

INORGANIC CHEMISTRY

Paper - I

(B.Sc. Biotechnology, Industrial Microbiology)

Time : Three Hours]

[Maximum Marks : 35

Note : Attempt two questions each from Section A and B carrying 7 marks each Section C is compulsory consisting of 7 short answer type questions carrying 1 mark each.

Section - A

- (a) 4s subshell is filled prior to 3d but on ionisation 4s electrons are removed first. Explain. 3

(b) Why do transition metals show variable oxidation states? 2

(c) Calculate the magnetic moment (spin only) for the complex $K_2[Mn(NCS)_6]$. 2
- (a) Explain the structure of Copper (II) acetate monohydrate and account for its low magnetic moment. 3

(b) What will happen when acidified $K_2Cr_2O_7$ is treated with H_2O_2 ? 2

(c) Why does Mn(II) ion show maximum paramagnetic character amongst the bivalent ions of first transition series? 2
- (a) Write short note on Ion Exchange method for the separation of lanthanides. 3

(b) Give reasons for the following : 3

 - Lanthanides have poor tendency to form complexes.
 - Zr and Hf possess similar properties.

2×2=4

4. (a) Explain : Anhydrous CuSO_4 is white while hydrated CuSO_4 is blue in colour. 3
 (b) Describe the structure of CrO_4^{2-} ion. 3
 (c) Why Europium (II) is more stable than Cerium (II) ? 2
- Section - B
5. (a) Explain the following :
 (i) The first ionisation energy of Hg is higher than that of Cadmium. 2
 (ii) First ionisation energy of 5d elements are higher than those of 3d and 4d elements. $2 \times 2 = 4$
- (b) Describe the structure of the following :
 (i) NbCl_6^- 3
 (ii) ReCl_6^- $1\frac{1}{2} \times 2 = 3$
6. (a) The complexes of first transition series are mainly high spin while those of second and third transition series are of lower spin. Explain. 3
 (b) How does the reactivity of Hg differ from that of Zn and Cd ? Explain. 2
 (c) What are the two oxidation states of gold ? Which of these is unstable to di-proportionation? 2
7. (a) What are later actinides ? Give the points of similarity between later lanthanides and later actinides. 3
 (b) What is actinide contraction ? Why heavier members do not form oxocations ? 2
 (c) Complete the following reaction :

$$\text{U}^{235}_{92} + \text{A} \longrightarrow \text{---} + \text{n}_0^1$$
 2
8. (a) Discuss briefly the method of separation of N, P and A from U. 3
 (b) Actinides show higher oxidation states than lanthanides. Why ? 2
 (c) Discuss the magnetic properties of actinides. 2
- Section - C
 (Compulsory Questions)
9. Give answer in short :
 (a) Iron is a transition element but Sodium is not. Why ?
 (b) Which should be a better oxidising agent Co^{2+} or Co^{3+} in water ?
 (c) Name the first and last element of second transition series.
 (d) Why are the salts of Zn, Cd and Hg white in colour ?
 (e) Write stereochemistry of $[\text{Ag}(\text{CN})_2]^-$.
 (f) What happens when cerium (III) nitrate is treated with alkaline KMnO_4 ?
 (g) How VOCl_2 is obtained from VOCl_3 ? $1 \times 7 = 7$