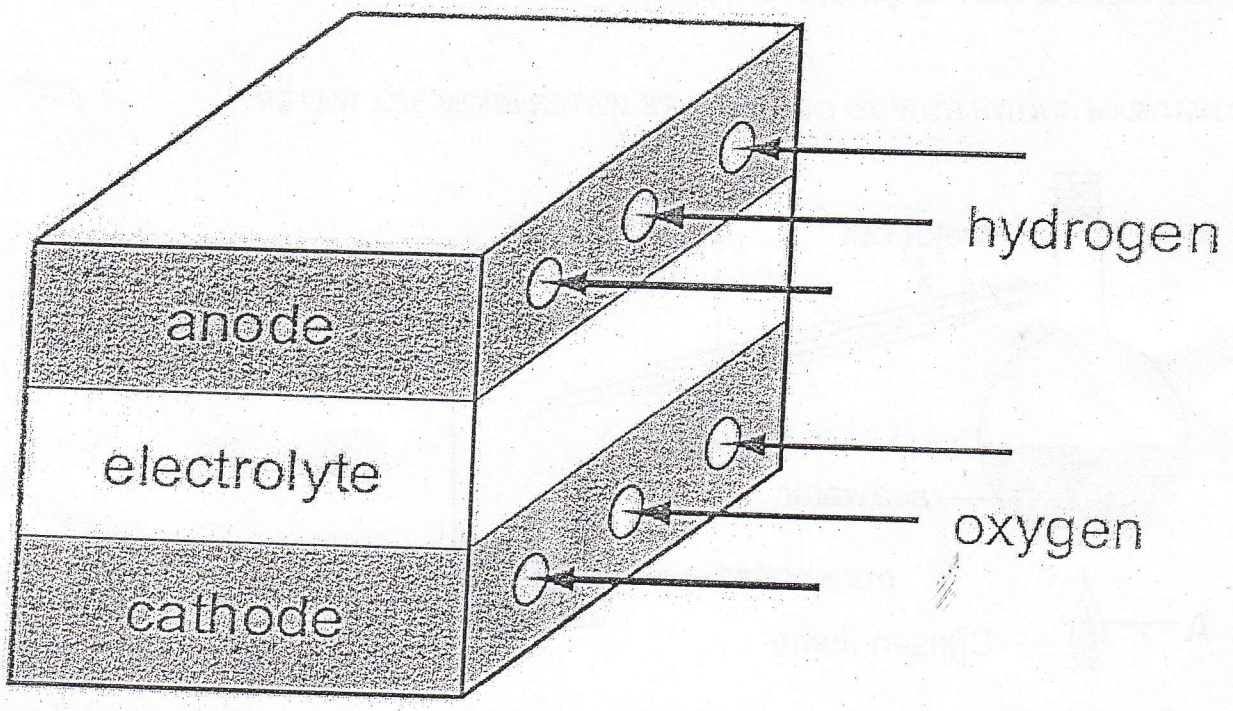
O-LEVEL CHEMISTRY PASSWORD FROM THE YEAR 2000 TO 2015

O-LEVEL REB PAST PAPERS WITH ANSWERS

FUEL CELLS ARE USED IN SPACECRAFT TO PRODUCE ELECTRICAL ENERGY



HOW IS OXYGEN OBTAINED FROM LIQUID AIR?

Education

"Education is the great engine of personal development. It is through education that the daughter of a peasant can become a doctor, that a son of a mineworker can become the head of the mine and a child of a farm worker can become the president of a nation."—Nelson Mandela

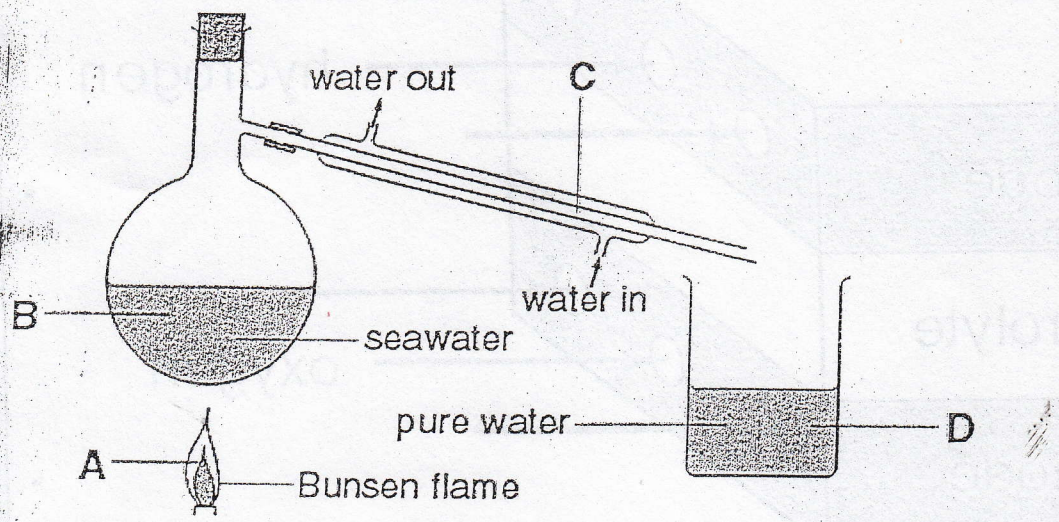
BIBLIOGRAPHY

This REB past paper question and answer booklet has been compiled to enable the Rwandan child who is so much interested in Chemistry to practice constantly and get used to the way REB Chemistry questions are set.

Other O - level books containing past paper questions with answers include Physics, Biology, Mathematics and Geography.

For more copies of other subjects, consult your teacher

THE DIAGRAM SHOWS HOW TO OBTAIN PURE WATER FROM SEA WATER.



Where do water molecules lose energy?

Chemistry I

002

17/11/2015 08.30AM – 11.30AM

REB
Rwanda Education Board

ORDINARY LEVEL NATIONAL EXAMINATIONS, 2015

SUBJECT: CHEMISTRY I

DURATION : 3 HOURS

INSTRUCTIONS:

1) Write your names and index number on the answer booklet as they appear on your registration form and **DO NOT** write your names and index number on additional answer sheets of paper if provided.
2) Do not open this question paper until you are told to do so.
3) This paper consists of three sections: **A, B** and **C.**
   - **SECTION A:** Attempt all questions. **(55 marks)**
   - **SECTION B:** Attempt any **THREE** questions **(30 marks)**
   - **SECTION C:** Attempt **ONLY ONE** question. **(15 marks)**
4) You do not need the Periodic Table.
5) Silent non-programmable calculators may be used.

SECTION A: ATTEMPT ALL THE QUESTIONS. (55 MARKS)

1) An atom of an element has the structure ${}^{A}_{Z}X$. This atom belongs to group VI and period III of the periodic table.

(a) Give the electronic configuration of atom X. (1 mark)

(b) Find Z. (1 mark)

(c) How many protons does this atom have? (0.5 marks)

(d) How many electrons does the ion X^{2-} have? (1 mark)

2) Some electrons of the periodic table are called noble or inert gases.

(a) In which group are these gases in the periodic table? (1 mark)

(b) What is meant by the term inert? (1 mark)

(c) Explain in terms of electronic structure why these gases are inert. (1 mark)

3) Name the process by which the components of the following mixtures can be separated:

(a) Water and ethanol. (0.5 marks)

(b) Pigments and leaves. (0.5 marks)

(c) Sand and water. (0.5 marks)

(d) Ammonium chloride and sodium chloride. (0.5 marks)

4) (a) A solution containing calcium ions was added to a solution of potassium carbonate.

(i) State what was observed. (0.5 marks)

(ii) Write the equation for the reaction that took place (1 mark)

(b) To the mixture prepared in (a) above, dilute hydrochloric acid was added.

(i) State what was observed. (0.5 marks)

(ii) Write the equation for the reaction. (1 mark)

5) Hydrochloric acid reacts with magnesium according to the equation:

$Mg_{(s)} + 2\ 2HCl_{(aq)} \longrightarrow MgCl_{2(aq)} + H_{2(g)}$

(a) Calculate the number of moles of magnesium that will react with excess hydrochloric acid to produce 720cm³ of hydrogen at room temperature and pressure. (1 mole of gas occupies 24dm³ at room temperature and pressure, Mg (Ar = 24) (3 marks)

(b) Why is it necessary to use excess hydrochloric acid? (1 mark)

6) (a) Calculate the molar mass of Fe_2O_3? (Atomic mass of Fe = 56, O = 16) (1 mark)

(b) How many atoms of oxygen are contained in 4.8g Fe_2O_3?
(1 mole contains 6.02×10^{23} atoms) (2 marks)

7) State one reagent that can be used to distinguish between each of the following pairs of ions and in each case state what would be observed if each ion is treated with the reagent.

(a) SO_4^{2-} (aq) and CO_3^{2-} (aq) (2.5 marks)

(b) Fe^{2+} (aq) and Fe^{3+} (aq) (2.5 marks)

8) The boiling and the melting points of substances W, X, Y and Z are given in the table below:

substance	Melting point (°C)	Boiling point (°C)
W	+29	+40
X	-5	+20
Y	0	100
Z	15	85

(a) Give the physical state (gas, solid or liquid) of the substances W, X, Y and Z at room temperature (25°C). (2 marks)

(b) Which of these substances is water? (1 mark)

9) (a) The oxides of some elements are listed below:
Sulfur dioxide, Aluminium oxide, Sodium oxide.
State the oxide which reacts with:

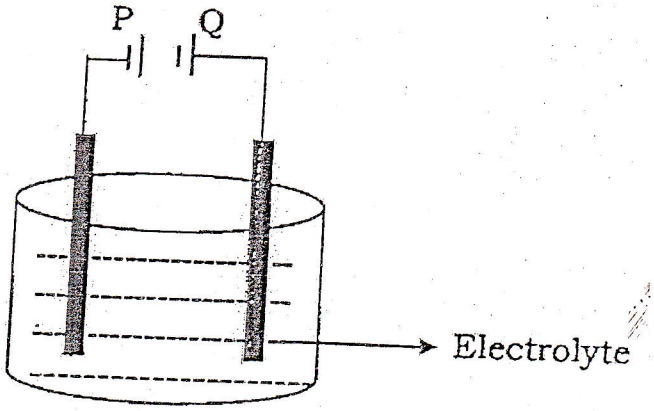
(i) Acids only (0.5 marks)

(ii) Alkalis only (0.5 marks)

(iii) Both acids and alkalis. (0.5 marks)

(b) When excess oxygen was passed over 6.20g of a strongly heated metal W, 14.20g of oxide was formed. Find the empirical formula of the oxide W. (Atomic mass: W = 31, O = 16) (4 marks)

10. The diagram below shows the arrangement apparatuses used for the purification of copper.



(a) Indicate which part is the anode and which part is the cathode on the diagram above. (1 mark)

(b) Name the substance used as the:

(i) Anode (0.5 marks)

(ii) Cathode (0.5 marks)

(c) Name the electrolyte (0.5 marks)

(d) Write the equation of the reaction that takes place at:

(i) Anode (0.5 marks)

(ii) Cathode (0.5 marks)

11. The molecular formula of an organic compound is $C_4H_{10}O$. This compound is an alcohol. Give the structural formula and names of all possible isomers (alcohols) of $C_4H_{10}O$. (4 marks)

12. Using the table below that shows the pH of different aqueous solutions, answer the questions that follow:

Solution	A	B	C	D	E
pH	12	5.5	3	7	9

Which of the solutions is:

(a) Most acidic? (0.5 marks)

(b) Most alkaline? (0.5 marks)

(c) Distilled water? (0.5 marks)

(d) Likely to be rain water? (0.5 marks)

(e) Which two solutions above would give a neutral solution when mixed? (0.5 marks)

(i) A + E; (ii) C + D; (iii) B + C; (iv) B + E

13. When 14.2g of hydrated sodium carbonate, $Na_2C0_3.nH_2O$ was heated, the mass of the residue was 10.6g.

(a) Complete this equation: $Na_2C0_3.nH_2O \xrightarrow{heat}$ ..... + ... (1 mark)

(b) Calculate the number of moles of water of crystallization (n). (4.5 marks)

(c) Write the molecular formula of hydrated sodium carbonate. (0.5 marks)

14. Complete and balance the equations below: (3 marks)

(a) $CH_3COOH + CH_3CH_2OH \longrightarrow$

(b) $CH_3CH = CH_2 + Br_2 \longrightarrow$

(c) $CH_2 = CH_2 + HCl \longrightarrow$

15. (a) Describe how you would prepare pure crystals of lead (II) nitrate in the laboratory starting from lead (II) oxide. (1 mark)

(b) Write the equation for the reaction that takes place. (1 mark)

SECTION B: ATTEMPT ANY THREE QUESTIONS. (30 MARKS)

16. (a) Copper (II) carbonate was heated strongly until there was no further observable change. During the reaction, a colorless gas was given off and a black solid was observed.

(i) Give the name of the black solid. (1 mark)

(ii) Write the equation for the reaction. (2 marks)

(iii) State the name of one reagent which can be used to identify the gaseous product and write an equation for the reaction. (2 marks)

(b) Excess dilute sulphuric acid was added to the residue in 16 (a) (ii) and the mixture warmed.

(i) State what was observed. (1 mark)

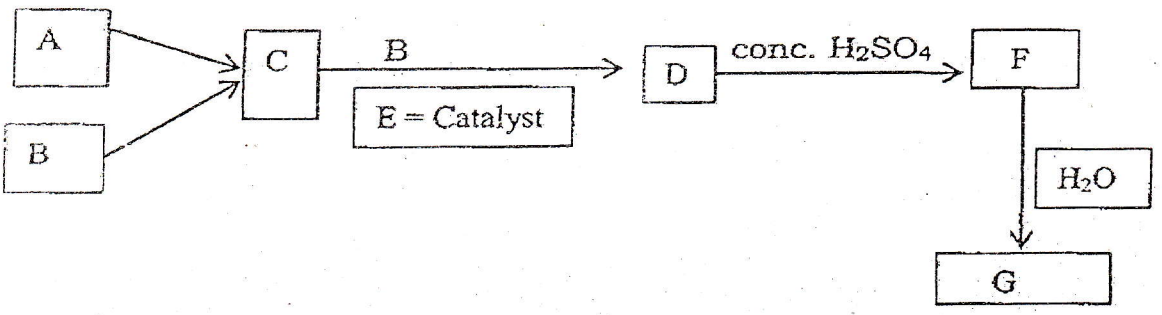
(ii) Write the equation for the reaction. (1 mark)

(c) To the product in (b) dilute sodium hydroxide solution was added drop wise until in excess.

(i) State what was observed. (1 mark)

(ii) Write an ionic equation for the reaction. (2 marks)

17. The diagram below represents the flow chart for the manufacture of sulphuric acid by the contact process.



(a) Write the molecular formula of the substance: A, B, C, D, E and F. (3 marks)

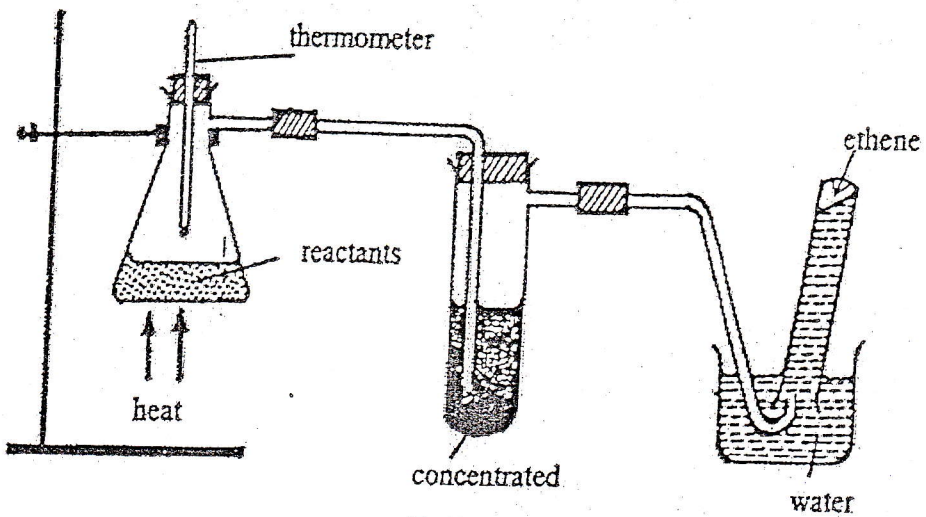
(b) Write the equation of the reaction that gives substance:
(i) C; (ii) D; (iii) F; (iv) G. (4 marks)

(b) The purity of sulphuric acid prepared in the contact process is 98% by mass; which means 98g of pure sulphuric acid in 100g of the solution.

(i) What mass of the acid is present in 1 litre of prepared sulphuric acid? (1 millitre of prepared sulphuric acid weighs 1.84g.) (2 marks)

(ii) What is the molar concentration of this solution? (S = 32, H = 1, O = 16) (1 mark)

18. Study the diagram below that shows the preparation of ethane in the laboratory and answer the questions that follow:



(a) Name the reactants. (1 mark)

(b) Write the equation of the reaction between the reactants. (1 mark)

(c) At which maximum temperature are the reactants heated? (1 mark)

(d) Why is it possible to collect ethane over water? (1 mark)

(e) In this experiment, what is the use of:
(i) Concentrated potassium hydroxide? (1 mark)
(ii) The thermometer? (1 mark)

(f) Write the equation of the reaction in the tube containing KOH. (1 mark)

(g) If the empirical formula of compound W is C_2H_3O and its molecular mass is 258. Find the molecular formula of W.
(Atomic mass: H = 1, C = 12, O = 16) (3 marks)

19. In an experiment to titrate the solution of hydrochloric acid, 15.9g of pure anhydrous sodium carbonate (Na_2CO_3) was dissolved in distilled water to make 500cm³ of the solution. 20cm³ of this solution neutralized 15cm³ of HCl acid using methyl orange. (Atomic masses: H =1, Cl = 35.5, Na = 23, C = 12, O = 16)

(a) What was observed during the titration? (1 mark)

(b) Write the equation of the reaction during the titration. (1 mark)

(c) What was the role of methylorange in this experiment? (1 mark)

(d) Calculate the concentration of Na_2CO_3 in g/dm³. (1.5 marks)

(e) Calculate the morality of Na_2CO_3 solution. (1.5 marks)

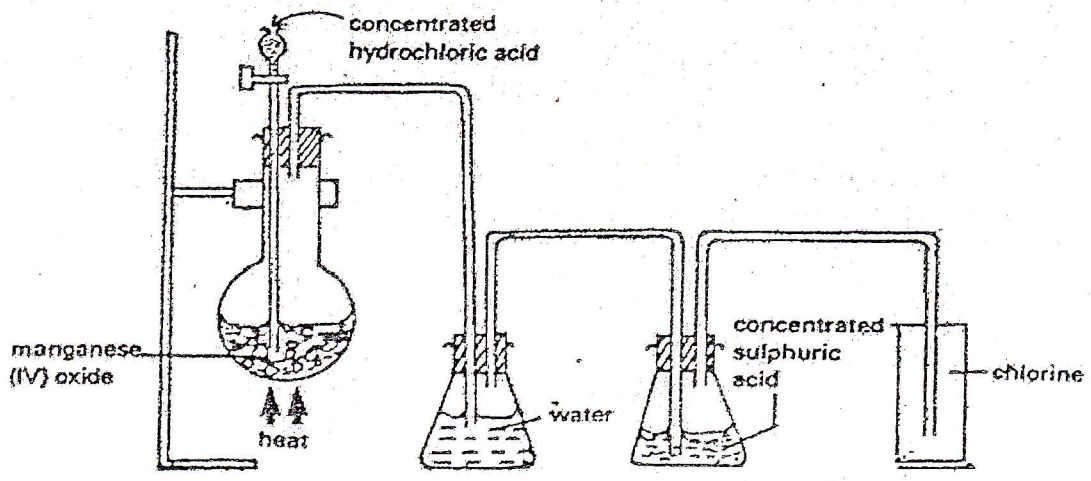
(f) Calculate the moles of Na_2CO_3 that reacted with HCl. (1 mark)

(g) Find the moles of HCl that reacted with Na_2CO_3. (1 mark) (1 mark)

(h) Calculate the morality of the solution of HCl. (1 mark)

(i) Find the concentration of hydrochloric acid in g/dm³. **(1.5 marks)**

20. Dry chlorine can be prepared by the reaction between manganese (IV) oxide with concentrated sulphuric acid. Below is a diagram of this preparation:



(a) Write the chemical equation of the reaction between manganese (IV) oxide and concentrated hydrochloric acid. **(1 mark)**

(b) What are the roles of water and concentrated sulphuric acid in this experiment? **(2 marks)**

(c) When chlorine reacts with iron:

(i) Why is iron (II) chloride not formed? **(1 mark)**

(ii) State the compound that is formed instead of iron (II) chloride? **(1 mark)**

(d) With the aid of ionic equation, state what would be observed if chlorine was bubbled through the solution of:

(i) Iron (II) sulphate **(2 marks)**

(ii) Potassium iodide **(2 marks)**

(e) Chlorine is a bleaching agent when in the presence of cold water. Write an equation for the reaction between chlorine and cold water. **(1 mark)**

SECTION C: ATTEMPT ONLY ONE QUESTION. (15 MARKS)

21. The figure below shows a part of the periodic table. The letter is not a correct symbol of the elements.

I	II	III	IV	V	VI	VII	VIII
J							
			G		E		
A						R	D
	X						

(a) Which of the elements are metals? **(2 marks)**

(b) Write the formula of the compounds formed between:

(i) X and R. **(1 mark)**

(ii) J and G. **(1 mark)**

(c) Which element is least reactive? Explain your answer. **(2 marks)**

(d) Which of the compounds (aqueous solution) formed between A and R, or between G and J would conduct electricity? Explain your answer. **(2 marks)**

(e) State which formula of the following: R_2, E_2, D_2, A_2 is written correctly. **(2 marks)**

(f) X is in period IV and group II of the periodic table. Give its electronic structure. (1 mark)

(g) State the type of bond that exists in the chloride of X and write the formula of the ion formed by X. (2 marks)

(h) The nitrate of X was strongly heated.

(i) State what was observed. (1 mark)

(ii) Write the equation of the reaction. (1 mark)

22. Substance A_2 reacts with B_2 to produce AB_3 according to the following equation (the letters A and B are not correct symbols of elements):

$$A_{2(g)} + 3B_{2(g)} \rightleftharpoons 2AB_{3(g)} + \text{heat}$$

(a) Is this reaction exothermic or endothermic? Explain. (2 marks)

The table below shows the percentage yield of AB_3 at various temperatures and pressure.

Temperature	Pressure (atmosphere)		
	10	200	1000
250	30%	75%	96%
500	1%	18%	60%
1000	0%	0.1%	60%

(b) Draw a graph showing the percentage yield of AB_3 at different pressures and 250°C. (%: x – axis, Pressure: y – axis) (6.5 marks)

(c) Using the graph, find the percentage yield of AB_3 at 700 atm. and 250°C. (2.5 marks)

(d) State:

(i) How the percentage yield of AB_3 varies with the temperature at constant pressure. (1 mark)

(ii) How the percentage yield of AB_3 varies with pressure at constant temperature. (1 mark)

(e) At which temperature and pressure is the production of AB_3 maximum? (2 marks)

END

CHEMISTRY I MARKING SCHEME, 2015

SECTION A:

1. a) X : 2, 8, 6

b) Z = 16

c) 16 protons

d) 18.

2. a) Group VIII or Group O.

b) Inert means non reactive or very stable. Or they don't lose or gain electrons.

c) Due to the fact that the element has got (2 electrons for He) 8 electrons on the outermost shell.

3. a) Fractional distillation

b) Chromatography

c) Filtration, decanting

d) Sublimation

4. a) i) A white precipitate was formed/ the solution turns milky or chalky or cloudy

ii) $K_2CO_{3(aq)} + Ca^{2+}_{(aq)} \longrightarrow Ca\,CO_{3(s)} + 2\,K^{+}_{(aq)}$

b) i) Effervescence occurred or a gas is evolved/produced or disappearance of a white precipitate or a hissing sound.

ii) $CaCO_{3(S)} + 2HCl_{(aq)} \longrightarrow CaCl_{2(aq)} + CO_2 + H_2O_{(L)}$

5. a) According to the equation:

1 mole of $H_2 \longrightarrow$ 24g of Mg

$2400cm^3$ or $24dm^3 \longrightarrow$ 24g of Mg

$720cm^3$ or $0.72dm^3 \longrightarrow \frac{24}{24000} \times 720g = 0.72g$ of Mg that reacted

Moles of Mg $= \frac{0.720g}{24gm/mol} = 0.03$ moles

b) To be sure that all the quantity of Magnesium was reacted

6. a) The molar mass of $Fe_2O_3 = (56 \times 2) + (16 \times 3) = 112 + 48 = 160g/mol$

b) Moles of Fe_2O_3 in 4.8g $= \frac{4.8}{160} = 0.03$ mol

Moles of oxygen in 4.8g of $Fe_2O_3 = 0.03 \times 3 = 0.09$mol.

Atoms of oxygen in 4.8g of $Fe_2O_3 = 0.09 \times 6.023 \times 10^{23} = 5.42 \times 10^{22}$

7. a) Reagent: Barium nitrate, $Ba(NO_3)$ with dilute nitric acid, HNO_3.

Observation: With SO_4^{2-}, a white precipitate insoluble in excess HNO_3/nitric acid is formed.

With CO_3^{2-}, a white precipitate which dissolves in excess nitric acid is formed. There is also effervescence .

b) Reagent: Sodium hydroxide (NaOH)

Observation with Fe^{2+}, a green precipitate insoluble in excess.

With Fe^{3+}, a reddish brown precipitate insoluble in excess NaOH is formed.

8. a) W is a solid, X is a gas, Y is a liquid, Z is a liquid, b) Y is water.	9. a) i) Sodium oxide ii) Sulfur dioxide iii) Aluminium oxide

b) Mass of oxygen = 14.2 – 6.2 = 8.0g

	W	O
Moles:	$\frac{6.2}{31} = 0.2$	$\frac{8}{16} = 0.5$
Mole ratio		
(Divide by the smallest)	$\frac{0.2}{0.2} = 1$	$\frac{0.5}{0.2} = 2.5$
Multiply by 2 on both sides to remove the decimal.	$1 \times 2 = 2$	$2.5 \times 2 = 5$

The empirical formula of the oxide is W_2O_5

10. a) Q is the anode, P is the cathode

b) i) Impure copper.
ii) Pure copper

c) Copper II sulphate solution

d) i) Anode: $Cu_{(S)} \longrightarrow Cu^{2+}_{(aq)} + 2\bar{e}$

ii) Cathode: $Cu^{2+}_{(aq)} + 2\bar{e} \longrightarrow Cu_{(S)}$

11. - $CH_3\ CH_2\ CH_2\ OH$ = n – butanol

- $CH_3\ CHOH\ CH_2\ CH_3$ = Butan – 2

- $CH_3 - CH - CHOH_2$ (with CH_3 branch) = Methyl. Propanol

- $CH_3 - C(CH_3) - OH$ (with CH_3 branch) = Methyl 2 - propan - 2

12. a) C, b) A, c) D, d) B, e) B + E

13. a) $Na_2CO_3.nH_2 \xrightarrow{heat} Na_2CO_3 + nH_2O$.

13. c) $Na_2CO_3.2H_2O$.

13. b) Mass of water = 14.2 – 10.6 = 3.6g

Molar mass of H_2O = (1× 2) + (16×1) = 18g/mol.

No. of moles = $\frac{mass}{molar\ mass} = \frac{3.6g}{18g/mol}$ = 0.2 mol

Molar mass of Na_2CO_3 = (23×2) + (12×1) + (16×3)
= 106g/mol.

Moles of Na_2CO_3 = $\frac{10.6g}{106g/mol}$ = 0.1 mol

$Na_2CO_3 : H_2O = 0.1 : 0.2 = 1 : 2$

n = 2

14. a) $CH_3COOH + CH_3CH_2OH \longrightarrow CH_3COO\ CH_2CH_3 + H_2O$.

b) $CH_3CH = CH_2 + Br_2 \longrightarrow CH_3\ CH\ Br.\ CH_2Br$

c) $CH_2 = CH_2 + HCl \longrightarrow CH_3\ CH_2Cl$

15. a) -Warm dilute Nitric acid in a beaker and add Lead(II) oxide to it until no more will dissolve.
- Then filter off excess Lead(II) oxide.
- The filtrate which is Lead (II) nitrate solution is heated to evaporate until it crystallizes
- The crystals are then removed and dried between filter paper.

b) $PbO_{(S)} + 2HNO_{3(aq)} \longrightarrow Pb(NO_3)_2 + H_2O$

SECTION B:

16. a) i) Copper (II) oxide or CuO.

ii) $CuCO_{3(S)} \xrightarrow{\Delta} CuO_{(S)} + CO_{2(g)}$

iii) Lime water or calcium hydroxide solution or $Ca(OH)_{2(aq)}$

Equation: $Ca(OH)_{2(aq)} + CO_{2(g)} \longrightarrow CaCO_{3(S)} + H_2O_{(L)}$

b) i) A blue solution was observed (the black solution disappeared to form a blue solution).

ii) $CuO_{(S)} + H_2SO_4 \longrightarrow CuSO_{4(aq)} + H_2O_{(L)}$

c) i) A pale blue precipitate insoluble in excess sodium hydroxide solution was formed.

ii) $Cu^{2+}_{(aq)} + 2HO^-_{(aq)} \longrightarrow Cu(OH)_{2(S)}$

17. a) A: S, B: O_2, C: SO_2, D: SO_3, E: V_2O_5, F: $H_2S_2O_7$

b) i) C: $S_{(S)} + O_{2(g)} \longrightarrow SO_{2(g)}$

ii) D: $2\,SO_{2(g)} + O_{2(g)} \longrightarrow 2\,SO_{3(g)}$

iii) F: $SO_{3(g)} + H_2SO_4 \longrightarrow H_2S_2O_7$

iv) G: $H_2O + H_2S_2O_7 \longrightarrow 2H_2SO_4$

c) i) 1 ml of solution $\longrightarrow$ 1.84g

1000ml of solution $\longrightarrow 1.84 \times 1000ml = 1840g$

Mass of H_2SO_4 in 1 litre of solution is 98% $= \frac{98 \times 1840}{100} = 1803.2g$

ii) Mm of $H_2SO_4 = 2 + 32 + (16 \times 4) = 98g/mol$

Morality of the solution $= \frac{1803.2}{98} = 18.4mol/L$

18. a) Ethanol and sulfuric acid

b) Equation: $CH_3\,CH_2\,OH \xrightarrow[170°-180°]{H_2SO_4} CH_2 = CH_2 + H_2O$

c) 170°C - 180°C.

d) Ethane is insoluble in water.

e) i) KOH reacts with CO_2 or SO_2 produced as an impurity

ii) The thermometer helps to maintain the temperature at 170°C.

f) $2KOH_{(aq)} + CO_{2(g)} \longrightarrow K_2CO_{3(S)} + H_2O$

g) $(C_2\,H_3O) \times n = 258$

$(24 + 3 + 16) \times n = 258$

$43 \times n = 258$

$n = \frac{258}{43} = 6$

Therefore, $(C_2H_3O)n = (C^2H^3O)_6 = C_{12}O_{18}O_6$

The molecular formular of W is $C_{12}H_{18}O_6$

19. a) Effervescence or a gas was given off.

b) $Na_2CO_{3(aq)} + 2HCl_{(aq)} \longrightarrow 2NaCl_{(aq)} + H_2O_{(L)} + CO_{2(g)}$

c) Methyl orange indicates the end of titration (the reaction) or it marks the end point.

d) $500cm^3$ of the solution of $Na_2CO_3 \longrightarrow$ 15.9g of pure Na_2CO_3

$1000cm^3$ of the solution of $Na_2CO_3 \longrightarrow \left[\frac{15.9 \times 1000}{500}\right]g = 31.8g/dm^3$

e) Mm of $Na_2CO_3 = (23 \times 2) + 12 + (16 \times 3) = 106g/mol$

Moles of Na_2CO_3 in dm^3 of the solution = (M)

$M = \frac{31.8}{106} = 0.3mol/dm^3.$

f) Moles of Na_2CO_3 that reacted with HCl: $\frac{0.3 \times 20}{1000} = 0.006$ moles

g) Moles of HCl that reacted with $Na_2CO_3 = 0.006 \times 2 = 0.012$ moles.

h) Morality of the solution of HCl = $\frac{0.012 \times 1000}{15} = 0.8\ mol/dm^3$

i) Mm of HCl = 1 + 35.5 = 36.5g/mol

Mass of HCl in dm^3 of the solution = $36 \times 0.8 = 29.2\ g/dm^3$

20. a) $MnO_2 + 4HCl \longrightarrow MnCl_{2(aq)} + 2\ H_2O_{(L)} + Cl_{2(g)}$

b) Water is used to remove hydrogen chloride gas, Conc H_2SO_4 is used to dry chlorine gas or remove water from chlorine gas.

c) i) Because it is immediately oxidized to iron (III) chloride.

ii) Iron (III) chloride.

d) i) Observation: the pale green solution turns brown or yellow.
Ionic equation: $Cl_{2(g)} + 2Fe^{2+}_{(aq)} \longrightarrow 2Cl^-_{(aq)} + 2Fe^{3+}_{(aq)}$

ii) Observation: the solution turns brown.
Ionic equation: $Cl_{2(g)} + 2I^-_{(aq)} \longrightarrow 2Cl^-_{(aq)} + I_{2(S)}$

e) $Cl_2 + H_2O \longrightarrow HCl_{(aq)} + HOCl.$

SECTION C:

21. a) A and X or Na and Ca.

b) i) XR_2 or $CaCl_2$

ii) J_4G or CH_4

c) Element D or Ar because it has full octet or because it has full shell with 8 electrons.

d) A and R because their aqueous solutions contain ions whereas that of G and J do not.

e) R_2 or E_2 / Cl_2 or O_2

f) 2, 8, 8, 2

g) Ionic bond. Ion is X^{2+} or Ca^{2+}

h) i) Reddish brown fumes are evolved/produced.

ii) $2 \times (NO_3)_{2(S)} \xrightarrow{\Delta} 2\times O_{(S)} + 4NO_{2(g)} + O_{2(g)}$

22. a) Exothermic reaction because it produces heat.

b) Teacher's guidance

c) See graph

d) i) The percentage yield of AB_3 (ammonia) decreases with increasing temperature at constant pressure.

ii) The percentage yield of AB_3 (ammonia) increases with increase in pressure at constant temperature.

e) Temperature of 250°C and pressure of 1000 atmosphere.

END