LOYOLA COLLEGE (AUTONOMOUS) CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – CHEMISTRY

FIFTH SEMESTER – NOVEMBER 2024

UCH 5504 – TRANSITION ELEMENTS AND NUCLEAR CHEMISTRY

Date: 18-11-2024   Dept. No.   Max. : 100 Marks
Time: 09:00 am-12:00 pm

	SECTION A - K1 (CO1)	
	Answer ALL the Questions -	**(10 x 1 = 10)**
1.	**Multiple Choice Questions**	
a)	Which of the following transition elements does not show variable oxidation state? (i) Cu (ii) Sc (iii) Ni (iv) Fe	
b)	The Primary metals used for making stainless steel alloys are (i) Pb and V (ii) Cu and W (iii) Fe and Cr (iv) Ag and Zr	
c)	Lanthanide contraction is caused by an increase in (i) atomic number (ii) effective nuclear charge (iii) atomic radius (iv) valence electrons	
d)	The type of radiation with the greatest ability to penetrate matter is (i) α-radiation (ii) photons (iii) γ-radiation (iv) β-radiation	
e)	A Geiger-Muller tube is a _____ . (i) gas ionization detector (ii) cloud chamber (iii) fluorescence detector (iv) spectrophotometer	
2.	**Fill in the blanks**	
a)	The common oxidation state of Cu is +2 and that of Au is _____.	
b)	The process of heating ore with carbon in the absence of oxygen is called as _____.	
c)	Complete the following reaction, $^{14}_{7}N + {}^{4}_{2}He \rightarrow {}^{17}_{8}O + \underline{\hspace{1cm}}$.	
d)	Tritium has one proton and _____ neutrons	
e)	The process of protecting Fe from rusting by coating zinc is called as _____	
	SECTION A - K2 (CO1)	
	Answer ALL the Questions	**(10 x 1 = 10)**
3.	**Define the following**	
a)	d-d transition	
b)	Pulverisation	
c)	Nuclear fusion	
d)	Isotones	
e)	Isobars	
4.	**Match the following**	
a)	Galena - absorbs neutrons	
b)	Zinc blende - slows neutrons	
c)	Control rods - High Stability	
d)	Moderator - ZnS	

e)	Magic number	-	PbS

SECTION B - K3 (CO2)

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

5.	(a) Describe the magnetic behaviour of transition elements. (5)
	(b) The melting and boiling points of transition metals are exceptionally high. Justify. (5)
6.	What is n/p ratio and how does it explain nuclear stability? (10)
7.	Describe calcination and smelting process of metallurgy with suitable reactions. (10)
8.	What is lanthanide contraction? Discuss its consequences. (10)

SECTION C – K4 (CO3)

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

9.	(a) Describe the purification of metals by van-Arkel method. (5)
	(b) Write the classification of steel and list its properties. (5)
10.	(a) Give reasons for the colour and the variable oxidation states of d-block elements. (5)
	(b) Explain the measurement of radioactivity using Geiger counter. (5)
11.	Describe in detail the principle involved in stellar energy. (10)
12.	Describe the methods of concentration of ores by froth flotation and electromagnetic processes. (10)

SECTION D – K5 (CO4)

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

13.	(a) Write a comparative account of coinage metals. (10)
	(b) Describe the chemistry of inner transition elements with reference to (i) position in periodic table and (ii) oxidation state. (10)
14.	(a) Explain the relationship between mass defect and binding energy. (10)
	(b) Write the significance and uses of Ellingham diagram. (10)

SECTION E – K6 (CO5)

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

15.	(a) Describe electroplating of metals. (10)
	(b) Explain the ion exchange method of separation of lanthanides. (10)
16.	(a) Discuss the shell model and explain stability of nucleus. (10)
	(b) Explain the applications of isotopes in pharmaceutical and in diagnosis of diseases. (10)