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

(ii) Questions : 9 Sub. Code : 0 3 5 0

Exam. Code : 0 0 0 4

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

(2053)

CHEMISTRY

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

Paper : XIII Inorganic Chemistry–B

Time Allowed : Three Hours] [Maximum Marks : 22

Note :—Attempt **FIVE** questions in all, **ONE** question from each unit and the compulsory Q. No. **1**.

(Compulsory Question)

1. (a) What happens when a lanthonoid reacts with :
   (i) mineral acid
   (ii) water ?
   (b) Name the lanthanide element which is :
   (i) Radioactive
   (ii) Does not exist in nature.
   (c) Compare the pk_a of formic acid and acetic acid.
   (d) Give two properties showing that Liq. NH_3 is better solvent than water.
   (e) Identify the oxidant and the reductant in the following reactions :
   (i) $CH_4 + 2O_2 \rightarrow CO_2 + 2H_2O$
   (ii) $2Na_2S_2O_3 + I_2 \rightarrow Na_2S_4O_6 + 2NaI$.

(f) Find out the oxidation number of Cr in following species :

(i) CrO_5

(ii) CrO_4^{2-} 1½×6=6

UNIT—I

2. (a) Describe the chemistry of separation of Np, Pu, Am and U.

(b) Give reasons for the following :

(i) Eu(II) is more stable than Ce(II)

(ii) Gd_2O_3 is more basic than YbO 2,2

3. (a) La^{3+}, Lu^{3+} and Ce^{4+} ions are diamagnetic while Sm^{3+} shows low paramagnetism. Explain.

(b) Explain why f-block elements are called inner-transition metals.

(c) Compare the following properties of the lanthanides and actinides.

(i) Oxidation states

(ii) Magnetic properties

(iii) Oxoanion formation

(iv) Radioactivity 1,1,2

UNIT—II

4. (a) Compare the acidic character of HOI, HOBr and HOCl.

(b) Arrange BF_3, BCl_3, BBr_3 and BI_3 in an increasing order of the acidic character and also give a suitable explanation for your answer.

(c) Using suitable reactions show that Al_2O_3 is amphoteric in nature. 1½,1½,1

5. (a) Why $AlCl_3$ exists an dimer but BCl_3 does not ?

(b) Explain why Cl-OH is acidic whereas Na-OH is basic in nature ?

(c) Give reasons for the following :

(i) $[AgI_2]^-$ complex is stable but $[AgF_2]^-$ is not.

(ii) $[Co(NH_3)_5F]^{2+}$ is stable but $[Co(NH_3)_5I]^{2+}$ is unstable.

1,1,2

UNIT—III

6. (a) Draw a Frost diagram for mercury in acid solution from the given Latimer diagram

$$Hg^{2+} \xrightarrow{+0.911} Hg_2^{2+} \xrightarrow{+0.796} Hg$$

Comment on the tendency of any of the species to act as an oxidizing agent or to undergo disproportionation.

(b) What are Ellingham diagrams ? What characteristic features of these diagrams are helpful in selecting the reducing agent for the reduction of metal oxides ?

(c) How Gibb's Free energy change is related to :

(i) Equilibrium constant

(ii) Cell potential

1½,1½,1

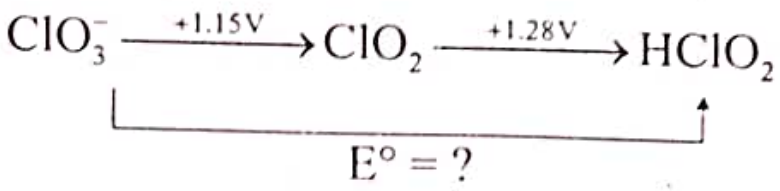
7. (a) Discuss the following with reference to the extraction of elements with suitable examples :

(i) Auto-reduction

(ii) Smelting

(iii) Hydrometallurgy.

(b) Consider the Latimer diagram :



Calculate the value of E° for the reduction of ClO_3^- to $HClO_2$.

(c) Using suitable example define disproportionation reaction.

1½,1½,1

UNIT—IV

8. (a) Give reason for the following :

(i) Electric conductivity of liquid NH_3 is increased when NH_4Cl is dissolved in it.

(ii) Na solution in liquid NH_3 is blue in color and good reducing agent.

(b) Complete the following reactions :

(i) $NbCl_5 \xrightarrow{Liq.\,SO_2}$

(ii) $Ag(CH_3COO) + SOCl_2 \xrightarrow{Liq.\,SO_2}$

(c) Give reasons for the following :

(i) Strong oxidizing agents do not exist in Liq. NH_3.

(ii) K_2SO_3 is soluble in Liq. SO_2. 1,1,2

9. (a) Complete the following reactions :

(i) $HgI_2 + KI \xrightarrow{Liq.\,SO_2}$

(ii) $Zn(NH_2)_2 + NH_4Cl \xrightarrow{Liq.\,NH_3}$

(iii) $SbCl_3 + 3\ LiI \xrightarrow{Liq.\,SO_2}$

(iv) $C_6H_6 + SO_3 \xrightarrow{Liq.\,SO_2}$

(b) Compare the solubilities of AgF, AgCl, AgBr and AgI in Liq. NH_3.

(c) Define aprotic and coordinating solvents. Give suitable examples. 2,1,1