DEPARTMENT OF CHEMISTRY
FACULTY OF SCIENCE & HUMANITIES
SRM UNIVERSITY
KATTANKULATHUR

SRM UNIVERSITY
(Under section 3 of UGC Act 1956)

LESSON PLAN
Academic year 2017 – 18 (Odd)

Program : M.Sc Chemistry
Subject Title : Main Group Elements and Nuclear Chemistry
Subject Code : 17PCY104
Total No. of hours: 60
Semester : I

UNIT No.& Title	TOPICS	LECTURE NO.	REFERENCE BOOKS
I Main group chemistry-I	Introduction & Discussion –General properties of elements in periodic table	1	1,2
	Chemical properties of s-block metals: reaction with water, air, nitrogen	2	1,2
	s-block metals- uses and their compounds	3	1,2
	compounds of *s*-block metals, oxides, hydroxides, peroxides, superoxides, preparation and properties	4	1,2
	oxo salts, carbonates, bicarbonates, nitrates, halides and polyhalides	5	1,2
	anomalous behavior of Li and Be complexes of *s*-block metals	6,7	1,2
	complexes with crown ethers and cryptands, biological importance	8,9	1,2
	Organometallic compounds of Li, Mg and Be, synthesis, reactivity and bonding	10,11	1,2
	Discussion/Question & Answer- Tutorial sheet with relevant problems will be provided	12	
II Main group chemistry-II	Polymorphism of carbon, phosphorus and sulfur	13	1,2
	catenation and heterocatenation, allotropy of carbon	14	1,2
	carbides, salt like carbides, interstitial carbides, covalent carbides	15	1,2
	silicates, ortho, pyro, cyclic, chain, sheet, three dimensional silicates and their properties and structures	16,17	1,2
	silicates in technology-alkali silicates, ceramics, glass	18	1,2
	organosilicones, preparation, structures, applications.	19	1,2
	Synthesis, structure and bonding in poly anions and isopoly anions of phosphorous, vanadium	20	1,2
	molybdenum and tungsten, hetero poly anions of molybdenum and tungsten, oxides and oxyacids of Se and Te,	21	1,2
	homocyclic inorganic systems pπ-pπ and pπ-dπ bonding, structure and properties of interhalogen compounds, [ClF, ICl, ClF_3, BrF_3, IF_3, ClF_5, BrF_5, IF_5] poly halides	22,23	1,2
	psuedohalogens, [cyanide, thiocyanate and azide] and xenon compounds. **Discussion/Question & Answer**	24	1,2
III Main group	Boron oxides and oxoacids, borates	25	1,3
	organic compounds containing boron-oxygen bonds, boron sesquioxide	26	1,3
	borates, borax, sodium peroxoborates	27	1,3

chemistry-III	chemistry of B-N compounds, aminoboranes, borazines, polyborazines	28,29	1,3
	boroxines and boron nitrides, compounds of boron with oxygen	30	1,3
	Chemistry of P-N compounds, synthesis and reactivity of phosphazene and its polymers	31,32	1,3
	theories of bonding, electronic structure and aromaticity, chemistry of S-N compounds	33	1,3
	synthesis and reactivity of S_4N_4, S_2N_2, $S_3N_3Cl_3$ and poly thiazyl$(SN)_x$ compounds	34,35	1,3
	Discussion/Question & Answer- Tutorial sheet with relevant problems will be provided	36	
Unit IV Main group chemistry-IV	Boron hydrides, reaction with ammonia, hydroboration	37	3,4,5
	structure of boranes, borohydrides and their uses	38	3,4,5
	boron and multicentre bonding, boron cages	39	3,4,5
	Vacuum technique of synthesis, lower and higher boranes reactions	40	3,4,5
	Structure and bonding, topological treatment	41	3,4,5
	Wade's rule, styx numbers, carboranes, metallocarboranes, other hetero atom boron derivatives	42	3,4,5
	Metal atom cluster, di, tri, tetra, and hexanuclearity metal clusters	43	3,4,5
	Cluster structure based on electron counting schemes	44	3,4,5
	capping rule, isoelectronic and isolobal analogy, structure implications	45	3,4,5
	relationship between fragments, isolobal relationships between main-group and transition metal fragments	46	3,4,5
	metal-ligand complexes vs heteronuclear clusters, dπ-pπ bonding ,examples	47	3,4,5
	Discussion/Question & Answer- Tutorial sheet with relevant problems will be provided	48	
Unit V Nuclear chemistry	Composition of nucleus, nuclear size, nuclear forces	49	6
	packing fraction, nuclear density, mass defect, binding energy of the nucleus	50	6
	nuclear models, concept of nuclear spin	51	6
	Radioactivity, radioactive disintegration, radioactive decay and half-life, Geiger-Nuttall rule, radioactive equilibrium, steady state	52	6
	transmutation of elements, group displacement rule, nuclear stability, radioactive series	53	6
	isotopes, isobars, isotones, separation of isotopes, determination of atomic masses	54	6
	artificial radioactivity, induced radioactivity, transuranic elements, nuclear coulombic energy barrier, q values of nuclear reactions	55	6
	nuclear fission, nuclear fusion	56	6
	Detectors: scintillation counter, gas ionisation chamber, proportional counter, Cerenkov counter	57	6
	accelerators, cyclotron, synchrocyclotron, betatron	58	6
	Applications of radioactivity, activation analysis, isotopic dilution technique, radiometric titration	59	6
	Discussion/Question & Answer- Tutorial sheet with relevant problems will be provided	60	

Text Books:

1. D. F. Shriver and P. W. Atkins, *Inorganic Chemistry*, 5th Ed., W. H. Freeman and Co, London, 1999.
2. F. A. Cotton, G. Wilkinson, C. Murillo and M. Bochman, *Advanced Inorganic Chemistry*, 6th Ed., 1999.
3. J. D. Lee, Concise Inorganic Chemistry, 4th Ed., Black well science publisher, UK. 2011 John Wiley, New York, 1999.
4. H. J. Arnikar, *Essentials of Nuclear Chemistry*, 4th Ed., New Age International, New Delhi, 1995.
5. B. K. Sharma, Nuclear & Radiation Chemistry Krishna Prakashan Media (P) Ltd, 2011.
6. Wahid U. Malik, G. D. Tuli, R D Madan, Selected Topics in Inorganic Chemistry, 17th edition, S. Chand Publishing, New Delhi, 2010.

Unit-I: Chapter 9 (J.D. Lee), Chapter 11, 12 (Shriver), Chapter 23, Part 2 (Cotton).
Unit-II: Chapter 13 (J. D. Lee), Chapter 16, 17, 18 (Shriver), Chapter 13, Part 2, (Cotton).
Unit-III: Chapter 12 (J. D. Lee), Chapter 13, 14, 16 (Shriver), Chapter 5, 13, 17, 18, Part 2 (Cotton).
Unit-IV: Chapter 13, 15 (Shriver), Chapter 5, Part 2 (Cotton).
Unit-V: (Arnikar & B. K. Sharma)

Reference Books:

1. J. E Huheey, E. A. Keiter, R. L. Keiter, O.K. Medhi, Inorganic Chemistry, 4th Edition, Pearson publisher, U.S.A,1993.
2. Miessler, G. L, Tarr, D. A., Inorganic Chemistry, 3rd edition Pearson Education Inc.2004
3. Keith F. Purcell, John C. Kotz, Inorganic chemistry, Cengage learning India Pvt Ltd., India 1977.
4. B. Douglas and A. McDaniel and J. Alexander, *Concepts and Models of Inorganic Chemistry*, 3rd Ed., John Wiley & Sons, Inc, 2001.
5. N.N. Greenwood and A. Earnshaw, *Chemistry of the Elements,* Pergamon Press, Oxford, 1984.
6. G. Frielander, J. W. Kennedy, E.S. Macias, J. M. Miller, Willey-Interscience publications, 1981.

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25-7-17
HOD/Chemistry