



## Course Outline

**Course Title:** Inorganic Chemistry

**Course Code:** CHEM-5102

**Course Duration:** 1 semester

**Credit Units:** (3+1) 4 credit

**Teacher:** **Dr Muhammad Azhar Abbas Raja**

**Department of Chemistry (Jinnah Block)**

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### Introduction to course

- Periodic Table and Periodicity of properties
- Chemical bonding
- Chemistry of p-block elements
- Acid – base equilibria
- Chemistry of d-block elements
- Separation techniques
- Introduction to analytical techniques in inorganic chemistry
- Chemical industries.

### Course pre-requisites

- The prerequisites is the Physical Chemistry (CHEM 181) in minimum grade “C” or better and promoted in 2<sup>nd</sup> semester in BS program by meeting the minimum criteria of Department of Chemistry.

### Learning outcomes

- Identify and explain, the importance/relevance of the subject matters covered in a graduate program curriculum; Students will acquire knowledge about the key introductory concepts of chemical bonding, acid-base Chemistry, and properties of p-block elements as well as using this knowledge for qualitative and quantitative analysis of inorganic compounds during laboratory work. In addition to basics of elements, students will be able to get familiar with separation and basic analytical techniques alongwith knowledge of chemical industry and metallurgical operations.
- Compare and relate the selected topics with the ones in General Chemistry and generate the conceptual links between the two fields, in order to establish a broader perspective on these foundational topics.

## **Textbooks to be used for the course**

- Bhatti, H.N. and Nasir, B.A. Modern Inorganic Chemistry, 1st Edition, The Carvan Book House, Lahore, (2000).
- Graham, H and Man, H. Chemistry in Context 5th Edition, Thomas Nelson Ltd. U.K. (2000).
- Shaheen, M. A., Jilani, Manual of Practical Chemistry Vol.II, Jilani Notes, Sargodha, (2016).
- Albert, C.F., Wilkinson G. and Gaus, P.L. Basic Inorganic Chemistry, 3rd Edition, John Wiley & Sons, Inc. NY (1995).
- Vogel, A.I., „A Text Book of Macro and Semimicro Qualitative Inorganic Analysis“, Longman Green & Co. NY (1995).
- Skoog, D.A., West, D.M and Holler, F.J. Analytical Chemistry, 6th Edition Saunders College Publications, UK (1994).
- Some relevant material from internet books *i.e* Satya Prakash.

## **Description of system of evaluation (Exam, assignments etc)**

- Sessional 15 (Min. attendance 75 % is necessary to appear in exam)  
(Attendance, Assignment & presentation)
- Mid Term Exam 15%
- Project/Practical/Oral work 25%
- Final Exam. 45%

## **Detailed lesson plans for each lecture (Weekly/Week wise)**

### ***Week 1-2***

Modern Periodic Table, Group trends and periodic properties, Atomic & ionic radii, ionization potentials, electron affinities and electronegativities; Redox potential.

### ***Week 3-4***

Electrochemical series and its applications. Corrosion and electroplating. Introduction to p-block elements (Group trends in p-block elements with reference to, atomic sizes & chemical reactivities). Boranes & Boride; aluminium halides, hydrides & Alums. Germanes; phosphazenes, Phosphides, Oxoacids of Phosphorous; Oxoacids & salts of sulphur.

### ***Week 5-6***

Silicates (Structural aspects, classifications and applications); silicones (Structural aspects, classifications and applications. Nature of a bond, Concept of hybridization.

Conduct **Mid-term Assignment** (Online) by assigning the topic to each students of the class.

### **Week 7-8**

Valence Bond Theory (VBT), The Concept of Resonance, Valence Shell Electron Pair Repulsion (VSEPR) theory, Molecular Orbital Theory (MOT) and Comparison between VBT/VSEPR/MOT. Introduction to Chemical Bonding, Special types of bonds such as Metallic, Hydrogen Bonding and Bent bond. Theories of Acids and bases, relative strengths of acids.

Submission of **Mid-term Assignment** (Online) from students.

### **Week 9-10**

Concept of pH, pKa, pKb. Hard and soft acid & Bases. SHAB Principle & its application. Buffers, types buffer, Preparation, Buffer capacity and applications of buffers. Indicators: (Acid-base, Redox, Adsorption), Solubility product, Common ion effect and its applications. Ion-dipole-dipole bond, ion induced-dipole bond.

### **Week 11-12**

Noble gases (compounds of Xe, Kr, Ra; bonding and applications). Production of pure silicon chips for solar energy cells. Electronic configuration. Characteristics. Nomenclature. Nature of bonding in coordination compounds: Werner's theory, VBT, MOT and CFT for coordination compounds

### **Week 13-14**

Isomerism in coordination compounds. Chelates: Classification and applications. Applications of coordination compounds (Medicinal, Industrial, Agricultural. General introduction and Applications (Solvent extraction and Chromatographic techniques such as paper, Ion exchange and Column

### **Week 15-16**

Introduction to spectroscopic Techniques: Principle, brief instrumentation, sample handling and applications of Flame emission, Atomic Absorption. Introduction to spectroscopic Techniques: Principle, brief instrumentation, sample handling and applications of Infrared & Ultraviolet/Visible

### **Week 17**

Metallurgy of Aluminum, Chromium and Uranium. Fertilizers (Urea & Phosphate fertilizers) Cement and Sugar.

### **Week 18**

**Final** Term Examination

### **Key dates and time of class meetings**

Semester Start Date: *w.e.f* March 3, 2020.

<b>Course</b>	<b>Mon</b>	<b>Tue</b>	<b>Wed</b>	<b>Thu</b>
CHEM-5102	12-01	12-01	12-01	04-06 Lab

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