

B.SC. MSC INTEGRATED PROGRAMME

JAMIA HAMDARD

Semester II Examination 2022

Paper code : BCH-CC3 TH

Title : Inorganic Chemistry I: Chemistry of s- and p-block elements

(Write your Roll No. at the top immediately on receipt of this question paper)

Time: **3 Hours**

Maximum Marks: **75**

Note: Attempt all the questions marks of each question given in parenthesis. All parts of a question must be attempted in continuation. Start answer of a fresh question on a new page. Cite examples and draw labelled diagrams wherever necessary.

Q1. Attempt *any ten* of the following:

(10 x 1.5 = 15)

- (i) The method of zone refining of metals is based upon the principle of:
- Greater solubility of the impurity in molten state than in solid.
 - Greater mobility of pure metal than impurity.
 - Higher melting point of impurity than that of pure metal.
 - Greater noble character of solid metal than that of the impurity.
- (ii) In electro refining of copper some gold is produced as:
- Cathode mud
 - Anode mud
 - Cathode deposit
 - Anode deposit
- (iii) Extraction of zinc from zinc blende is achieved by
- Electrolytic reduction
 - Roasting followed by reduction with carbon
 - Roasting followed by reduction with another metal
 - Roasting followed by self-reduction
- (iv) Which of the ions have maximum hydration energy?
- | | |
|----------------------|----------------------|
| (a) Sr^{2+} | (b) Ca^{2+} |
| (c) Mg^{2+} | (d) Be^{2+} |
- (v) Find the incorrect trend for alkaline earth metals
- | | |
|--|--|
| (a) Atomic size $\text{Be} < \text{Mg} < \text{Ca} < \text{Sr}$ | (b) Second ionization energy $\text{Be} < \text{Mg} < \text{Ca} < \text{Sr}$ |
| (c) Hydration enthalpy $\text{Sr} < \text{Ca} < \text{Mg} < \text{Be}$ | (d) Density $\text{Ca} < \text{Mg} < \text{Be} < \text{Sr}$ |
- (vi) Which one is known as a fusion mixture?
- | | |
|--|--|
| (a) $\text{Na}_2\text{CO}_3 + \text{NaHCO}_3$ | (b) $\text{Na}_2\text{CO}_3 + \text{NaOH}$ |
| (c) $\text{Na}_2\text{CO}_3 + \text{K}_2\text{SO}_4$ | (d) $\text{Na}_2\text{CO}_3 + \text{K}_2\text{CO}_3$ |
- (vii) Arrange the following group 15 trifluorides in the correct order of melting points.
- | | |
|--|--|
| (a) $\text{PF}_3 < \text{AsF}_3 < \text{SbF}_3 < \text{BiF}_3$ | (b) $\text{BiF}_3 < \text{AsF}_3 < \text{PF}_3 < \text{SbF}_3$ |
| (c) $\text{BiF}_3 < \text{SbF}_3 < \text{PF}_3 < \text{AsF}_3$ | (d) $\text{PF}_3 < \text{SbF}_3 < \text{AsF}_3 < \text{BiF}_3$ |
- (viii) The species which has see-saw shape is?

- (a) XeF₄ (b) SF₄
(c) ClF₄ (d) ClF₄⁻
- (ix) Which among these has the highest bond angle?
(a) NH₃ (b) NF₃
(c) BF₃ (d) PH₃
- (x) What is the bond angle of CO₃²⁻?
(a) 120° (b) 180°
(c) 109.5° (d) 90°
- (Xi) Which of the following is true about interhalogen compounds?
(a) They have unpaired electrons (b) They are highly stable
(c) They are diamagnetic (d) They are paramagnetic
- (xii) What do asthma patients use for respiration?
(a) O₂ and H₂ (b) O₂ and He
(c) O₂ and Ar (d) O₂ and Ne
- (Xiii) What are interhalogen compounds used as?
(a) Reducing agents (b) Aqueous solvents
(c) To decreasing reactivity (d) Non-aqueous solvents
- (xiv) What is the basic structural unit of a silicate?
(a) Si₄⁻ (b) SiO⁻
(c) SiO₄ (d) SiO₄⁴⁻
- (xv) What is the second hardest material known?
(a) Coke (b) Carborundum
(c) Graphite (d) Diamond

Q2. Attempt **any three** of the following:

(3x5=15)

- (A) Give detailed insight on van Arkel-de Boer process.
(B) Describe Ellingham diagrams.
(C) Write short note on hydrometallurgy on cyanide process for silver and gold.
(D) Describe Mond's Process.
(E) Write short note Interhalogen and pseudohalogen compounds.

Q3. Attempt **any three** of the following:

(3x5=15)

- (A) Describe inert pair effect in detail by citing suitable examples
(B) Describe the effect of electron gain enthalpy and trend for group 17 elements.
(C) Give insight over diagonal relationship between B and Si element.

(D) Discuss the variation trends of atomic size, metallic character and ionization enthalpy for group 14 elements.

(E) Explain preparation, structure and uses of silicates.

Q4. Attempt **any three** of the following:

(3x5=15)

(A) What is the cause of diagonal relationship?

(B) Discuss the trend of the following:

(i) Thermal stability of carbonates of group 2 elements.

(ii) The solubility and the nature of oxides of group 2 elements.

(C) Suggest a route for the preparation of beryllium hydride starting from lithium hydride by writing chemical equations involved in the process.

(D) When a metal of group 1 was dissolved in liquid ammonia, the following observations were obtained: (i) Blue solution was obtained initially, (ii) On concentrating the solution, blue colour changed to bronze colour. How do you account for the blue colour of the solution? Give the name of the product formed on keeping the solution for some time.

Q5. Attempt **any three** of the following:

(3x5=15)

(A) Present a comparative account of the alkali and alkaline earth metals with respect to the following characteristics:

(i) Tendency to form ionic and covalent compounds (ii) Nature of oxides and their solubility in water.

(B) Write short note on Phosphonitrilic halides.

(C) Write short notes on oxoacids of phosphorus.

(D) Explain the stability of hydrides of group 14 elements.

(E) Comment on the hydrolysis, acidic/basic nature of halides of phosphorus.