(i) Printed Pages: 4 Roll No. .....

(ii) Questions : 9 Sub. Code : 0350

Exam. Code : 0004

B.A./B.Sc. (General) 4th Semester

(2042)

CHEMISTRY

(Same for B.Sc. Microbial & Food Technology)

(Inorganic Chemistry–B)

Paper–XIII

Time Allowed : Three Hours] [Maximum Marks : 22

Note :— Attempt **five** questions in all, including Q. No. **1** which is compulsory and selecting **one** question from each unit.

(Compulsory Question)

1. (a) With suitable examples, explain the levelling and differentiating effects.

(b) What is the impact of lanthanide contraction on the atomic radii of second and third transition elements belonging to same group ?

(c) $SiCl_4$ acts as a Lewis acid but CCl_4 does not. Give reason.

(d) What are the oxidation states of O-atoms in OF_2 and O_2F_2 ?

(e) In the reaction $MnO_2 + 4HCl \rightarrow MnCl_2 + H_2O$ which species acts as (i) oxidant and (ii) reductant ?

(f) Write the general electronic configuration of the f-block elements. 1×6

UNIT–I

2. (a) Compare the basic character of $La(OH)_3$ and $Lu(OH)_3$.

   (b) Actinides have strong tendency to form oxocations but Lanthanides do not. Give suitable explanation.

   (c) What happens when :

   (i) Uranyl sulfate is treated with excess of sodium carbonate

   (ii) Sodium diuranate is digested with ammonium carbonate ? 1,1,2

3. (a) Find out the oxidation number of U in following species :

   (i) UO_2^+

   (ii) UO_2^{2+}

   (b) What is Misch metal ? Give its uses.

   (c) Draw the structure of $[Ce(NO_3)_6]^{2-}$ and find out the coordination number and oxidation state of Ce in complex ion. 1,1,2

UNIT–II

4. (a) Identify the Lewis acid and Lewis bases in the following reactions :

   (i) $BrF_3 + F^- \rightarrow BrF_4^-$

   (ii) $KH + H_2O \rightarrow KOH + H_2$

   (b) Compare the acidic strength of HClO, $HClO_2$, $HClO_3$ and $HClO_4$. 2,2

5. (a) Identify the Lewis acid and Lewis base in the following reaction :

$$BF_3 + F^- \rightarrow BF_4^-$$

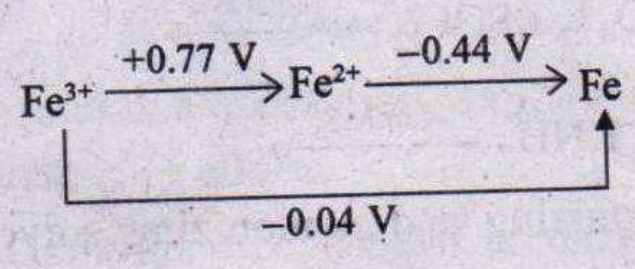
What are the changes in the geometry and B-F bond lengths in BF_3 on coordination with F^- ion ?

(b) Arrange the following in an increasing order of the acidic character and also give a suitable explanation for your answer :

Monochloroacetic acid, Dichloroacetic acid and Trichloroacetic acid. 2,2

UNIT–III

6. (a) Consider the Latimer diagram for Iron :



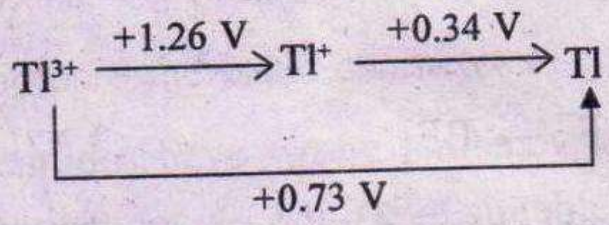
Construct a Frost diagram and compare the stability of Fe^{3+} and Fe^{2+} ions.

(b) Explain why H_3PO_4 acts as only oxidizing agent whereas H_3PO_3 can act as oxidizing as well as reducing agent.

(c) Using a well leveled redox cycle show that Lithium is the strongest reducing agent. 1½,1,1½

7. (a) What are Pourbaix diagrams ? Elaborate some of the important limitations of Pourbaix diagrams.

(b) Consider the Latimer diagram for Thallium :



Construct a Frost diagram and explain stability of Tl^{+} ion. Which among the Tl^{3+}, Tl^{+} and T1 is strongest oxidant ?

(c) Cu+ ions are unstable in aqueous medium. Give reason. 1½,1½,1

UNIT–IV

8. (a) Complete the following reactions :

(i) $SbCl_5 + NOCl \xrightarrow{Liq.SO_2}$

(ii) $AlCl_3 + NaI \xrightarrow{Liq.SO_2}$

(iii) $Cr_2(SO_4)_3 + SOCl_2 \xrightarrow{Liq.SO_2}$

(iv) $PbI_2 + KNH_2 \xrightarrow{Liq.NH_3}$

(b) What are ionizing and nonionizing solvents ? Give examples. 2,2

9. (a) Why NH_4Cl is an acid whereas $NaNH_2$ behaves as base in Liquid NH_3 ?

(b) Why Liquid SO_2 is a better solvent for organic compounds ?

(c) Describe the effect of following factors on the role of a chemical as solvent in chemical reactions :

(i) Dielectric constant

(ii) Heat of fusion and heat of vaporization. 1,1,2