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 : 1×7=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 ?

(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 : 2×4=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 : 5×3=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 : 1×5=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.
