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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.

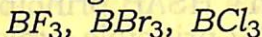
1. Answer the following as directed : $1 \times 7 = 7$

(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)

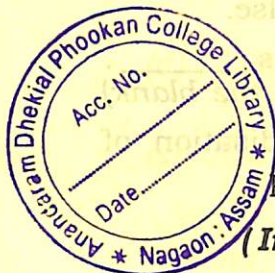
(b) Arrange the following compounds in the decreasing order of their relative acidic strength.



(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 $[\text{Co}(\text{CN})_5\text{I}]^{3-}$ and $[\text{Co}(\text{NH}_3)_5\text{F}]^{2+}$ are stable while $[\text{Co}(\text{CN})_5\text{F}]^{3-}$ and $[\text{Co}(\text{NH}_3)_5\text{I}]^{2+}$ 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.

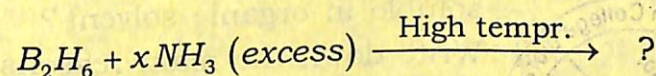
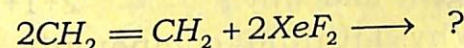
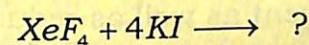
$1 + 2 + 5 = 8$

(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. 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. $2+2=4$

