

**SCHEME OF EXAMINATION  
AND  
COURSE OF STUDY  
CHOICEBASEDCREDITSYSTEM (CBCS)  
And  
LOCF  
M.Sc.(CHEMISTRY)  
(w.e.f. 2022-2023)**



**DEPARTMENT OF CHEMISTRY  
GURUKUL KANGRI (DEEMED TO BE UNIVERSITY), HARIDWAR**

**27 May, 2022**

## **PROGRAMME- M.Sc. Chemistry**

### **PROGRAMME OBJECTIVES:**

It is a job oriented, innovative and applied programme. The main objectives of the programme are to-

1. Provides opportunity to students as Quality Control Chemist, Research and Development Chemist, Analytical Chemist in various laboratories and institutions.
2. Develops analytical skill amongst students
3. To Acquire knowledge of modern as well as Vedic concept of chemistry
4. Equip students to step up in research and development

### **PROGRAMME OUTCOMES:**

After studying this programme students become able to -

1. Familiar with the knowledge of theoretical aspects of Inorganic, Organic, Physical and Analytical Chemistry
2. Explain working principle, instrumentation and application of various experiments by performing more practices in the laboratories.
3. Develop skills to handle analytical techniques in industry, research and institutes.
4. Discuss modern as well as Vedic concept of chemistry
5. Employ critical thinking and scientific knowledge to design, carry out, record and analyse the results
6. Describe about environment, chemicals and pollution problems in details
7. Accomplish their goals in professional and academic life.
8. Be provided with the knowledge to step up in Research and Development.

<b>Course Title: Chemistry Core-1: General Inorganic Chemistry w.e.f. the session 2022-23 and onwards</b>	
<b>Class: M.Sc. Pt.-I / Semester-I</b>	<b>Course code: MCH-C101</b>
<b>Lectures: 60</b>	<b>Credits : 04</b>
<b>MM: 70</b>	<b>Exam Hours: 03</b>

**NOTE:** The question paper shall consist of Two sections (Sec.-A and Sec.-B). Sec.-A shall contain 10 short answer (about 150 words) type questions of SIX marks each and student shall be required to attempt any five questions. Sec.-B shall contain 08 descriptive type questions of TEN marks each and student shall be required to attempt any four questions. Both sections shall have questions from the entire syllabus. The previous year paper/model paper can be used as a guideline and the following syllabus should be strictly followed while setting the question paper.

## **COURSE CONTENTS:**

### **Unit - I**

**COORDINATION CHEMISTRY:** Distortion in Complexes, Molecular orbital theory (M.O.T.) as applied to octahedral complexes,  $\pi$  - bonding in octahedral complexes, inert and labile complexes based on various theories, ligand substitution reaction in octahedral and square planar complexes, electron transfer reaction in coordination compounds.

### **Unit - II**

**ELECTRONIC SPECTRA OF COMPLEXES:** Term symbols S,P,D,F, in a cubic field; splitting of term for d configuration; spectra of Transition metal complexes, selection rules and intensities of the transitions, nature of Electronic transitions in complexes, Orgel energy level diagram, Tanabe-Sugano diagram. Calculation of  $Dq$ ,  $B'$  and  $\beta$  for Cr III and Ni II complexes. Structural Evidence from Electronic spectra, charge-transfer spectra.

### **Unit - III**

**MAGNETOCHEMISTRY:** Contribution of magnetic properties, Effect of the ligand field on spin-orbit coupling, measurement of magnetic properties, methods of magnetic susceptibility determination, temperature dependence of magnetism, application of magnetic data (Ref. book : Drago)

**MOLECULAR SYMMETRY:** Symmetry elements, Symmetry operations and point groups, Character Tables ( $C_{2v}$ ) and applications.

### **Unit - IV**

**BIOINORGANIC CHEMISTRY:** General introduction to Bio-inorganic Chemistry; occurrence of Inorganic elements in organisms, classification of metallo bio-molecules; Biologically important features and functions of inorganic elements, Biologically important ligands for metal ions, co-ordination by proteins and Enzymatic catalysis.

Role of metal ions and non-metals in Biological systems Na, K, Ca, Mg, Zn, Cl, Si, As, F, I, Se (Giving suitable examples) Biomineralisation.

### **Unit - V**

**OXYGEN CARRIERS:** Haemoglobin; non-porphyrin and porphyrin oxygen carriers, synthetic oxygen carriers. Recent trends in

Nitrogen fixation, photosynthesis PS- 1 & PS - 11, superoxide Dismutase.

### **Suggested Readings:**

1. Inorganic Chemistry by: James E. Huheey
2. Text Book of Inorganic chemistry by: Cotton and Wilkinson 5th Edition
3. Physical Methods in Inorganic Chemistry by: R.S.Drago
4. Selected Topics in Inorganic Chemistry by: Malik, Tuli & Madan
5. Bioinorganic and Supramolecular Chemistry by: A.K.Bhagi, G.R.Chatwal

## COURSE OBJECTIVES:

1. Coordination chemistry.
2. Electronic spectra of complexes
3. Knowledge of Magnetochemistry.
4. Molecular symmetry.
5. Basic concepts of Bio-inorganic chemistry
6. Oxygen Carriers

## COURSE OUTCOMES:

On completion of this course, student shall be able to:

CO 1: Understand the basic concepts behind metal ligand bonding in octahedral complexes, reactions taking place in octahedral and square- planar complexes, trans effect and its applicability in synthesis of different metal complexes

CO 2: Deduce terms, state & microstate and explain L-S coupling scheme, Racah parameters, Orgel diagram, Tanabe-Sugano diagram alongside classify the transitions on the basis of selection.

CO 3: Enlist different magnetic properties existing in chemical compounds. Student can classify & recognize the symmetry elements and their operations & be able to find point group of molecule by systematic procedure and its application in chemistry

CO 4: Able to describe how metal ions take part in biological system and their concentration effect and physiological effect on biological system and recognize organic chemical reactions embodied in biochemical processes

CO 5: Able to recognize role of porphyrin ring in hemoglobin and chlorophyll and Associate the bioinorganic chemistry with function of hemoglobin in addition to enumerate the chemical aspects of photosynthesis and nitrogen fixation.

Mapping of Course outcomes (Cos) with Programme outcomes (POs)

Course outcomes/ Programme outcomes	1	2	3	4	5	6	7	8
CO 1	X				X			X
CO 2	X		X		X			X
CO 3	X				X			X
CO 4	X		X			X		X
CO 5	X					X		X