

UNIVERSITY OF MUMBAI

No. UG/73 of 2018-19

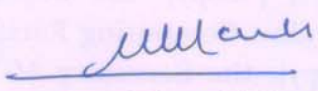
CIRCULAR:-

Attention of the Principals of the affiliated Colleges and Directors of the recognized Institutions in Science & Technology Faculty is invited to this office Circular Nos. UG/156 of 2016-17, dated 16th November, 2016 relating to syllabus of the Bachelor of Science (B.Sc.) degree course.

They are hereby informed that the recommendations made by the Board of Studies in Chemistry at its meeting held on 28th May, 2018 have been accepted by the Academic Council at its meeting held on 14th June, 2018 **vide** item No. 4.41 and that in accordance therewith, the revised syllabus as per the (CBCS) for the Chemistry of T.Y.B.Sc. Physical Chemistry, Inorganic Chemistry, Organic Chemistry and Analytical Chemistry (Sem - V & VI) (3 and 6 Units) including Applied Component Drugs and Dyes, Heavy Fine Chemicals and Petrochemicals has been brought into force with effect from the academic year 2018-19, accordingly. (The same is available on the University's website www.mu.ac.in).

MUMBAI – 400 032

To ^{6th June, 2018}
6th July


(Dr. Dinesh Kamble)
I/c REGISTRAR

The Principals of the affiliated Colleges & Directors of the recognized Institutions in Science & Technology Faculty. (Circular No. UG/334 of 2017-18 dated 9th January, 2018.)

A.C./4.41/14/06/2018

No. UG/ 73 -A of 2018

MUMBAI-400 032

^{6th June, 2018}
6th July

Copy forwarded with Compliments for information to:-

- 1) The I/c Dean, Faculty of Science & Technology,
- 2) The Chairman, Board of Studies in Chemistry,
- 3) The Director, Board of Examinations and Evaluation,
- 4) The Director, Board of Students Development,
- 5) The Co-Ordinator, University Computerization Centre,


(Dr. Dinesh Kamble)
I/c REGISTRAR

T.Y B.Sc. CHEMISTRY (3units)

SEMESTER V

INORGANIC CHEMISTRY

COURSE CODE: USCH502

CREDITS: 01

LECTURES: 30

(Numericals and word problems are expected)	
UNIT-I	L/Week
1. Molecular Symmetry and Chemical Bonding	
1.1 Molecular Symmetry (6L)	
1.1.1 Introduction and Importance of Symmetry in Chemistry.	
1.1.2 Symmetry elements and Symmetry operations.	
1.1.3 Concept of a Point Group with illustrations using the following point groups :(i) $C_{\infty v}$ (ii) $D_{\infty h}$ (iii) C_{2v} (iv) C_{3v} (v) C_{2h} and (vi) D_{3h}	
1.2 Molecular Orbital Theory for heteronuclear diatomic molecules and polyatomic species (9L)	
1.2.1 Comparison between homonuclear and heteronuclear diatomic molecules.	
1.2.2. Heteronuclear diatomic molecules like CO, NO and HCl, appreciation of modified MO diagram for CO.	
1.2.3 Molecular orbital theory for H_3 and H_3^+ (correlation diagram expected).	

1.2.4. Molecular shape to molecular orbital approach in AB ₂ molecules. Application of symmetry concepts for linear and angular species considering σ - bonding only. (Examples like : (i) BeH ₂ , (ii) H ₂ O).	
UNIT-II	
2.0 CHEMISTRY OF INNER TRANSITION ELEMENTS (15L)	
2.1 Introduction: , Position in periodic table and electronic configuration of lanthanides and actinides.	
2.2 Chemistry of Lanthanides with reference to (i) lanthanide contraction and its consequences(ii) Oxidation states (iii) ability to form complexes (iv) magnetic and spectral properties	
2.3 : Occurrence, extraction and separation of lanthanides by (i) Ion Exchange method and (ii) Solvent extraction method (Principles and technique)	
2.4 Applications of lanthanides	

References

SEM-V

Unit-I

1. Per Jensen and Philip R. Bunker , Fundamentals of Molecular Symmetry , Series in Chemical Physics, Taylor & Francis Group
2. J. S. Ogden, Introduction to Molecular Symmetry, Oxford University Press
3. [Derek W. Smith](#), Molecular orbital theory in inorganic chemistry Publisher: Cambridge University Press
4. [C. J. Ballhausen](#), [Carl Johan Ballhausen](#), [Harry B. Gray](#) Molecular Orbital Theory: An Introductory Lecture Note and Reprint Volume [Frontiers in chemistry](#) Publisher W.A. Benjamin, 1965
5. Jack Barrett and Mounir A Malati, Fundamentals of Inorganic Chemistry, Affiliated East west Press Pvt. Ltd., New Delhi.
6. Satya Prakash, G.D.Tuli, R.D. Madan , , Advanced Inorganic Chemistry.S. Chand & Co Ltd

Unit-II

1. Cotton, Wilkinson, Murillo and Bochmann, Advanced Inorganic Chemistry, 6th Edition.
2. Greenwood, N.N. and Earnshaw, Chemistry of the Elements, Butterworth Heinemann. 1997.
3. Huheey, J.E., Inorganic Chemistry, Prentice Hall, 1993.
4. G. Singh, Chemistry of Lanthanides and Actinides, Discovery Publishing House
5. Simon Cotton , Lanthanide and Actinide Chemistry Publisher: Wiley-Blackwell

Practicals

SEMESTER V

INORGANIC CHEMISTRY

COURSE CODE: USCHP07

CREDITS: 01

I. Inorganic preparations

1. Preparation of Potassium diaquobis- (oxalato)cuprate (II)

II. Determination of percentage purity of the given water soluble salt and qualitative detection w.r.t added cation and/or anion (qualitative analysis only by wet tests).

(Any two salts of transition metal ions)

Reference Books (practicals)

1. Vogel Textbook of Quantitative Chemical Analysis G.H. Jeffery, J. Basset.
2. Advanced experiments in Inorganic Chemistry., G. N. Mukherjee., 1st Edn., 2010., U.N.Dhur & Sons Pvt Ltd .
3. Vogel's. Textbook of. Macro and Semimicro *qualitative inorganic analysis*. Fifth edition.

SEMESTER VI
INORGANIC CHEMISTRY

COURSE CODE: USCH602

CREDITS: 01

LECTURES: 30

UNIT-I	L/week
1.Theories of the metal-ligand bond (I) (15L)	
1.1 Limitations of Valence Bond Theory.	
1.2 Crystal Field Theory and effect of crystal field on central metal valence orbitals in various geometries from linear to octahedral(from coordination number 2 to coordination number 6)	
1.3 Splitting of <i>d</i> orbitals in octahedral, square planar and tetrahedral crystal fields.	
1.4 Distortions from the octahedral geometry : (i) effect of ligand field and (ii) Jahn-Teller distortions.	
1.5 Crystal field splitting parameters Δ ; its calculation and factors affecting it in octahedral complexes, Spectrochemical series.	
1.6 Crystal field stabilization energy(CFSE), calculation of CFSE for octahedral complexes with d^0 to d^{10} metal ion configurations.	
1.7 Consequences of crystal field splitting on various properties such as ionic radii, hydration energy and enthalpies of formation of metal complexes of the first transition series.	
1.8 Limitations of CFT : Evidences for covalence in metal complexes (i) intensities of d-d transitions, (ii) ESR spectrum of $[\text{IrCl}_6]^{2-}$ (iii) Nephelauxetic effect.	
UNIT-II	

2 SOME SELECTED TOPICS	(15L)	
2.1 Metallurgy	(7L)	
2.1.1 Types of metallurgies,		
2.1.2 General steps of metallurgy; Concentration of ore, calcinations, roasting, reduction and refining.		
2.1.3 Metallurgy of copper: occurrence, Physicochemical principles, Extraction of copper from pyrites & refining by electrolysis.		
2.2 Chemistry of Group 18	(5L)	
2.2.1 Historical perspectives		
2.2.2 General characteristics and trends in physical and chemical properties		
2.2.3 Isolation of noble gases		
2.2.4 Compounds of Xenon (oxides and fluorides) with respect to preparation and structure (VSEPR)		
2.2.5 Uses of noble gases		
2.3 Introduction to Bioinorganic Chemistry.	(3L)	
2.3.1 Essential and non essential elements in biological systems.		
2.3.2 Biological importance of metal ions such as Na^+ , K^+ , $\text{Fe}^{2+}/\text{Fe}^{3+}$ and Cu^{+2} (Role of Na^+ and K^+ w.r.t. ion pump.)		

REFERENCES:

SEM VI

Unit-I

1. [Geoffrey A. Lawrance](#) Introduction to Coordination Chemistry John Wiley & Sons.
2. R. K. Sharma Text Book of Coordination Chemistry [Discovery Publishing House](#)

3. [R. Gopalan](#) , [V. Ramalingam](#) Concise Coordination Chemistry , Vikas Publishing House;
4. Shukla P R, Advance Coordination Chemistry , Himalaya Publishing House
5. Glen E. Rodgers, Descriptive Inorganic, Coordination, and Solid-State Chemistry Publisher: Thomson Brooks/Cole

Unit-II

- 1 R. Gopalan, Inorganic Chemistry for Undergraduates, Universities Press India.
- 2 D. F. Shriver and P. W. Atkins, Inorganic chemistry, 3rd edition, Oxford University Press
- 3 Cotton, Wilkinson, Murillo and Bochmann, Advanced Inorganic Chemistry, 6th Edition.
- 4 Jack Barrett and Mounir A Malati, Fundamentals of Inorganic Chemistry, Affiliated East west Press Pvt. Ltd., New Delhi.
- 5 R.Gopalan, Chemistry for undergraduates. Chapter 18. Principles of Metallurgy.(567-591)
- 6 Puri ,Sharma Kalia Inorganic chemistry. Chapter 10, Metals and metallurgy.(328-339)
- 7 Greenwood, N.N. and Earnshaw, Chemistry of the Elements, Butterworth Heinemann. 1997.
- 8 Huheey, J.E., Inorganic Chemistry, Prentice Hall, 1993.
- 9 Lippard, S.J. & Berg, J.M. Principles of Bioinorganic Chemistry Panima Publishing Company 1994.
- 10 Satya Prakash, G.D.Tuli, R.D. Madan , , Advanced Inorganic Chemistry.S. Chand & Co Ltd

Practicals

SEMESTER V

INORGANIC CHEMISTRY

COURSE CODE: USCHP08

CREDITS: 01

I. Inorganic preparations

Preparation of Tris(acetylacetonato) iron(III)

II. Determination of percentage purity of the given water soluble salt and qualitative detection w.r.t added cation and/or anion (qualitative analysis only by wet tests).

(Any three salts of main group metal ions)

Reference Books (practicals)

4. Vogel Textbook of Quantitative Chemical Analysis G.H. Jeffery, J. Basset.
5. Advanced experiments in Inorganic Chemistry., G. N. Mukherjee., 1st Edn., 2010., U.N.Dhur & Sons Pvt Ltd .
6. Vogel's. Textbook of. Macro and Semimicro *qualitative inorganic analysis*. Fifth edition.