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3 (Sem-3/CBCS) CHE HC 1

2021

(Held in 2022)

**CHEMISTRY**

(Honours)

Paper : CHE-HC-3016

**(Inorganic Chemistry-II)**

Full Marks : 60

Time : Three hours

***The figures in the margin indicate  
full marks for the questions.***

1. Answer the following as directed :  $1 \times 7 = 7$ 
  - (i)  $F^-$  is a hard base.  
(State True or False)
  - (ii) Predict the shape of  $XeF_2$  with the help of the VSEPR model.
  - (iii) Why does nitrogen not form any pentahalide in contrast to phosphorus ?

Contd.

- (iv) Why is the dipole moment of  $NF_3$  very low compared to that of  $NH_3$  ?
- (v)  $NaCl$  and  $KCl$  are anhydrous whereas  $MgCl_2 \cdot 6H_2O$  and  $CaCl_2 \cdot 6H_2O$  have water of crystallization. Give a reason.
- (vi)  $MgSO_4$  is soluble in water but  $BaSO_4$  is insoluble. Why ?
- (vii)  $FeS$  is much less soluble than  $Fe(OH)_2$ . Explain.

2. Answer the following questions :  $2 \times 4 = 8$

- (i) Briefly discuss the structural differences of  $BeH_2$  and  $CaH_2$ .
- (ii) What are pseudohalogens ? Write *two* similar properties of  $CN^-$  and  $Cl^-$ .
- (iii) Arrange the following molecules in increasing order of their acid strengths and give reasons for your choice :  
 $BBr_3, BF_3, BCl_3$
- (iv) What happens when sodium hydrogencarbonate ( $NaHCO_3$ ) is heated ? Why is it used as the fire extinguisher ?

3. Answer *any three* of the following questions :  $5 \times 3 = 15$

- (i) Define Lewis base. Lewis acids may be classified into four categories. Discuss these four categories of Lewis acids.  $1+4=5$
- (ii) Identify the products :  $1 \times 5 = 5$
- (a)  $XeF_4(s) + Pt(s) \rightarrow$
- (b)  $XeF_2(s) + SbF_5(l) \rightarrow$
- (c)  $Li_3N + H_2O \rightarrow$
- (d)  $Li(s) + N_2(g) \rightarrow$
- (e)  $B_2H_6 + 2NH_3 \rightarrow$
- (iii) Applying Wade's rule, rationalize why the cage structure of  $C_2B_4H_6$  is an octahedron. How many cage isomers are possible for it ?  $3+2=5$
- (iv) Write the preparation method, structure and application of polysiloxanes.  $2+2+1=5$
- (v) What is inert-pair effect ? Give *two* examples where the inert-pair effect is seen.  $1+2+2=5$

4. Answer **any three** of the following questions : 10×3=30

(i) Discuss the Ellingham diagram. 10

(ii) Discuss the layer structure of boron nitride. Write *one* method for the preparation of boron nitride. Write *two* dissimilarities between the boron nitride and the graphite. 7+1+2=10

(iii) Discuss the synthesis, structure and applications of phosphazene polymers. 10

(iv) Write the differences between lithium and the other Group 1 elements. 10

(v) Discuss the structures of various silicates. 10

(vi) Write about — 5+5=10

(a) the allotropes of phosphorus and

(b) the structure of carbon nanotubes.

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