

FORM FOUR CLUSTER KCSE MODEL9

CHEMISTRY PAPER 1 ANSWERS

1.
 - i) Sulphur ✓½
 - ii) $S_{(s)} + O_{2(g)} \longrightarrow SO_{2(g)}$ ✓½
 B.B+S.S-award fully
 B.B-S.S-penalize½ mark
 S.S. B.B- penalize fully
 - iii) Transition temperature ✓½
2.
 - a) Atoms with the same atomic number but having different mass numbers/number of neutrons.
 - b)
$$= \frac{(92.2 \times 28) + (4.7 \times 29) + (3.1 \times 30)}{92.2 + 4.7 + 3.1} \checkmark \frac{1}{2}$$

$$= \frac{2581.6 + 136.3 + 93.0}{100} \checkmark \frac{1}{2}$$

$$= \frac{2810.9}{100} = 28.109 \checkmark \frac{1}{2}$$
 - c) Period 3 ✓ Group IV ✓ (mark tied)
3.
 - a) Nitrogen ✓½ and Hydrogen ✓½ (Reject formula)
 - b) Nitrogen ✓½ and water ✓½
 - c) Nitrogen (II) ✓½ and water ✓½
4.
 - a)
 - A -Anode ✓½
 - B -Cathode ✓½
 - b)
 - i) A-Oxygen ✓½
 B-Hydrogen ✓½
 - ii) It relights/rekindles a glowing splint. ✓1
5.
 - a) Charcoal which has been heated to remove any absorbed gases. ✓1
 - b) Colourless ✓1
 - c) Activated charcoal absorbs the dye in the litmus leaving a colourless solution ✓1
6.
 - a) $2H_{2(g)} + O_{2(g)} \rightarrow 2H_2O_{(g)}$ ✓✓1
 B.B+S.S – award fully
 B.B-S.S- penalize ½mark
 S.S B.B – penalize fully
 - b) $80\text{cm}^3 - 40\text{cm}^3 = 40\text{cm}^3$ ✓1
therefore oxygen was in excess ✓½
By $(60-40)\text{cm}^3$
 $=20\text{cm}^3$ ✓½
- a) -Red brown fumes ✓1
 The blue solid turns to black ✓1
 - b) Oxygen/O_{2(g)} ✓1 (accept name or correct formula)

8.

$$\begin{aligned}\text{Consider } 1 \text{ cm}^3 \text{ of acid} &= 1 \times 1.42 \text{ g} \\ &= 1.42 \text{ g}\end{aligned}$$

$$\begin{aligned}\text{Actual mass of acid in } 1 \text{ cm}^3 &= \frac{68}{100} \times 1.42 \\ &= 0.9656 \text{ g}\end{aligned}$$

$$\text{Molar mass of } \text{HNO}_3 = 1 + 14 + (16 \times 3) = 63 \text{ g}$$

$$\text{Moles of acid in } 1 \text{ cm}^3 = \frac{0.9656}{63} = 0.01533 \text{ moles}$$

If 1 cm³ contain 0.01533 moles

$$\begin{aligned}1000 \text{ cm}^3 \text{ contain } &\frac{1000}{1} \times 0.01533 \text{ moles} \\ &= 15.33 \text{ moles}\end{aligned}$$

Therefore Concentration of acid = 15.33 moles/litre (or 15.33m)

9. a) Sublimation ✓1
b) Fractional distillation. ✓1
c) Use of separating funnel. ✓1
10. a) i) U ✓½
ii) V ✓½
iii) W ✓½
iv) Y ✓½
b) W and X ✓1 (mark is tied)
11. a) Iron II sulphide ✓1
b) Hydrogen sulphide is fairly soluble in cold water but insoluble in warm water. ✓1
c) Black precipitation is formed. ✓1
12. a) i) C ✓½
ii) A ✓½
b) It lowers the activation energy. ✓1
c) Exothermic reaction. ✓1
13. a) Aluminium, Zinc, Lead (Any two award 1 mark)
b) Nitrogen, Sulphur, Carbon Phosphorus (Any two award 1 mark)
c) Sodium, Magnesium, Potassium, Calcium (Any two award 1 mark) Reject chemical symbol

14. a) Is the decomposition of a compound in molten or aqueous solution form by passage of an electric current through it. $\sqrt{1}$

b) -Extraction of reactive metals e.g. Sodium, Magnesium and aluminium.

-Electroplating.

-Purification or refining of metals such as copper.

-Manufacture of sodium hydroxide, chloride and hydrogen.

-Anodising of aluminium. (Any 2 award 2 marks 1 mark each)

15. To ensure that all the copper II ions are displaced. $\sqrt{1}$

b) Moles of $\text{Cu}^{2+} = \frac{100}{100} \times 0.5 = 0.05 \text{ mol}$ $\sqrt{1/2}$

$\Delta H \text{ for the rxn} = 100 \times 4.2 \times 6 = 2520 \text{ J}$

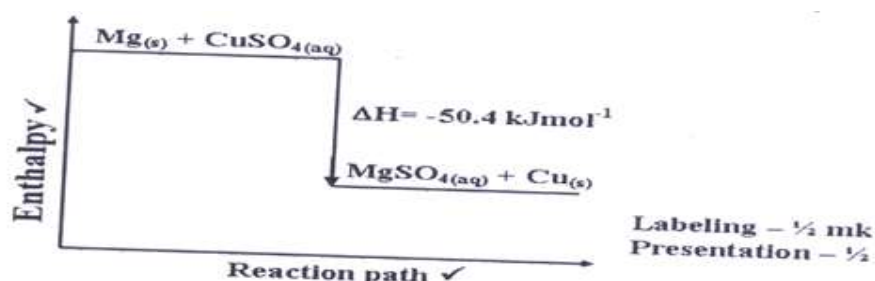
If 0.05 mols give 2520 J $\sqrt{1/2}$

1 mole will give $\frac{1 \times 2520}{0.05} = 50,400 \text{ J}$
 $= 50.4 \text{ kJ}$

$\therefore$ Molar heat of displacement = $-50.4 \text{ kJ mol}^{-1}$ $\sqrt{1/2}$

Penalize $\frac{1}{2}$ if no sign for ΔH / units / if K is small letter to a maximum of $\frac{1}{2}$

16.

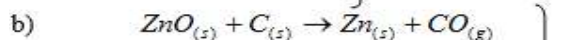


a) -Zinc blende $\sqrt{1/2}$

-Calamine $\sqrt{1/2}$

Penalize fully if not balanced

Penalize $\frac{1}{2}$ if wrong s.s. but well balanced.



OR



(Award 1 mark for any 1 above)

Penalize fully if not balanced

Penalize $\frac{1}{2}$ if wrong s.s. but well balanced

c) -Galvanizing iron.

-As an electrode in dry cells.

-Making brass (Cu and Zn alloy)

-Making German silver (Cu, Zn and Ni alloy)

-In extraction of Silver and Gold. (For any 1 above award 1 mark)

17.

- a) i) Halogens ✓ 1
 ii) Alkaline earth metals ✓
- b) -Sodium chloride is used as a preservative for meat and fish.
 -Sodium chloride is used as a food additive.
 -Sodium carbonate is used in water softening.
 -Sodium nitrate is used as a fertilizer.
 -Potassium nitrate is used in explosives. (Any 1 above, award 1 mark)
18. a) i) $Pb_{(s)} \rightarrow Pb^{2+}_{(aq)} + 2e^-$ ✓1
 ii) $Cu^{2+}_{(aq)} + 2e^- \rightarrow Cu_{(s)}$ ✓1
- b) e.m.f = $+0.34 - (-0.13)V$
 $= +0.34 + 0.13V$
 $= +0.47V$
19. a) Protons = $6\sqrt{1/2}$
 Neutrons = $14 - 6 = 8\sqrt{1/2}$
- b) $\frac{1}{32} = \frac{1}{2} 5 \rightarrow$ Five half lives ✓1
 $\therefore \text{Time} = 5 \times 5600 \text{ yrs}$ ✓ $1/2$
 $= 28,000 \text{ yrs}$ ✓ $1/2$
20. a) A large or long chain molecule formed by combining many small molecules in a regular repeating pattern. ✓1
- b) -Cellulose
 -Proteins
 -Starch
 -Fats/Oils
 -Natural rubber. (Any 2 above award 1 mark)
21. Molar mass of HCl = $1 + 35.5 = 36.5g$ ✓
~~Gas~~ ✓ $1/2$

$$\text{Molar mass of } CO_2 = 12 + (16 \times 2) = 44g \rightarrow \text{Gas } 2 \sqrt{1/2}$$

$$\frac{t_1}{t_2} = \sqrt{\frac{36.5}{44}} = \frac{t_1}{200} \sqrt{1/2}$$

$$= t_1 = 200 \times \sqrt{\frac{36.5}{44}} \sqrt{1/2}$$

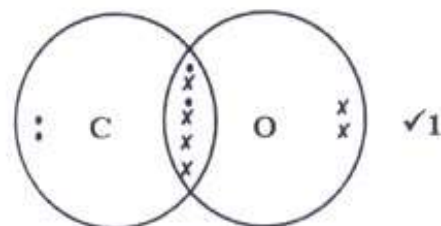
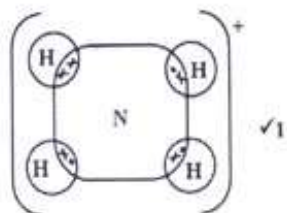
$$= 200 \times 0.9108 \sqrt{1/2}$$

$$= 182.16 \text{ sec.} \sqrt{1/2}$$

$$\therefore \text{HCl will take } 182.16 \text{ seconds}$$

22.

a)



b) Giant ionic structure ✓1

23. 23.

	Al_2O_3	H_2O
Mass	20.6g	7.2g ✓ $\frac{1}{2}$
Moles	$\frac{20.6}{102} = 0.202$	$\frac{7.2}{18} = 0.4$ ✓1
Mole ratio	$\frac{0.202}{0.202} = 1 :$	$\frac{0.4}{0.202} = 2$ ✓1
	$\therefore n = 2 \frac{1}{2}$	

24. i) K ✓1
 ii) J ✓1
 iii) L ✓1

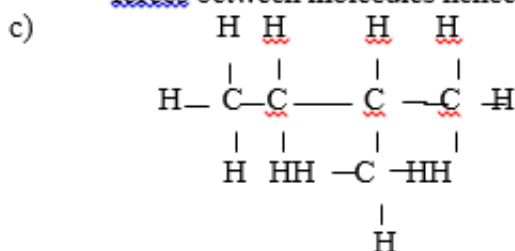
25. a) i) Concentrated hydrochloric acid. ✓1
 ii) Concentrated sulphuric VI acid ✓1
 b) It is denser than air. ✓1

26. a) Non-luminous flame ✓1

b) -It does not produce soot ✓1

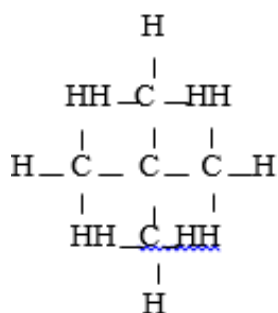
-It is hotter (Any 1 of above, award 1 mark)

27. a) Is a family of organic compounds in which successive members differ in composition by a constant factor. ✓1
 b) Increase in molecular mass of members leads to increase in strength of vander waals forces between molecules hence the physical state changes from gas to liquid. ✓1



$\sqrt{\frac{1}{2}}$

2- Methybutane $\sqrt{\frac{1}{2}}$



$\sqrt{\frac{1}{2}}$

2,2-dimethyl propane