**CHM322S: PSM-III - SALES MANAGEMENT**

**CREDITS: THEORY: 2, PRACTICAL: 2  
MAX MARKS: THEORY: 30, PRACTICAL: 30  
MIN MARKS: THEORY: 12, PRACTICAL: 12**

**THEORY (2 CREDITS)**

**UNIT 1**

**1.1 Marketing (3 hours)**

Definition, general concepts and scope of marketing, distinction between marketing & selling, marketing environment.

**1.2 Pharmaceutical market (4 hours)**

Quantitative and qualitative aspects, size and composition of the market, market segmentation & targeting, motivation and prescribing habits of the physician, patients' choice of physician and retail pharmacist, role of market research

**1.3 Product decision (4 hours)**

Product mix and product line decisions, product life cycle, product portfolio analysis, product positioning, packaging and labeling decisions, Product management in pharmaceutical industry

**1.4 Promotion (4 hours)**

Methods, determinants of promotional mix, promotional budget, an overview of personal selling, advertising, direct mail, sampling, medical exhibition, public relations, online promotional techniques for OTC Products

**UNIT 2**

**2.1 Pharmaceutical marketing channels (4 hours)**

Designing channel, channel members, selecting the appropriate channel, conflict in channels.

**2.2 Professional sales representative (PSR) (3 hours)**

Duties of PSR, purpose of detailing, selection and training, supervising, norms for customer calls, motivating, evaluating, compensation and future prospects of the PSR

**2.3 Pricing (4 hours)** Meaning, importance, objectives, determinants of price, pricing methods and strategies, issues in price management in pharmaceutical industry. An overview of DPCO (Drug Price Control Order) and NPPA (National Pharmaceutical Pricing Authority)

**2.4 Emerging concepts in marketing (4 hours)**

Brief overview of Vertical & horizontal marketing, rural marketing, consumerism, industrial marketing, global marketing

**PRACTICAL (2 CREDITS)**

1. Submit an assignment, which may include:
  - i) Sales/marketing case presentation (minimum 2)
  - ii) Market survey to collect information regarding the marketed preparations of drug given in any disease condition (minimum 2)
2. Group discussions and case studies based on theory topics (minimum 2)
3. Deliver in-clinic presentations to healthcare professionals
4. Presentations/meetings with retailers/distributors for product promotion
5. Interactive lectures and discussions among students with pharmaceutical sales/marketing managers as resource persons (minimum 3)
6. Preparation of pharmaceutical sales/marketing charts and models (minimum 3)

**RECOMMENDED BOOKS:**

1. Marketing Management, Philip Kotler & Kevin Lane Keller
2. Marketing Strategy – Planning and Implementation, Walker, Boyd & Larreche
3. Marketing, Dhruv Grewal & Michael Levy
4. Marketing Management, Arun Kumar & N Menakshi
5. Marketing Management, Rajan Saxena
6. Pharmaceutical Marketing in India, Subba Rao Changanti

# Government Degree College Baramulla

**SEMESTER 1<sup>st</sup>**

**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 (6<sup>th</sup> /7<sup>th</sup> /8<sup>th</sup>/9<sup>th</sup>Edns); LewisPublishers.
7. Environmental Chemistry; 2<sup>nd</sup> 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.