

Total number of printed pages-4

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.
