

**2018**  
**CHEMISTRY-HONOURS**  
**Fourth Paper**  
**Group-A**  
**Full Marks : 50**

*The figures in the margin indicate full marks.*  
*Candidates are required to give their answers in their own words*  
*as far as practicable.*

**CHT-21a**

**Unit-I**

Answer *any three* questions.

1. (a) Give a comparative view on the fluorides of S, Se, Te with respect to their structure and hydrolytic behaviour. 3
- (b) Explain the following order of the complex forming ability of group IIA metals:  

$$\text{Be}^{2+} > \text{Mg}^{2+} > \text{Ca}^{2+} > \text{Sr}^{2+} > \text{Ba}^{2+}$$
2
2. (a) "Structure of boron trichloride is monomeric while structure of aluminium trichloride is dimeric." Comment. 3
- (b) Explain why  $\text{NF}_3$  is inert to hydrolysis while  $\text{PF}_3$  is reactive. 2
3. (a) Compare the thermal stabilities of  $\text{N}_2\text{O}$ ,  $\text{N}_2\text{O}_3$  and  $\text{N}_2\text{O}_5$  suggesting reasons thereof. 3
- (b) Xenon has the maximum ability to form compounds among the inert gas elements. Elucidate with example. 2
4. (a)  $\text{MgSO}_4$  is freely soluble in water whereas  $\text{BaSO}_4$  is almost insoluble in it. On the other hand  $\text{BaO}$  is 2000 times more soluble than  $\text{MgO}$  in water. Justify. 3
- (b) What is sodide ion? How can it be stabilised? 2
5. (a)  $\text{N}(\text{CH}_3)_3$  and  $\text{N}(\text{SiH}_3)_3$  gives different products on reaction with  $\text{HCl}$ . Explain. 3
- (b) Explain 'Inert Pair Effect' with reference to Group 14 elements. 2

**Please Turn Over**

## Unit-II

Answer *any two* questions.

6. (a) Construct the MO diagram of  $\text{CN}^-$  and compare its donor-acceptor property with CO. 3
- (b) The O – O bond length varies in the species as  $\text{O}_2^+ < \text{O}_2 < \text{O}_2^- < \text{O}_2^{2-}$ . Justify. 2
7. (a) Predict all possible isomers of the following: 3
- (i)  $[\text{Co}(\text{NH}_3)_4(\text{NO}_2)\text{Cl}]\text{Cl}$
- (ii)  $[\text{Co}(\text{en})_3][\text{Cr}(\text{CN})_6]$
- (iii)  $[\text{Co}(\text{NH}_3)_3\text{Cl}_3]$
- (b) Write the IUPAC name of the following complexes: 2
- (i)  $[\text{Co}(\text{en})_2(\text{CO}_3)]\text{Cl}$
- (ii)  $[\text{Co}(\text{N}_3)(\text{NH}_3)_5]\text{SO}_4$
8. (a) What are intrinsic and extrinsic semiconductors? Indicate the type of semiconduction (n or p) expected in the following: 3
- (i) As doped Ge
- (ii) B doped Si
- (b) Between  $\text{H}_2\text{O}$  and  $\text{H}_2\text{O}_2$  which one has higher boiling point and why? 2

## CHT-21b

## Unit-I

Answer *any three* questions.

9. (a) Outline the structural patterns of silicates and silicones. 3
- (b) Give examples to show that hydroxylamine possess both oxidising and reducing properties. 2
10. (a) What are freons? Explain its environmental impact with probable reasons. 2
- (b) Compare and contrast the properties of inorganic benzene and benzene based on structures and bonding. 3

11. (a) Mention the different types of interhalogens. Discuss the structure of any two types mentioning the hybridisation involved. 3
- (b) Suggest a method of preparation of  $\text{XeO}_2\text{F}_2$  and draw its structure. 2
12. (a) What happens when
- (i) Ferric chloride solution is gradually added to sodium thiosulphate solution.
- (ii) Ammonium persulphate solution is added to  $\text{MnSO}_4$  solution in presence of  $\text{AgNO}_3$  catalyst in  $\text{H}_2\text{SO}_4$  medium. 3
- (b) Explain why the P – N bond distances in  $\text{P}_3\text{N}_3\text{F}_6$  are shorter than those in  $\text{P}_3\text{N}_3\text{Cl}_6$ . 2
13. (a) How can you obtain  $\text{S}_2\text{N}_2$ ? What structural change takes place on keeping this compound at ordinary temperatures? Mention a remarkable property of this compound which develops. 3
- (b) Pseudohalides are more reactive than halides. Justify this statement with chemical reactions. 2

### Unit-II

Answer *any two* questions.

14. (a) Explain on the basis of the solubility product principle and common ion effect the precipitation of Gr-II A and Gr-IIIB sulphides in qualitative analysis. 3
- (b) Balance the following redox reactions by ion-electron method:
- (i)  $\text{P} + \text{H}_2\text{O} + \text{OH}^- \longrightarrow \text{PH}_3 + \text{H}_2\text{PO}_2^-$
- (ii)  $\text{NO}_2^- + \text{Zn} + \text{NaOH} \longrightarrow \text{Na}_2\text{ZnO}_2 + \text{NH}_3$  2
15. (a) Construct the Frost diagram for  $\text{O}_2$  in acid medium from the given Latimer diagram:
- $$\text{O}_2 \xrightarrow{+0.70\text{V}} \text{H}_2\text{O}_2 \xrightarrow{+1.76\text{V}} \text{H}_2\text{O}$$
- Comment on the tendency of any one of the species to undergo disproportionation. 3
- (b) Calculate the equilibrium constant of the following cell reaction:
- $$\text{Zn}|\text{Zn}^{2+}||\text{Cu}^{2+}|\text{Cu} \quad E_{\text{cell}}^{\circ} = 1.1\text{V}$$
- 2
16. (a) Calculate the equivalence potential in the titration of 25ml of 0.1N  $\text{Fe}^{+2}$  solution with 0.1N  $\text{Cr}_2\text{O}_7^{2-}$  solution. The pH of the medium is maintained at 1.0.
- Given:  $E_{\text{Fe}^{+3}/\text{Fe}^{+2}}^{\circ} = 0.77\text{V}$
- $$E_{\text{Cr}_2\text{O}_7^{2-}/\text{Cr}^{+3}}^{\circ} = 1.36\text{V}$$
- 3
- (b) Compare the oxidizing power of  $\text{K}_2\text{Cr}_2\text{O}_7$  in acidic and neutral medium. 2