INTER B.SC. EXAMINATION, 2018

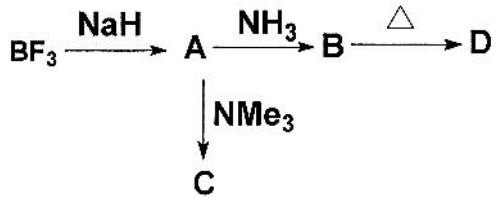
(2nd Semester)

CHEMISTRY (HONOURS)

PAPER - X

INORGANIC CHEMISTRY

Time : Two hours Full Marks : 50

1. a) 

Identify **A, B, C** and **D**. Account for the formation of **B** and **C**. 1+1

b) Explain why of the followings :

i) The B-F bond in $[BF_4]^-$ is larger than that in BF_3 – Explain. 1

ii) Compare the feasibility of the following decomposition reactions with proper reason. 2

$SnBr_4 \rightarrow SnBr_2 \rightarrow Br_2$

$PbBr_4 \rightarrow PbBr_2 \rightarrow Br_2$

c) Show how the compounds with empirical formula Me_2ENMe_2 with E = B and Al differ from one another. Why are they so different ? 2

d) Give descriptions of the bonding in ClO_2 and $[ClO_2]^-$, and rationalize the differences in Cl-O bond lengths. 2

e) Describe the synthesis and structure of $[IF_6]^-$. 2

f) In liquid SO_2 medium iodine reacts with AsF_5 $1\frac{1}{2}$

$$3AsF_5 + 5I_2 \rightarrow 2[A][AsF_6] + AsF_3$$

Identify A and hence comment on its structure and magnetic behaviour.

2. a) Comment on the oxidation states of S atoms in tetrathionic acid and thiosulphuric acid. 2

b) Write the structure of trimetaphosphoric acid and comment on its basicity. 2

c) Write a short note on $P_3N_3Cl_6$. 2

d) Telluric acid and phosphoric acid are differently formulated – Explain. 2

e) Comment on the reaction of $N(CH_3)_3$ and $N(SiH_3)_3$ with HCl. 2

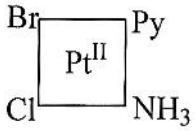
d) How do you prepare a yellow sodium chloride ? Explain the origin of the color mentioning the relevant terminology. 2

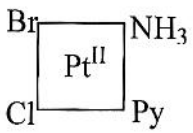
e) What is solid solution and hence explain the term, "interstitial solid solutions" with example. 2

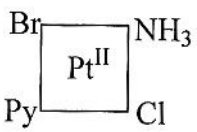
e) Predict the geometry of one-electron paramagnetic $[Co(H_2O)(CN)_5]^{3-}$ complex with the aid of Valence Bond Theory. 2

f) Prepare the following isomers starting from $[PtCl_4]^{2-}$. (Pt–N bond strength is greater than Pt–Cl bond strength; the order of trans directing ability : $Br^- > Cl^- > Py > NH_3$)

$2\frac{1}{2}$







4. a) What do you mean by zero dimensional imperfections in crystalline compounds ? What are the different types of stoichiometric defect and explain the electrical conductivity and density changes that occur in crystals due to different types of stoichiometric defect. 1+1+2

b) What is superconductor ? What are the two most fascinating properties of superconducting materials valuable for their application ? 1+1

c) What is metallic luster ? How it can be explained in terms of electron sea model as well as band theory ? Point out the limitations of the electron sea model in this context.

$2\frac{1}{2}$

f) SF_6 is inert to hydrolysis even in presence of molten KOH, but $TeCl_6$ readily undergoes hydrolysis. Justify the statement. $2\frac{1}{2}$

3. a) Cite one example with structural formula for each case of a coordination compound (i) containing ligand without lone pair of electrons, and (ii) exhibiting optical activity without the presence of C atom. 2

b) How did Alfred Werner establish the geometry of the hexa-coordinated $[M(A\frown A)_2B_2]$ complex ? 2

c) Write the IUPAC nomenclature of the following complexes ***(any two)***

$[Ag(NH_3)_2][Ag(CN)_2]$, $K_3[Fe(CN)_5NO]$, $K_2[Fe(CO)_4]$

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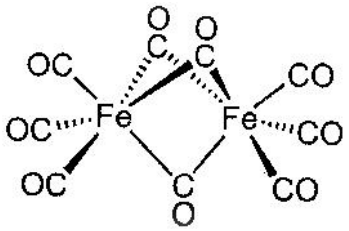

d) Draw all possible stereoisomers for hexa coordinated $[M(A\cap A)(B\cap B)CD]$ complex, where $A\cap A$ and $B\cap B$ are bidentate, and C and D are monodentate ligands. 2