U.G. 5th Semester Examination - 2020

CHEMISTRY

Course Code : BCEMCCHC501

Course Title : Inorganic Chemistry-IV

Full Marks : 30 Time : 2 Hours

The figures in the right-hand margin indicate marks.

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

1. Answer any **ten** questions from the following: $1\times10=10$

   a) Calculate the CFSE of $[Ni(H_2O)_6]^{2+}$.

   b) What is Neel temperature

   c) Which one of the $[Ti(H_2O)_6]^{3+}$ and $[Sc(H_2O)_6]^{3+}$ is a colour compound ?

   d) Name the chief ore of titanium with chemical formula.

   e) What is the Russel –Saunders ground state term of Ni(IV) ?

   f) Write the synthetic route for preparation of Rousin salt.

   g) Why does $V(CO)_6$ readily form $[V(CO)_6]^-$?

   h) State whether $MgFe_2O_4$ is a normal spinel or inverse spinel.

   i) Arrange the following in respect of there placement in spectrochemical series of ligands.

      F^-, I^-, H_2O, CN^-.

   j) Write down the major uses of yttrium.

   k) Write the electronic configuration of Nd.

   l) Write the structure of Million's base.

   m) Find out the oxidation state of Cr in CrO_5.

   n) State the basic assumption of Crystal Field Theory.

   o) Calculate the magnetic moment of Brown ring complex.

2. Answer any **five** questions from the following: $2\times5=10$

   a) "The observed magnetic moment for a complex is 5.98 B.M." How many unpaired electron does it have ? Find out the spin multiplicity.

   b) Which should have comparatively more intense d-d transition and why: $[Ni(CO)_4]$ and $[Cr(CO)_6]$?

c) What is lanthanide contraction ?

d) Compare the crystal field splitting parameter (Δ) of the following $[TiF_6]^{3-}$ and $[VF_6]^{2-}$ complexes.

e) What do you mean by π – acid ligand ? Explain with example.

f) "OH^- ion is in lower position than H_2O in spectrochemical series" – Explain.

g) "$[Mn(H_2O)_6]^{2+}$ is almost colorless"- Explain.

h) "The stable oxidation state of Cu, Ag, Au are +2, +1 and +3 respectively" – Explain.

3. Answer any **two** questions from the following: $5\times2=10$

a) i) Write the d-orbital splitting diagram for a square pyramid and trigonal bipyramid complex.

ii) "Magnetic moment of $[Mn(CN)_6]^{3-}$ and $[MnBr_4]^{2-}$ are 2.8 and 5.9 B.M. respectively". What are the geometries of the complexes ? 3+2=5

b) i) "The oxidizing strength of $[MO_4]^-$(M= Mn, Tc and Re) decreases and energy of LMCT band position increases down the group".- Explain.

ii) "The lanthanides elements show the common stable oxidation state of +3". – Comment. 3+2=5

c) i) When Conc. H_2SO_4 is added to $K_2Cr_2O_7$ and KCl mixture, brown fumes evolved. Write down the complete reaction, name of the test and usefulness of this reaction in detection of the group.

ii) Write the formula and structure of the Vaska's complex. 3+2=5

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