

## CHEMISTRY

(Paper – XIII : Inorganic Chemistry – B)

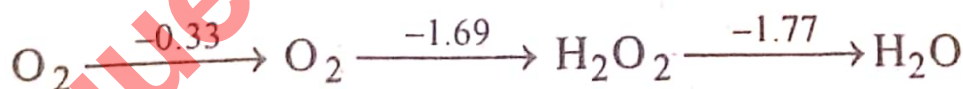
Time Allowed : 3 Hours

Maximum Marks : 22

Note : Attempt five questions in all , selecting at least one question from each Unit. Question No. 1 is compulsory.

### UNIT-I

- What happens when cerium (III) nitrate is treated with alkaline  $\text{KMnO}_4$  ?
  - What are transuranic elements ?
  - Why  $\text{H}_2\text{Se}$  is stronger acid than  $\text{H}_2\text{S}$  ?
  - What is the electrode potential for  $\text{O}_2/\text{H}_2\text{O}$  half reaction ?



- (e) Out of  $Zn(NH_3)_2$ ,  $NH_4Cl$ ,  $KNH_2$  which of the following shows amphoteric behaviour in liquid ammonia ?
- (f) Which is stronger acid :  $BF_3$  or  $BCl_3$  ? 1×6

### UNIT-I

2. (a) Describe the extraction of lanthanides from Monazite.  
 (b) What is Lanthanide Contraction and give its consequences ? 2,2
3. (a) What are nuclear fuels ? Give preparation of plutonium.  
 (b) Why actinides have greater tendency to form complexes compared to lanthanides ? 2,2

### UNIT-II

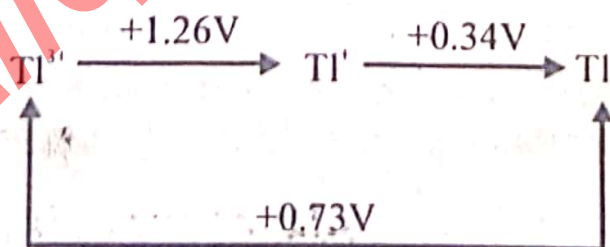
4. Explain the trend of basic strength of primary, secondary and tertiary amines (in gaseous as well as aqueous media). 4
5. Explain the trend of acidic strength of the following molecules : 2,2
- (a)  $H_3PO_4 < H_2SO_4 < HClO_4$   
 (b)  $BF_3 < BCl_3 < BBr_3$

### UNIT-III

6. (a) Calculate  $E^\circ$  for the reaction :  
 $Fe^{3+} + 3e^- \rightarrow Fe$   
 Given :  
 (i)  $Fe^{3+} + 3e^- \rightarrow Fe$   $\Delta G^\circ = +0.17F$   
 (ii)  $Fe^{3+} + e^- \rightarrow Fe^{2+}$   $E^\circ = +0.77V$   
 (iii)  $Fe^{2+} + 2e^- \rightarrow Fe$   $E^\circ = -0.47V$
- (b) Why lithium is the strong reducing agent ? Explain with a well labelled redox cycle. 2,2

### UNIT-IV

7. (a) Consider the Latimer diagram for thallium :



Construct a frost diagram and explain :

- (i) Stability of  $Tl^+$   
 (ii) Which one is a strong oxidant.
- (b) Give an example of Pourbaix diagram. 3,1

#### UNIT-IV

8. (a) Describe the following on role of a solvent in chemical reaction :
- (i) Dielectric constant
  - (ii) Heat of fusion and heat of vapourisation
- (b) Why  $\text{NH}_4\text{Cl}$  is an acid in liquid  $\text{NH}_3$  and  $\text{K}_2\text{SO}_4$  is a base in liquid  $\text{SO}_2$ . 2,2
9. (a) Discuss the important advantages of liquid sulphur dioxide as solvent in spite of its toxic nature. 2,2
- (b) Explain ammonolysis with at least two examples. 2,2