

2021

Time : 3 Hours

Full Marks : 100

Candidates are required to give their answers in their own words as far as practicable.

Answer any five questions in which Q.No.1 is compulsory.

1. Choose the correct answer of the following : $2 \times 10 = 20$

(a) Which of the following shall form an octahedral complex ?

- (i) d^8 (High spin)
- (ii) d^6 (High spin)
- (iii) d^4 (Low spin)

(iv) None of these

(b) Between $A = [\text{Co}(\text{H}_2\text{O})_6]^{2+}$ and $B = [\text{Cu}(\text{H}_2\text{O})_6]^{2+}$ more distorted structure is of :

- (i) A
- (ii) B
- (iii) Both (i) and (ii)
- (iv) None of (i) and (ii)

(c) The μ spin only for Fe^{3+} is shown by :

- (i) $\sqrt{8}$ BM
- (ii) $\sqrt{15}$ BM
- (iii) $\sqrt{24}$ BM
- (iv) $\sqrt{35}$ BM

(d) In the normal Zeeman effect the transition ${}^1D_2 \rightarrow {}^1P_1$ splits into :

- (i) 6 lines
 - (ii) 7 lines
 - (iii) 8 lines
 - (iv) 9 lines
- (e) According to spin selection rule, the permitted transition is :

- (i) $2P \rightarrow 1P$
- (ii) $3T_{1g} \rightarrow 3T_{2g}$
- (iii) $3T_{1g} \rightarrow 1T_{2g}$
- (iv) None of these

(f) The most stable complex ion is :

- (i) $AgCl_2^-$
- (ii) $AgBr_2^-$
- (iii) AgI_2^-

(iv) AgF_2^-

(g) Paramagnetic carbonyl is :

- (i) $Fe_2(CO)_8$
- (ii) $Ru(CO)_5$
- (iii) $V(CO)_6$
- (iv) $Ni(CO)_4$

(h) How many nitrogen atom co-ordinated from phosphine group to Iron in hemoglobin ?

- (i) 2
- (ii) 3
- (iii) 4
- (iv) 6

(i) Temperature resistance clothes are formed with the following :

- (i) Borazine
- (ii) Silicon
- (iii) Phosphonitrile
- (iv) None of these
- (j) Which trivalent actinides is red in colour :
- (i) Pu^{3+}
- (ii) Am^{3+}
- (iii) Ac^{3+}
- (iv) U^{3+}
2. (a) Explain the crystal field splitting of d-orbitals of metal under square planar field.
- (b) What will be the effect of tetragonal distortion on CFSE of an Octahedral complex of Cu^{2+} ? Explain.

- (c) What are the factors that affect the magnitude of the crystal field splitting ? $7+7+6=20$
3. (a) Explain Gony's balance method for the determination of magnetic susceptibility.
- (b) What is Curies Law? Explain magnetic susceptibility. How it varies with temperature? $12+8=20$
4. (a) What are the selection rules of electronic spectra? Explain. <https://www.lnmuonline.com>
- (b) Explain the electronic spectra of $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ complex. $10+10=20$
5. (a) What is trans effects ? Explain mechanism of substitution reaction in square planar complex. $(6+8)$

- (b) Why CO is stronger trans directing ligand than NH₃? 6
6. (a) Discuss the nature of bonding in metal Carbonyl. 8
- (b) Write a short note on 18 electron-rule in metal Carbonyl. 6
- (c) Write short note on Ziegler-Natta catalyst. 6
7. (a) What are macro and micro nutrients? 8
- (b) Discuss the role of Fe in hemoglobin and myoglobin in biological system. 12
8. (a) What are silicones? what are different types of silicones? 12
- (b) Explain the nature of bonding in triphosphazene. 8

9. Explain the Chemistry of Actinides with reference

to :

5×4=20

- (a) Electronic configuration
- (b) Oxidation state
- (c) Magnetic properties
- (d) Actinide contraction

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