WAKISSHA JOINT MOCK EXAMINATIONS
MARKING GUIDE
Uganda Certificate of Education
UCE August 2019
CHEMISTRY 545/2

1. (a) (i) Paper chromatography ✓ Accept chromatography ✓ rej. wrong spelling
(ii) The different components in the mixture show different relative solubilities in the two solvents. ✓ Accept; Components have different rates of movement over the absorbent paper.

(b) (i) W ✓
(ii) Z ✓ 05½

(c) W bonds strong and hence it's carried for a longer distance. ✓ Accept; W is more soluble hence moves faster over the absorbent material

(d) Black ink / Blood / chlorophyl pigments ✓ ink

2. (a) (i) oxidation ✓
(ii) reduction ✓

(b) (i) $Zn_{(s)} \rightarrow Zn^{2+}_{(aq)} + 2e$ ✓ deny ½ – for wrong states
(ii) $2H^{+}_{(aq)} + 2e \rightarrow H_{2(g)}$ ✓ rej – for wrong symbols and unbalanced equations 04½

(c) $Zn_{(s)} + 2H^{+}_{(aq)} \rightarrow Zn^{2+}_{(aq)} + H_{2(g)}$ ✓✓

3. (a) (i) $2NaNO_{3(S)} \rightarrow^{heat} 2NaNO_{2(S)} + O_{2(g)}$ ✓✓
(ii) $2Pb(NO_3)_{2(S)} \rightarrow^{heat} 2PbO_{(S)} + 4NO_{2(g)} + O_{2(g)}$ ✓✓

(b) Molecular mass of $KClO_3$ $= 39 + 35.5 + 16 \times 3 = 122.5g$ ✓
Moles of $KClO_3$ USED $\frac{12.25}{122.5} = 0.1 moles$ ✓
$2\,KClO_{3(s)} \longrightarrow KCl_{(s)} + 3O_{2(g)}$
2 moles $KClO_3$ decompose to form 3 moles of oxygen
0.1 moles $KClO_3$ will form $\left(0.1 \times \frac{3}{2}\right)$ moles of Oxygen ✓
= 0.15 moles
1 mole a gas occupies 22.4 dm^3 at s.t.p ✓
0.15 moles of Oxygen will occupy $0.15 \times 22.4 = 3.36 dm^3$ ✓ rej $3.4 dm^3$ 05½

4. (a) (i) Nitrogen molecule consists of two atom that are joined by a strong triple covalent bond. ✓✓ which requires a lot of energy to break ✓

(b) (i) magnesium nitride ✓ (accept Mg_3N_2)
(ii) $3Mg_{(s)} + N_{2(g)} \rightarrow Mg_3N_{2(S)}$ ✓✓ 05

(c) Calcium ✓

5. (a) Elements/Compounds | Fe | S | O | H_2O

MOLES | $\frac{20.1}{56}$ | $\frac{11.5}{32}$ | $\frac{23.0}{16}$ | $\frac{45.3}{18}$

(Ignore the words) MOLE ~~RATE~~ RATIO | $\frac{0.3589}{0.3589}$ | $\frac{0.3593}{0.3593}$ | $\frac{1.4375}{0.3589}$ | $\frac{2.5166}{0.3589}$

1: 1 : 4 : 7

The empirical formula for M is, $FeSO_4.7H_2O$ deny without dot

(b) (i) The green crystals turn white, and a colourless condesate

(ii) $FeSO_4.7H_2O_{(s)} \rightarrow 7H_2O_{(g)} + FeSO_{4(s)}$

6. (a) (i) M-2,8,7 / 2:8:7
(ii) N- 2,8,8,1 / 2:8:8:1
(iii) Y^{2+}-2,8,8 / 2:8:8

(b) The ions of X can be formed by atom x gaining one electron

(c) Atoms X and M deny only one atom

7. (a) (i) Silvery beads of lead
(ii) $2PbO_{(s)} + C_{(s)} \rightarrow 2Pb_{(l)} + CO_{2(g)}$

(b) To prevent lead from being re oxidized by providing a protective coating

(c) Iron (III) oxide, Copper (II) oxide.

8. (a) SO_4^{2-} and Cl^- – Accept CO_3^{2-} – Accept names

(b) Acidified barium nitrate solution, Acidified barium chloride
Deny without acidified

(c) white precipitate formed with the sulphate and No observable change with the Cl^-

9. (a) (i) heating, the acid must be concentrated

(ii) $4HCl_{(aq)} + MnO_{2(s)} \longrightarrow MnCl_{2(aq)} + Cl_{2(g)} + 2H_2O_{(l)}$

(b) Potassium manganate (VII)
Deny Lead(IV) oxide

(c) By passing the gas through water to remove acid spray and then through concentrated sulphuric acid to dry.

10. (a) G - Alcohol / alkanol
H – Alkene
rej. hydrocarbon

(b) (i) The colour of bromine turns from red to colourless reject reddish brown

(ii) $C_2H_{4(g)} + Br_{2(l)} \rightarrow C_2H_4Br_2$ (l)

Accept structural formula

(c) (i) Fermentation

(ii) $C_6H_{12}O_{6(aq)} \xrightarrow{\text{zymase}} 2C_2H_6O_{(l)} + 2CO_{2(g)}$ (aq)

05½

SECTION B

11. (a) Electrovalent compounds contain ions while covalent compouds contain molecules 01

(b) (i) A hydrocarbon is a compound which contains carbon and hydrogen only. 01

deny without only.

(ii) $C_{(s)} + 2H_{2(g)} \rightarrow CH_{4(g)}$ 01½

(iii) CH_4 is a saturated hydrocarbon. 02

All the carbon – hydrogen bonds in methane are single bonds

(c) Mr of CH_4 = 12+4 = 16g

OR. Mr. of CH_4 is 12+4 = 16g.

Moles of CH_4 is $\frac{8.2}{16}$ = 0.512 moles

02½

8.2g of methane produces 446.3KJ of heat

0.512 moles of CH_4 produce 446.3 KJ of heat

1 mole of CH_4 produces $\left(\frac{446.3}{0.512} \times 1\right)$ = -870.8KJ

$\therefore$ 16g of methane produces $\frac{16 \times 446.3}{8\,2} = \frac{7140.8}{8.2} = -870.8$KJ/ mole

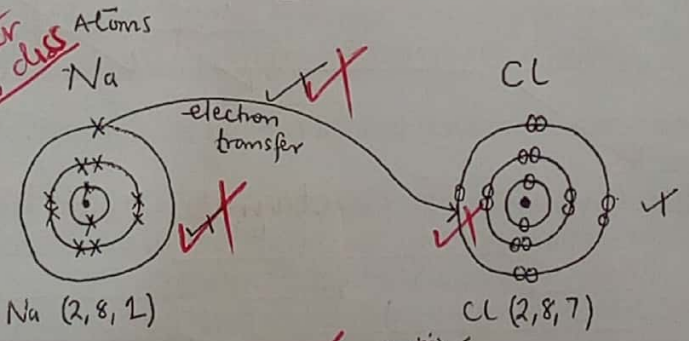
deny without negative and units

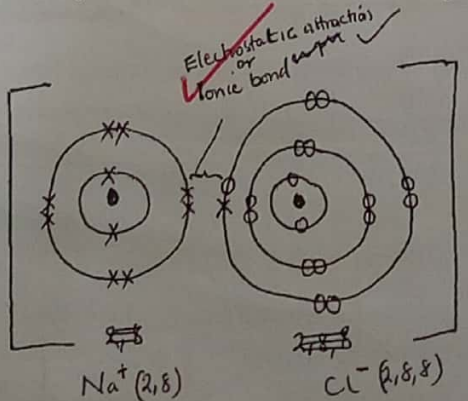
(i) Electrovalent compounds consist of ions of opposite **charges.** These are held together **by strong electrostatic** forces of attraction which hold the ions and restrict motion. The covalent compounds consist of **molecules** with **weak van der waals** forces between them. Hence molecules are free to move. 02

(ii) Electrovalent compounds have **electrostatic** forces between them. The **water molecules** are able to **overcome** them hence the ions become hydrated and the compound dissolves in water. 01½

OR

Electrovalent compounds are polar and water is polar. Hence they can dissolve in one another. Covalent cpds have different forces (non-polar). Hence they cannot dissolve in water.





03½

TOTAL = 15 MARKS

12. (a) Place sodium chloride in a flat bottomed flask fitted with a delivery tube. Add concentrated Sulphuric Acid by means of a thistle funnel, the gas is given off according to the equation

$NaCl_{(s)} + H_2SO_{4(l)} \longrightarrow NaHSO_{4(s)} + HCl_{(g)}$

Pass the gas through concentrated sulphuric acid to dry

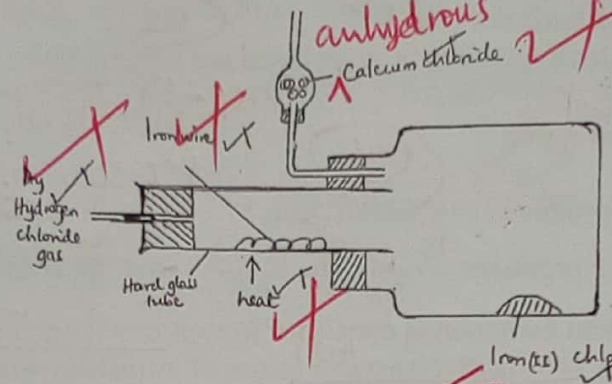
Collect the gas by downward delivery.

04

(b) Hydrogen chloride gas exists in molecular form while in methyl benzene, but when dissolved in water ions are formed. The H^+ ions produced combine with the CO_3^{2-} ions to evolve carbon dioxide. $2H^+_{(aq)} + CO^{2-}_{3(s)} \rightarrow CO_{2(g)} + H_2O_{(l)}$

03

(c)



03

(d) (i) bubbles of a colourless gas 01

(ii) $4OH^-_{(aq)} \rightarrow 2H_2O_{(l)} + O_{2(g)} + 4e^-$ 01½

(e) (i) $2Cl^-_{(aq)} \rightarrow Cl_{2(g)} + 2e$ 01½

(ii) Increasing the concentration increase the chance for the chloride Cl^- to be discharged in preference to OH^- 01

TOTAL = 15MKS

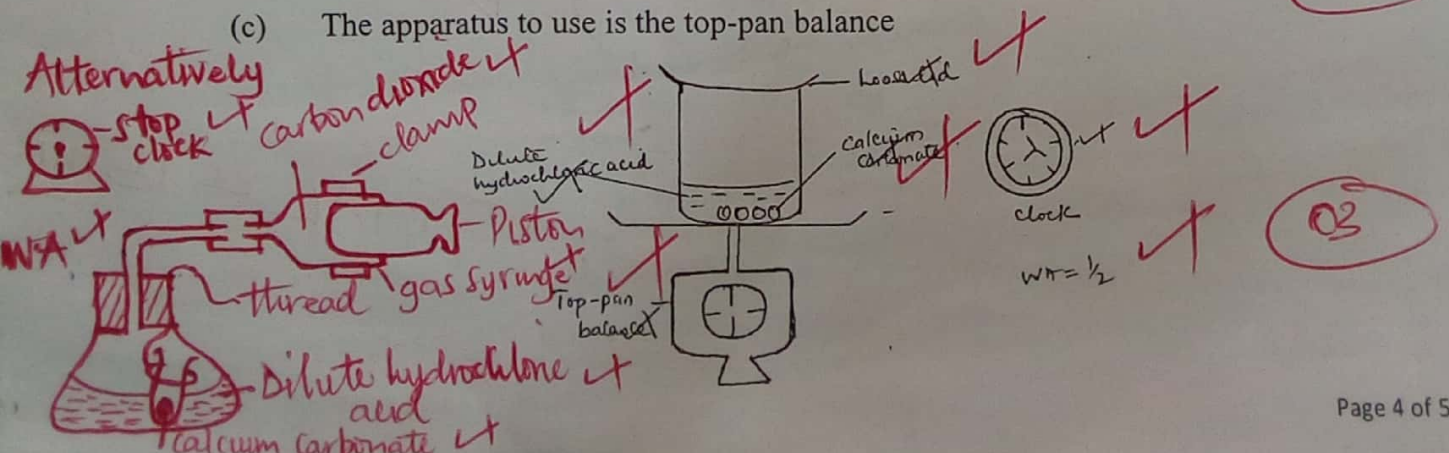
13. (a) The amount of products formed per unit time/amount of reactants used up per unit time. 01

OR Amount of reaction per unit time, Any correct definition

(b) (i) Grinding increases the surface area of the reactants increasing the level of contact between particles increases the chance of collision. As the number of effective collisions increases the rate of reaction also increases. 02½

(ii) Increasing the concentration increases the number of reacting particles Per unit volume. This in turn increases the chances of particles colliding with each other. Once the number of colliding particles increases, the rate of reaction also increases. 02½

(c) The apparatus to use is the top-pan balance



(d) (i) $2H^+_{(aq)} + CO^{2-}_{3(s)} \rightarrow CO_{2(g)} + H_2O_{(l)}$

(ii) Mr of $CaCO_3 = 40+12+48 = 100g$

Moles of $CaCO_3$ Used $\frac{10.2}{100} = 0.102 moles$

1mole of calcium carbonate produces 1mole of CO_2gas

$\therefore$ 0.102moles of $CaCO_3$produces $(0.102 \times 22.4dm^3)$ of CO_2

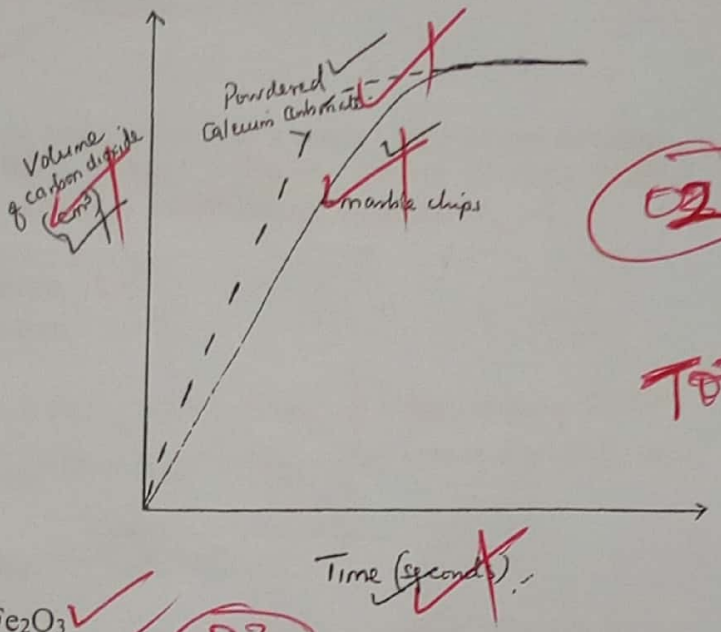
$= 2.28dm^3$ of CO_2

Alternatively;
MM of $CaCO_3$ = 100g
100g of $CaCO_3$ produce $22.4dm^3$ of CO_2
10.2g of " " $\left(\frac{22.4}{100} \times 10.2\right) dm^3$ of CO_2
$= 2.3 dm^3$ of CO_2

02½

(e) (i)

$2.3 dm^3$ of CO_2 Answer to 1 dp



02

TOTAL = 15MKS

14. (a) Haematite Fe_2O_3
Magnetite Fe_3O_4

03

(b) The process of extraction goes on in three stages

(i) Formation of carbon monoxide; coke at the base burns in hot air blast to form carbon dioxide. This is then reduced by excess carbon monoxide

The roasted ore, coke and limestone are fed from above the furnace and a hot air blast from the bottom

coke to

$C_{(S)} + O_{2(g)} \rightarrow CO_{2(g)}$

$CO_{2(g)} + C_{(S)} \rightarrow 2CO_{(g)}$

(ii) Reduction of iron (III) oxide, the carbon monoxide rise up the furnace and reduces the oxide

$Fe_2O_{3(S)} + 3CO_{(g)} \rightarrow 2Fe_{(l)} + 3CO_{2(g)}$ Accept ; $\rightleftharpoons$

(iii) Formation of the slag, limestone decomposes into quicklime and carbon dioxide.

$CaCO_{3(s)} \rightarrow CaO_{(S)} + CO_{2(g)}$

the calcium oxide then combines with silicon dioxide to form aslag

$CaO_{(S)} + SiO_{2(S)} \rightarrow CaSiO_{3(l)}$

08

(c) (i) $3Fe_{(s)} + 4H_2O_{g)} \rightarrow Fe_3O_{4(S)} + 4H_{2(g)}$ Accept $\rightleftharpoons$

01½

(ii) by lowering a glowing splint into a gas jar full of hydrogen a pop sound is Heard.

burning

01

(d) steel, carbon

01½

END

TOTAL = 15MKS