LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **CHEMISTRY**

THIRD SEMESTER – **NOVEMBER 2023**

PCH3MC01 – MAIN GROUP ELEMENTS AND NUCLEAR CHEMISTRY

Date: 30-10-2023 Dept. No. Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

	SECTION A – K1 (CO1)	
	Answer ALL the questions	**(5 x 1 = 5)**
1	**Answer the following.**	
a)	Write an example of transmetallation.	
b)	Labelling of borazine as inorganic benzene is a misnomer. Justify.	
c)	Draw the dimer structure of chlorine dioxide.	
d)	Write an example of K electron capture.	
e)	Write any two sequestering agents for radioisotopes.	
	SECTION A – K2 (CO1)	
	Answer ALL the questions	**(5 x 1 = 5)**
2	**Answer the following**	
a)	Cite an example for metathesis.	
b)	Write the molecular formula of the repeating unit present in amphibole mineral.	
c)	Write the isomers of dichlorine monoxide.	
d)	What is the expression for half-life of a first order reaction?	
e)	Name any two isotopes used in an isotopic dilution analysis.	
	SECTION B – K3 (CO2)	
	Answer any THREE of the following	**(3 x 10 = 30)**
3	Explain the structural determination of borohydrides using Wade's rule and cite any three examples.	
4	Illustrate the π-bonding models and structural features of cyclic phosphazenes.	
5	a) Discuss the characteristics of haloamines. b) Write the applications of xenon compounds.	(5+5)
6	Explain the principle of carbon dating. How is the age of the earth determined?	
7	Explain radiolysis of water.	
	SECTION C – K4 (CO3)	
	Answer any TWO of the following	**(2 x 12.5 = 25)**
8	Write a note on preparation of carboranes.	
9	a) Describe the preparation, properties and applications of silicones. b) Write a brief note on heteropoly anions of molybdenum.	(8+4.5)
10	a) How are Cl_2O and ClO_2 prepared on a commercial scale? b) Explain pulse radiolysis.	(6+6.5)
11	Explain Soddy-Fajan group displacement law by citing appropriate examples.	
	SECTION D – K5 (CO4)	
	Answer any ONE of the following	**(1 x 15 = 15)**
12	a) Describe any four reactions of diborane. b) Explain the effect of pH on the formation of isopoly acids and salts.	

	(8+7)
13	a) Write a note on nuclear isomers. b) Cite any four examples of radiopharmaceuticals. (8+7)
	SECTION E – K6 (CO5)
	Answer any ONE of the following **(1 x 20 = 20)**
14	a) Explain the uses of phase transfer catalysts with examples. b) Write a note on preparation of carboranes. c) Describe the synthesis and structural features of zeolite. (5+5+10)
15	a) Mention the synthesis and draw the structure of P_4O_6. b) Explain the characteristics of nuclear stability curve. How is nuclear stability predicted based on neutron-proton ratio? c) A uranium mineral contains 15 g of lead for each 100 g of uranium present. What is the age of the mineral? The $t_{1/2}$ of ^{238}U is 4.5 x 10^9 years. (4+10+6)

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