## **Stage 2 Chemistry**

## **Birdwood**

HIGH SCHOOL **Topic 3 Elemental & Environmental Chemistry**

**Periodic table, electronic config. periodic trends**

**Review Paper 1** Essentials pp 1-12

**DUE DATE:**

**Question 1**

*Carefully examine the following list of 7 different chemical substances.*

Use the list to answer the following questions.

CuSO4, H2O, K, SO2, Cl2, CO2, Ca(NO3)2

1. Select from the list, one of the substances that represents a metallic *element*. K
2. State the *block* of the periodic table where this element from part (i) is found. S block
3. Select a compound that could be classified as a *small molecule. H2O, SO2, CO2*
4. One of the compounds in the list is called calcium nitrate. Write the *formula* for magnesium nitrate. [Calcium and magnesium are in the same group.] Mg(NO3)2
5. Two of the chemical substances in the list contain sulfur. Write the *oxidation number* of sulfur in SO2. +4
6. Identify an element from the list that can be classified as a *non-metal.* Cl (10 marks)

**Question 2**

The elements sodium, aluminium and chlorine are all found in the same period of the periodic table.

They form “*hydroxy*” compounds with the formulae NaOH, Al(OH)3 and HOCl.

(i) Give the period and group number of aluminium. Period 3 group 3

(ii) Which of the three elements listed above, would be most metallic? Sodium

1. State the oxidation number of each of the three elements in their corresponding “*hydroxyl”*

compounds given above. Na +1, Al +3, Cl +1

1. Briefly define the term *electronegativity*. How strongly an atom holds onto its valance electrons

(v) Which of these three elements (Na, Al, Cl) would have the highest electronegativity? Cl

(vi) How would the electronegativity vary as you go across *this period* of the periodic table? Increases

(10 marks)

**Question 3**

Selenium is a member of Group VI on the periodic table.

1. State the number of electrons it has in its valence shell? 6
2. State the block of the periodic table to which selenium belongs. P block
3. In what state would selenium most likely exist in its elemental form? Solid
4. Write the sub-shell electronic configuration for selenium. 1s2 2s2 2p6 3s2 3p6 4s2 3d10 4p4
5. Three different compounds of selenium have the formulae: H2Se, SeO2, and H2SeO4.

State the oxidation state of selenium in each of these 3 compounds. -2, +4 and +6

(8 marks)

**Question 4**

Write electronic configurations for the following substances:

1. Argon 1s2 2s2 2p6 3s2 3p6
2. K 1s2 2s2 2p6 3s2 3p6 4s1
3. Cr3+  1s2 2s2 2p6 3s2 3p6 3d3
4. O2-  1s2 2s2 2p6
5. a manganese ion, Mn 2+ 1s2 2s2 2p6 3s2 3p6 3d5
6. Be2+ 1s2
7. a sulfide ion 1s2 2s2 2p6 3s2 3p6 (7 marks)

**Question 5**

Compounds of phosphorus can be used to soften water.

1. Write the electronic configuration of phosphorus using subshell notation. 1s2 2s2 2p6 3s2 3p3
2. Phosphorus commonly displays an oxidation state of +5 in its compounds.
   1. Explain how the oxidation state of phosphorus can be positive. If the phosphorus bonds to a more electronegative atom such as oxygen or a halogen
   2. Explain how the oxidation state of phosphorus can be 5. Phosphorus has 5 valence electrons and can therefore form 5 covalent bonds. Its empty d shell allows for the acceptance of the electrons above the normal octet.
3. Identify the other positive oxidation state that phosphorus commonly displays in its compounds. Phosphorus would also have a +3 oxidation state as it requires 3 electrons to form a stable octet.

(5 marks)

**Question 6**

1. By referring to the position of an element in the periodic table, it is possible to determine a number of properties of the element and its compounds.
2. State the block of the periodic table to which calcium belongs. S block
3. State whether calcium would have a low, intermediate or high electronegativity. Low
4. State the charge on the ion formed by calcium. +2
5. Write the formula of calcium oxide. CaO
6. Would calcium oxide be classified as a molecular substance? Explain your answer. No. Calcium oxide is ionic and so would form a continuous lattice. Only covalently bonded substances can be molecular.
7. State whether calcium oxide would most likely be a solid, a liquid or a gas at room

temperature. Solid, as it is ionically bonded.

1. Write the equation for the reaction of calcium oxide with water. CaO + H2O -> Ca2+ + 2OH
2. State what this equation suggests about the nature of the oxide of calcium? Basic
3. State the oxidation state of nitrogen in the following substances:

(i) HNO3 +5

(ii) NO2 +4

1. N2O +1
2. N2 0 (14 marks)

**TOTAL MARK = 54**