3 (Sem–3/CBCS) CHE HC 1

2024

CHEMISTRY

(Honours Core)

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

   (a) The process used to remove silver and copper from impure gold is called—

   (i) Van Arkel process

   (ii) Kroll process

   (iii) Parting process

   (iv) Vapour phase method

   (Choose the correct option)

   (b) Arrange the following compounds in the decreasing order of their relative acidic strength.

   BF_3, BBr_3, BCl_3

   (c) Explain why does $BiCl_5$ not exist.

   (d) Explain why is Borax used in softening of water.

(e) "Raman spectra of diborane gives two intense frequencies."—State whether the statement is true **or** false.

(f) The shape of XeF_4 molecule is _____ .
(Fill in the blank)

(g) What is the type of hybridisation of Boron in diborane ?
(i) sp^3
(ii) sp^2
(iii) d^2sp^3
(iv) sp^3d^2

2. Answer the following questions : 2×4=8

(a) Li_2CO_3 is thermally unstable. Explain why.

(b) Describe the structure of Cl_2O_7.

(c) Why does urea behave as an acid in liquid ammonia ?

(d) How is *N*-trimethylborazine formed ? Give chemical reactions.

3. Answer ***any three*** of the following : 5×3=15

(a) Briefly discuss the bonding and structure of diborane.

(b) What is Pearson's HSAB principle ? On the basis of HSAB principle explain why $[Co(CN)_5I]^{3-}$ and $[Co(NH_3)_5F]^{2+}$ are stable while $[Co(CN)_5F]^{3-}$ and $[Co(NH_3)_5I]^{2+}$ are unstable complexes. 1+4=5

(c) What are interhalogen compounds ? Explain the structure of ClF_3 molecule. 1+4=5

(d) Discuss how copper can be purified from crude copper.

(e) On the basis of VSEPR theory, explain the structure of XeF_6 molecule.

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

(a) (i) What is inorganic benzene ? How can it be prepared in the laboratory ? Describe its structure on the basis of molecular orbital concept. 1+2+5=8

(ii) Why polysulphate is considered the best fertilizers ? 2

(b) (i) Complete the following reactions : 1×4=4

$2XeF_6 + SiO_2 \longrightarrow$?

$XeF_4 + 4KI \longrightarrow$?

$2CH_2 = CH_2 + 2XeF_2 \longrightarrow$?

$B_2H_6 + x\,NH_3\,(excess) \xrightarrow{\text{High tempr.}}$?

(ii) What are silicones ? How many types of silicones are there ? How linear silicones can be prepared ? 1+1+4=6

(c) (i) What are clathrate compounds? Discuss these clathrates with reference to gas hydrates. Why do *He* and *Ne* not form clathrate? 2+3+1=6

(ii) Discuss Van Arkel method of purification of zirconium and titanium. 4

(d) Write notes on : ***(any two)*** 5+5=10

(i) Polyhalides

(ii) Graphite

(iii) Diagonal relationship

(e) (i) Give the formula, structure and method of preparation of basic beryllium nitrate. 1+2+2=5

(ii) Discuss the laboratory method of preparation of P_4O_6. Explain the structure of P_4O_6. 2+3=5

(f) (i) Name and draw the structures of two oxyacids of nitrogen. Which oxyacid of nitrogen acts both as oxidizing agent as well as reducing agent and why? 2+1+1=4

(ii) Why Lithium compounds are soluble in organic solvent? 2

(iii) Write down the main reasons for the anomalous behaviour of fluorine. Mention *two* anomalous behaviour of fluorine. 2+2=4
