BINDURA UNIVERSITY OF SCIENCE EDUCATION

SCIENCE AND MATHEMATICS EDUCATION DEPARTMENT

DC002/ DCH004: INORGANIC CHEMISTRY

Time: 2Hours

ANSWER QUESTION 1 AND FOUR (4) OTHER QUESTIONS TWO (2) FROM EACH OF THE SECTIONS "A" AND "B". EACH QUESTION CARRIES 20 MARKS

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1. (a) Define
   (i) Electron shielding.
   (ii) Electropositivity.
   (iii) Effective nuclear charge
   (iv) Ionic radius. [4 × 2 marks]

   (b) State and explain how:
   (i) Reducing power of group I metals varies down the group. [4 marks]
   (ii) Oxidising power of group VII elements varies down the Group. [4 marks]

   (c) Give the properties that make d-block elements good construction materials. [4 marks]

SECTION A: ANSWER TWO QUESTIONS FROM THIS SECTION

2. Group II metals behave differently in their reactions with H_2O and in air.
   (a) Describe the reactions of group II elements with water giving balanced reactions for all the reactions that take place. [10 marks]
   (b) Outline the reactions of the elements with air. [10 marks]

3. (a) Discuss the trends of Group 6 hydrides under the following sub-headings:
   (i) Reducing character. [3 marks]
   (ii) Thermal stability. [3 marks]

   (b) Oxygen can be prepared from heating some metallic oxides. Illustrate this with an equation. [2 marks]

   (c) Outline the manufacture of Sulphuric acid in the Contact process. [12 marks]

4. (a) Part of the periodic table is shown below.

			B		N	O	F	Ne
Na						S	Cl	
K	Ca	Cu						
Cs				Pb				Rn

From the elements shown in the table, identify one which:

(i) Has the lowest first ionisation energy.
(ii) Has the highest first ionisation energy.
(iii) Has a hydride that forms the strongest hydrogen bonds.
(iv) Has a nitrate of formula $X(NO_3)_2$ that gives a brown gas when heated.
(v) Has a trifluoride with molecules of trigonal shape. [5 marks]

(b) The six elements in the third period from sodium to sulphur show a change in properties based on structure and bonding. State and explain the change in:

(i) metallic character. [3 marks]
(ii) melting point. [3 marks]
(iii) electrical conductivity. [3 marks]

(c) Choose one metallic and one non-metallic element from these six and for each chosen element describe what you would observe when:

(i) The element reacts with oxygen. [2 marks]
(ii) The oxide reacts with water containing universal indicator. [4 marks]

SECTION B: ANSWER ANY <u>TWO</u> QUESTIONS FROM THIS SECTION

6. (a) Outline the differences between:

(i) Elemental silicon and carbon. [8 marks]
(i) Oxides of silicon and carbon [10 marks]

(b) Describe the variation in group 4 elements' catenation ability. [2 marks]

5. Hydrogen can be classified as Group 1, 4 and 7. Outline the chemistry of hydrogen that makes it typical and unlike Group 1, 4 and 7 elements. [20 marks]

7. (a) Explain the following:

(i) Transition metals are used as catalysts. [3 marks]

(ii) Transition metal ions form colored compounds in solution. [3 marks]

(iv) Transition metals are better electrical conductors than s block metals. [3 marks]

(v) Melting points of transition metals are higher than the melting points the s block metals. [3 marks]

(b) Copy and complete the following table.

d-block element	Catalyst formula	Reaction catalyzed
V		
Fe		
Ni		
Pt		

[8 marks]

END OF PAPER

PERIODIC TABLE OF ELEMENTS