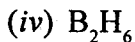
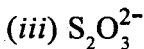


M.Sc. 1st Semester Examination, 2009**CHEMISTRY***(Inorganic)***PAPER—CH-1103***Full Marks : 40**Time : 2 hours***Answer any four questions***The figures in the right-hand margin indicate marks*

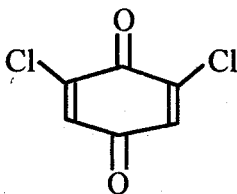
1. (a) Discuss the role of distal and proximal histidine residues in hemoglobin and myoglobin. 4
- (b) What do you mean by HiPIP? 2
- (c) Explain secondary structure of a protein. 2
- (d) What is ferritin? 1

(Turn Over)

- (e) Write down the structure of 3 Fe-4s ferredoxin. 1
2. (a) Explain why salts of $\text{trans-}[\text{OsO}_2(\text{OH})_4]^{2-}$ are diamagnetic in nature. 2
- (b) What do you mean by "Wolfram's red salt" ? 2
- (c) The electrochemical oxidation of $[\text{Ru}(\text{H}_2\text{O})_6]^{2+}$ in aqueous solution produces a Ru(IV) species. Write down the composition of that species and give the structure. 2
- (d) How will you synthesize "Wilkinsons Catalyst" ? 1
- (e) Briefly discuss halides and oxohalides of Nb and Ta. 3
3. (a) Identify the point group for each of the following molecules/ions: 3
- (i) Borazine
- (ii) POCl_3



(vi)



- (b) Verify that if there are two twofold axes at right angles to one another, there must necessarily be a third at right angles to both. 2
- (c) With regular trigon only three regular polyhedrons are possible. Explain. 2
- (d) What are the differences between Reducible and Irreducible representations of a group. 2
- (e) What do you mean by equivalent atoms in a molecule? Give example. 1

4. (a) Using "Great Orthogonality Theorem" verify that the vectors whose components are the characters of two different irreducible representations are orthogonal. 3
- (b) Explain the colour of the following anions: 3
- $[\text{FeF}_6]^{3-}$: Colourless
- $[\text{FeCl}_6]^{3-}$: Yellow
- $[\text{FeBr}_6]^{3-}$: Brown
- (c) $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$ shows three absorption bands at 17400, 24600 and 37900 cm^{-1} . Assign three bands and calculate Dq and B' . 4
5. (a) Why are $d-d$ electronic transitions weakly absorbing? Why are the absorptions observable at all, if they are forbidden? 3

(b) What *d*-orbital splitting pattern would you expect for $1\frac{1}{2} \times 2$

(i) a trigonal bipyramidal ML_5 complex.

(ii) a square pyramidal ML_5 complex ?

(c) Explain why the ground state term symbol have maximum *L* and *S* value. 2

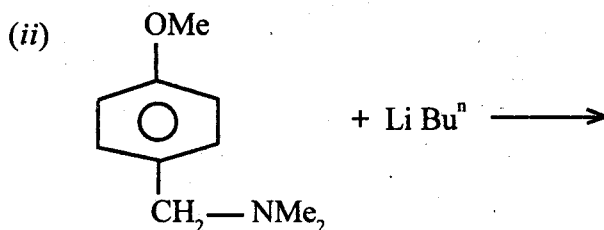
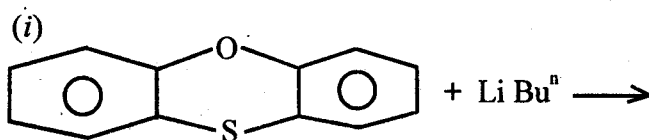
(d) Explain why the tetrahedral nickel (II), octahedral cobalt (II) (weak field) and octahedral iron (II) (weak field) complexes the magnetic moment is higher than the spin-only magnetic moment value. 2

6. (a) Predict the product when RuO_4 is reacted with aqueous HCl in presence of KCl. Write down the structure of the final product. 2

- (b) What do you mean by "Creutz-Taube Cation" ? Write down its synthesis. 2
- (c) What is the role of zinc and molybdenum metal ions in biology ? 2
- (d) Write down the active site structure of hemerythrin. 1
- (e) How does nature protect Fe(II) in hemoglobin from its irreversible oxidation in the presence of O_2 ? Justify your answer by considering the properties of suitable models. 3
7. (a) On the basis of Wade's rule, rationalise the core structures of the following molecules or species : $1\frac{1}{2} \times 4$
- CB_5H_7 ; 1, 7, 2, 4 $C_{P_2} Co_2 (C_2B_5H_5)_2$;
- $C_3B_6H_{13}^-$; $C_2B_9H_{11}^{2-}$

(b) Complete the following reactions:

2



(c) A borane molecule has its styx no. 4120. Find out its formula and predict how many electron pair bonds are there? What are the limitations of the styx topology?

1+1