INORGANIC CHEMISTRY

(Common with B.Sc., B.Sc. Biotechnology, B.Sc. Industrial Microbilogy Semester–III) Paper - I

Time Allowed : Three Hours] [Maximum Marks : 35

Note : The candidates are required to attempt *two* questions each from Section A and B carrying 7 marks each and the entire Section C consisting of 7 short answer type questions carrying 1 marks.

Section : A

1. (a) First ionisation energy of copper is higher than those of alkali metals while second and third

ionisation energies are lower. Explain. 2

(b) Calculate magnetic moment for the following :
(i) Fe^{3+} (ii) Ni^{2+} 3

(c) What are transition elements ? Why do transition metals exhibits good catalytic properties? 2

2. (a) Describe the oxidising character of $KMnO_4$ in acidic, basic and neutral medium. 3

(b) Explain :
(i) The compunds of tranistion elements are generally coloured while those of p–block are generally colourless.
(ii) Transition metals form interstitial compounds. 2×2=4

3. (a) What is lanthanide contraction ? Give its consequences. 3

(b) Explain :
(i) Why La Gd and Lu show +3 oxidation state whereas other elements of f–block show +2 and +4 also ?
(ii) Lanthanides do not form oxocations. 2×2=4

4. (a) Co^{2+} does not form stable complexes with ammonia whereas Co^{3+} form a stable complex $[Co(NH_3)_6]^{3+}$. Why ? 2

(b) Explain Cu^{2+} is more stable than Cu^{+}. 2

(c) What are the problems in separation of lanthanides form one another ? 3

Section : B

5. (a) First ionisation energies of 5d elements are higher than those of 3d and 4d elements. Give reasons. 3

(b) What is unique about the structure of niobium fluoride in solid state ? Draw its structure. 2

(c) Actinides form oxocations but lanthanides do not. Why ? 2

6. (a) $ZrCl_4$ is is more stable chloride of Zr while for palladiuim it is $PdCl_2$. Why ? 2

(b) What are transuranic elements ? Name at least four transuranic elements. 2

(c) Discuss the variation of atomic and ionic radii of 2nd and 3rd transition series in comparison with first transition series. 3

7. (a) Draw the structure of $Mo_2Cl_8^{3-}$ and $W_2Cl_8^{3-}$. 2

(b) How does reactivity of Hg differ from that Zn and Cd ? Explain. 2

(c) Compare the oxidation state and metal–metal bonding tendency of elements of first transition series and their analogues heavier elements. 3

8. (a) The electronic configuration and position of most of the actinides are controversial. Comment. 3

(b) Actinides have greater tendency to form complexes than lanthanides. Explain. 2

(c) Complete the following reaction :

Pu_{92}^{239} ---------→ Cm_{96}^{242} + ----------. 2

Section : C
(Compulsory Questions)

9. Explain briefly :
(i) Why do Eu and Yb exhibit +2 oxidation states ?
(ii) Zn forms only Zn^{2+} and not Zn^{3+} why ?
(iii) Which ion should exhibit a larger magnetic moment Mn^{2+} or V^{2+} ?
(iv) Which is more basic Gd_2O_3 or YbO ? Why ?
(v) Give electronic configuration of X (z = 74) and Mo (z = 42).
(iv) How Ti metal is obtained ? Why is has been called the wonder metal ?
(vii) Sc^{3+} is more stable than Sc^{2+}. Why ? 1×4=7