

**63/1 (SEM-3) CC5/CHMHC3056**

**2023**

**CHEMISTRY**

**Paper : CHMHC3056**

**( Inorganic Chemistry—II )**

*Full Marks : 60*

*Pass Marks : 24*

*Time : 3 hours*

*The figures in the margin indicate full marks  
for the questions*

1. Choose the correct answer from the following (any five) : 1×5=5

(a) Ultra pure metals can be obtained by

(i) vapour phase method

(ii) parting method

(iii) solvent extraction

(iv) Van Arkel-de Boer method

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- (b) Parting process is used to remove Ag and Cu from
- (i) Pb
  - (ii) Ni
  - (iii) Au
  - (iv) Cr
- (c)  $\text{CN}^-$  is
- (i) hard acid
  - (ii) soft acid
  - (iii) soft base
  - (iv) hard base
- (d) According to HSAB principle hard acids prefer to form bond with
- (i) hard acids
  - (ii) soft acids
  - (iii) soft bases
  - (iv) hard bases

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- (e) For any element to show catenation the valency of the element must be greater or equal to
- (i) 1
  - (ii) 2
  - (iii) 3
  - (iv) zero
- (f) In fullerene the arrangement of C-atoms in  $\text{C}_{60}$  is
- (i) linear
  - (ii) trigonal planar
  - (iii) soccer ball-like
  - (iv) tetrahedral
- (g) The structure of  $\text{IF}_5$  is
- (i) pentagonal bipyramidal
  - (ii) tetrahedral
  - (iii) octahedral
  - (iv) square pyramidal

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(h) Which of the following gases does not form clathrates?

(i) Ne

(ii) Ar

(iii) Kr

(iv) Xe

(i) Mica is the sheet of tetrahedral

(i)  $\text{SiO}_4$

(ii)  $\text{SiO}_3$

(iii)  $\text{SiO}_2$

(iv)  $\text{SiO}$

(j) Polysulphates contain sulphates of

(i) Mg only

(ii) Ca only

(iii) K only

(iv) Mg, Ca and K

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2. Answer any *five* of the following questions :

2×5=10

(a) Give one merit and one limitation of Ellingham diagram.

(b) Explain the relative Lewis acid strength of  $\text{BF}_3$ ,  $\text{BCl}_3$  and  $\text{Br}_3$ .

(c) What is inert pair effect? Give one example.

(d) Write the main conditions for S and P-block elements to form complexes.

(e) What are carboranes?

(f) What are clathrates? Give conditions to form clathrates.

(g) What are Silicones? Give their general formula.

3. Answer any *five* of the following questions :

5×5=25

(a) Define hydrometallurgy. How it helps to purify Cu from copper ores? 2+3=5

(b) What is HSAB principle? Give its applications with suitable examples in each application. 2+3=5

(c) Define the term allotropy. Discuss the various allotropic forms of group 14 and 15 elements. 1+2+2=5

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(d) Describe one method to prepare xenontetra-fluoride. Explain its structure. 2+3=5

(e) Why is borazine called inorganic benzene? How is it prepared from diborane? Give its action on HCl at 50 °C to 100 °C. 1+2+2=5

(f) Describe briefly Van Arkel and de Boer method to refine titanium and zirconium. 5

(g) What are Bronsted-Lowry type of acids and bases? Give at least four reactions involving Bronsted-Lowry acids and bases and explain them. 1+4=5

(h) Name different oxyacids of phosphorus and chlorine. Give one method of preparation of orthophosphoric acid. 3+2=5

(i) Describe various sources of noble gases. Give at least four uses, each of neon and helium. 2+3=5

4. Answer any two of the following questions : 10×2=20

(a) (i) What are Ellingham diagrams? Explain its use by carbon as reductant. 4

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(ii) Describe in detail with suitable examples, the chief modes of occurrence of metals based on electrode potentials. 6

(b) (i) What are silicates? Describe the chemistry of orthosilicates and cyclosilicates with one example in each case. 2+2+2=6

(ii) Describe the preparation and structure of the following interhalogen compounds : 2+2=4  
1.  $\text{ClF}_3$   
2.  $\text{ICl}$

(c) (i) Classify the following into hard, soft and border line acids and bases : 3  
 $\text{Na}^+$ ,  $\text{Pb}^{2+}$ ,  $\text{NH}_3$ ,  $\text{SCN}^-$ ,  $\text{Br}^-$ ,  $\text{Co}^{2+}$

(ii) All Bronsted acids may not be Arrhenius bases. Explain. 3

(iii) Why are noble gases inert in nature? 4

(d) (i) What are phosphazenes? How are lower polymers obtained? 1+2=3

(ii) What are polymers and macromolecules? How do they differ? Give one example. 4

(iii) Write any three characteristics of inorganic polymers. 3

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