ZAMANI COLLEGE KADUNA

SS3 CHEMISTRY STUDY PACK TERM 1 2014-2015

Instruction: Read through the following outline of topics from any of your chemistry text books and make notes on them and answer the questions that follow. All of these will be due for submission as will be communicated to you. This is part of your assessment upon resumption.

Topic: **Chlorine and its Compounds**

Outline to study:
Chlorine

- ✓ Laboratory preparation with diagram
- ✓ Industrial preparation (diagram not required)
- ✓ Physical properties
- ✓ Chemical properties
    - Displacement of other halogens
    - Direct combination with elements
    - Reaction with hydrogen
    - As an oxidizing agent
    - As a bleaching agent
    - Reaction with alkalis
    - Test for chlorine

Hydrogen chloride

- ✓ Laboratory preparation with diagram
- ✓ Industrial preparation (diagram not required)
- ✓ Physical properties
- ✓ Chemical properties of hydrogen chloride gas
    - Direct combination with ammonia
    - Reaction with metals
- ✓ Properties of hydrochloric acid
    - Action of heat
    - As an acid
    - Reactions with strong oxidizing agents
    - Test for hydrogen chloride
- ✓ Uses

Now answer the following questions;

1. a. The electronic configuaration of atoms of elements V, W, X and Y are given below:
   V = $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^4$
   W = $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^5\ 4s^2$
   X = $1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^1$
   Y = $1s^2\ 2s^2\ 2p^6$
   Which of the elements:

   i. Belong to group VIA and period in the periodic table?
   ii. Is a d- block element?
   iii. Is the most electropositive?
   iv. Has a complete and most stable outermost configuration?
   v. Exist as a polyatomic molecule?

2. a. One of the components of limestone is calcium trioxocarbonate (IV). 24.5cm^3 of hydrochloric acid with molar concentration 0.6500 m0ldm^{-3} was found to react with all the $CaCO_3$ in the limestone. Calculate the:

i. Mass of $CaCO_3$ limestone ii. Volume of CO_2 evolved at s.t.p.

Equation for the reaction is: $CaCO_{3\,(s)} + 2HCl_{(aq)} \longrightarrow CaCl_{2\,(aq)} + H_2O_{(l)} + CO_{2(g)}$
(Ca= 40, O= 16, H= 1, 1 mol of gas occupies 22.4 dm^3 at s.t.p.)

b. Give the IUPAC name for each of the following: (i) MnO_2 (ii) ClO_3^- (iii) $CUSO_4 . 5H_2O$

c. Calculate the oxidation state of nitrogen in the following compounds:
(i) N_2O (ii) NO (iii) NO_2 (iv) NO_3 (v) NO_3^- (vi) HNO_3

3. Given below is a table of the electronegativities of some elements.

Atomic number	3	4	5	6	7	8	9
electronegativity	1.0	1.5	2.0	2.5	3.0	3.5	4.0

i. Plot a graph atomic number against electronegativity.
ii. From the graph, does electronegativity decrease or increase with increasing atomic number? Give reason for your answer.

4. a. (i) Draw a labelled diagram for the laboratory preparation of a dry sample of chlorine.
(ii) Give one chemical test for chlorine.

b. Write equations to represent the reaction of chlorine gas with:
(i) Iron (II) chloride solution;
(ii) Potassium iodide solution;
(iii) Hot concentrated sodium hydrogen solution.

c. State what is observed in:
(i) Bubbling hydrogen chloride gas into an aqueous solution of lead (II) trioxonitrate (v);
(ii) Heating the mixture from c(i) above to boiling and then allowing it to cool.

d. A solution of bismuth chloride was prepared by adding the oxychloride which is a white powder, to concentrated hydrochloric acid. The following equilibrium was set up:

$$BiOCl_{(s)} + 2HCl_{(aq)} \rightleftharpoons BiCl_{(aq)} + H_2O_{(l)}$$

State what would be observed if some water were added to the system. Explain your answer.