

Total number of printed pages—4

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 :  $1 \times 7 = 7$

(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.

Contd.



(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 :  $2 \times 4 = 8$

(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 :

$5 \times 3 = 15$

(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 :

$10 \times 3 = 30$

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

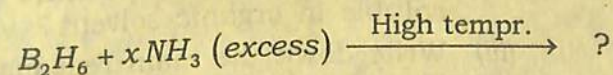
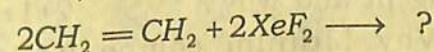
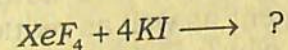
$1 + 2 + 5 = 8$

(ii) Why polysulphate is considered the best fertilizers?

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(b) (i) Complete the following reactions :

$1 \times 4 = 4$



(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.

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(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?

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

2+2=4