LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **CHEMISTRY**

FIFTH SEMESTER – **NOVEMBER 2023**

UCH 5504 – TRANSITION ELEMENTS AND NUCLEAR CHEMISTRY

Date: 10-11-2023 Dept. No. Max. : 100 Marks

Time: 09:00 AM - 12:00 NOON

	SECTION A - K1 (CO1)	
	Answer ALL the Questions	**(10 x 1 = 10)**
1.	**Choose the correct answer**	
a)	Which of the following is not a property of a transition metal? i) Lustrous ii) Malleable iii) Ductile iv) Low boiling points	
b)	Which of the following is the electronic configuration of copper? i) $3d^{10}\ 4s^1$ ii) $3d^{10}\ 3s^1$ iii) $3d^9\ 4s^2$ iv) $3d^9\ 3s^2$	
c)	**The metal extracted by leaching with cyanide is** i) Mg ii) Ag iii) Cu iv) Na	
d)	**The Mond process is used for the** i) purification of Ni ii) purification of Zr iii) extraction of Zn iv) extraction of Mo	
e)	Which type of radiation has the greatest penetrating power? i) Alpha ii) Beta iii) Gamma iv) Microwave	
2.	**Fill in the blanks**	
a)	In _____ reactions, small nuclei combine, producing a large nucleus and releasing large amounts of energy.	
b)	Lanthanides are _____ metals that can be cut with a knife.	
c)	_____ plating is used in the cylinders and piston rings of internal combustion engines.	
d)	The isotope of Uranium _____ has the capacity to sustain the chain reaction.	
e)	The _____ mass is the minimal mass of fissionable material required to sustain a chain reaction.	
	SECTION A - K2 (CO1)	
	Answer ALL the Questions	**(10 x 1 = 10)**
3.	**Answer the following**	
a)	Define ionization energy.	
b)	Mention any two ores of titanium.	

c)	What are natural isotopes?		
d)	What is meant by n/p ratio?		
e)	Name the nuclear reactors in India.		
4.	**Match the following**		
a)	Atom bomb	-	$^{1}H_{1}$, $^{2}H_{1}$
b)	Hydrogen bomb	-	$^{39}K_{19}$ and $^{37}Cl_{17}$
c)	Nuclear medicine	-	Uncontrollable nuclear fusion
d)	Isotones	-	Nuclear Fission
e)	Isotopes	-	Radiotracer

SECTION B - K3 (CO2)

Answer any TWO of the following **(2 x 10 = 20)**

5.	Explain the separation of lanthanides by a) ion exchange method b) solvent extraction method	(5+5)
6.	Discuss the following with examples. a) Calcination b) Aluminothermic process	(5+5)
7.	Compare the characteristics of copper group elements.	
8.	What are the characteristics of alpha, beta and gamma rays? Mention the differences.	

SECTION C – K4 (CO3)

Answer any TWO of the following **(2 x 10 = 20)**

9.	Define binding energy. Give its different types and explain its variation with mass number.	
10.	Give a comparative account of lanthanides and actinides with respect to their oxidation states and compounds.	
11.	a) Account for the colour of the first row *d*-block elements. b) Discuss the nuclear stability based on neutron proton ratio.	(5+5)
12.	Discuss the liquid drop model in understanding nuclear fission and fusion reactions.	

SECTION D – K5 (CO4)

Answer any ONE of the following **(1 x 20 = 20)**

13.	Describe the following metallurgical processes neat diagram. a) Froth flotation process b) Zone refining	(10+10)
14.	a) What is lanthanide contraction? Explain the causes and its important consequences. b) Describe the process of electroplating of metals.	(10+10)

SECTION E – K6 (CO5)

Answer any ONE of the following **(1 x 20 = 20)**

15.	a) Compare the physical and chemical properties of the first and other rows of the *d*-block elements. b) Explain van–Arkel and Arther Forest cyanide processes for purification of metals.	(10+10)
16.	a) What are the essential components of a nuclear reactor? Explain. b) Explain the concept of radiocarbon dating.	(10+10)

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