# UNIVERSITY OF MADRAS

B.Sc. DEGREE PROGRAMME IN CHEMISTRY

SYLLABUS WITH EFFECT FROM 2023-2024

<table>
<tr><td>Title of the Course</td><td colspan="8">INORGANIC CHEMISTRY –II</td></tr>
<tr><td>Paper No.</td><td colspan="8">Core XIV (CC14)</td></tr>
<tr><td rowspan="2">Category</td><td rowspan="2">Core</td><td>Year</td><td>III</td><td rowspan="2">Credits</td><td rowspan="2">4</td><td rowspan="2">Course Code</td><td colspan="2" rowspan="2">324C6B</td></tr>
<tr><td>Semester</td><td>VI</td></tr>
<tr><td>Instructional hours per week</td><td>Lecture</td><td>Tutorial</td><td colspan="3">Lab Practice</td><td colspan="3">Total</td></tr>
<tr><td></td><td>4</td><td>1</td><td colspan="3">-</td><td colspan="3">5</td></tr>
<tr><td>Prerequisites</td><td colspan="8">Inorganic Chemistry – I</td></tr>
<tr><td>Objectives of the course</td><td colspan="8">The course aims to provide knowledge on<ul><li>tracer elements and their role in the biological system.</li><li>iron transport and storage</li><li>metallo enzymes, oxygen transport.</li><li>silicates and their applications</li><li>industrial applications of refractories, alloys, paints and pigments</li></ul></td></tr>
<tr><td rowspan="3">Course Outline</td><td colspan="8">UNIT I<br>Bioinorganic Chemistry<br>Essential and trace elements: Role of $Na^{+}$, $K^{+}$, $Mg^{2+}$, $Ca^{2+}$, $Fe^{3+}$, $Cu^{2+}$ and $Zn^{2+}$ in biological systems. Effect of excess intake (Toxicity) of Metal ions – trace elements - As, Cd, Pb, Hg.</td></tr>
<tr><td colspan="8">UNIT II<br>Metal ion transport and storage<br><br>Iron – storage, transport - Transferrin and Ferretin; Iron-porphyrins – myoglobin, haemoglobin – oxygen transport - Bohr effect; Sodium/potassium pump, calcium pump; transport and storage - copper and zinc.</td></tr>
<tr><td colspan="8">UNIT III<br>Metallo enzymes<br><br>Isomerase and synthetases, structure of cyanocobalamin (Vitamin B12), nature of Co-C bond; Metalloenzymes - functions of carboxy peptidase A, zinc metalloenzyme – mechanism and uses, Zn-Cu enzyme - structure and function, carbonic anhydrase, Vitamin B-12 as transferase and isomerase - Iron-sulphur proteins - 2Fe-2S – rubredoxin, 4Fe-2S – ferridoxin, Iron sulphur clusterenzymes.<br>Invivo and Invitro nitrogen fixation – biological functions of nitrogenase and molybdo enzymes.</td></tr>
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| | **UNIT IV**<br>**Silicates**<br><br>Introduction – general properties of silicates, structure – types of silicates – ortho silicates(zircon), pyrosilicates (thortveitite), chain silicates(pyroxenes), ring silicates(beryl), sheet silicates (talc, mica, asbestos), silicates having three dimensional structure (feldspars, zeolites, ultramarines) |
| | **UNIT V**<br>**Industrial Applications of Inorganic Compounds**<br><br>Refractories, pyrochemical, explosives. Alloys, Paints and pigments - requirements of a good paint; classification, constituents of paints – pigments, vehicles, thinners, driers, extenders, anti-knocking agents, anti-skinning agents, plasticizers, binders-application; varnishes- oils, spirit; enamels.<br>Nanocomposite Hydrogels: synthesis, characterization and uses.<br><br>Industrial visits and internship mandatory. |
| Extended Professional Component (is a part of internal component only, Not to be included in the external examination question paper) | Questions related to the above topics, from various competitive examinations UPSC/ JAM /TNPSC others to be solved<br>(To be discussed during the Tutorial hours) |
| Skills acquired from this course | Knowledge, Problem solving, Analytical ability, Professional Competency, Professional Communication and Transferable skills. |
| **Recommended Text** | 1. Puri B R, Sharma L R, Kalia K C (2011), Principles of Inorganic Chemistry, 31$^{th}$ed., Milestone Publishers & Distributors, Delhi. |
| | 2. Satya Prakash, Tuli G. D., Basu S. K., Madan R. D. (2009), Advanced Inorganic Chemistry, 18$^{th}$Edition, S. Chand & Co., NewDelhi<br>3. Lee J D, (1991), Concise Inorganic Chemistry, 4$^{th}$ed., ELBS William Heinemann, London.<br>4. W V Malik, G D Tuli, R D Madan, (2000), Selected Topics in Inorganic Chemistry, S Chand and Company Ltd.<br>5. A. K. De, Text book of Inorganic Chemistry, Wiley East Ltd, seventh edition,1992 |

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| **Reference Books** | 1. Madan R D, Sathya Prakash, (2003), Modern Inorganic Chemistry, 2nd ed., S.Chand and Company, NewDelhi.<br>2. Gopalan R, (2009) Inorganic Chemistry for Undergraduates, Ist Edition, University Press (India) Private Limited, Hyderabad<br>3. Sivasankar B, (2013) Inorganic Chemistry. Ist Edition, Pearson, Chennai<br>4. Alan G. Sharp (1992), Inorganic Chemistry, 3rd Edition, Addition-Wesley, England<br>5. Peter Atkins, Tina Overton, Jonathan Rourke and Mark Weller, Inorganic Chemistry, Oxford University Press, sixth edition,2014. |
| **Website and e-learning source** | 1. www.epgpathshala.nic.in<br>2. www.nptel.ac.in<br>3. http:/swayam.gov.in |

**Course Learning Outcomes (for Mapping with POs and PSOs) On completion of the course the students should be able to**

**CO1:** ability to explain the importance of tracer elements on biological system.

**CO2:** explain the metal ion transport, Bohr effect, Na, K, Ca pump.

**CO3:** explain the function of Vitamin B12, Zn-Cu enzyme, ferredoxin, cluster enzymes.

**CO4:** classification and structure of silicates.

**CO5:** explain the manufacture of refractories, explosives, paints and pigments

| | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |
|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | S | S | S | S | S | S | S | M | S | M |
| **CO2** | M | S | S | S | M | S | S | M | M | M |
| **CO3** | S | S | S | M | S | S | S | M | S | M |
| **CO4** | S | S | S | S | S | S | S | M | M | M |
| **CO5** | S | M | S | S | S | S | S | M | M | S |

**CO-PO Mapping (Course Articulation Matrix)**

| CO /PSO | PSO 1 | PSO 2 | PSO 3 | PSO 4 | PSO5 |
|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 3 | 3 | 3 |
| **CO4** | 3 | 3 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 3 | 3 | 3 |
| **Weightage** | 15 | 15 | 15 | 15 | 15 |
| **Weighted percentage of Course Contribution to Pos** | 3.0 | 3.0 | 3.0 | 3.0 | 3.0 |

**Level of Correlation between PSO's and CO's**