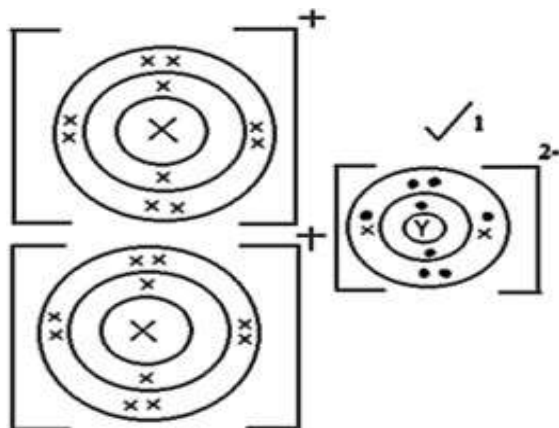


FORM FOUR CLUSTER KCSE MODEL 1

CHEMISTRY PAPER 1 ANSWER

1. (a) X_2Y ✓/1

(b)



NB: Na may be used in place of x for full credit.

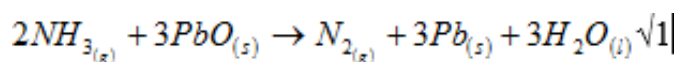
2. (a) Heating. ✓/1

(b) chlorate Sodium $NaClO_3$ //3 ✓/1

(c) They turn white ✓/½ due to bleaching effect of NaOCl or

They are bleached since NaOCl is bleaching agent.

3.



(b) Mole ratio

$$NH_3 : PbO = 2 : 3$$

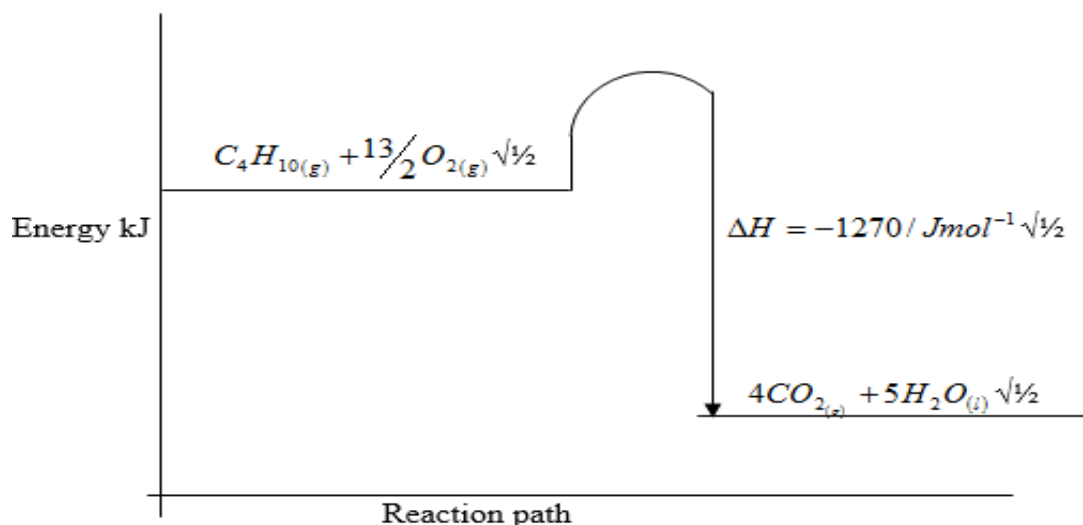
$$RFM \text{ of } PbO = 223 \quad \checkmark/½$$

$$\text{Moles of } PbO = \frac{30}{223} = 0.1345 \quad \checkmark/½$$

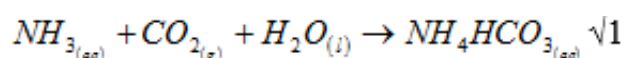
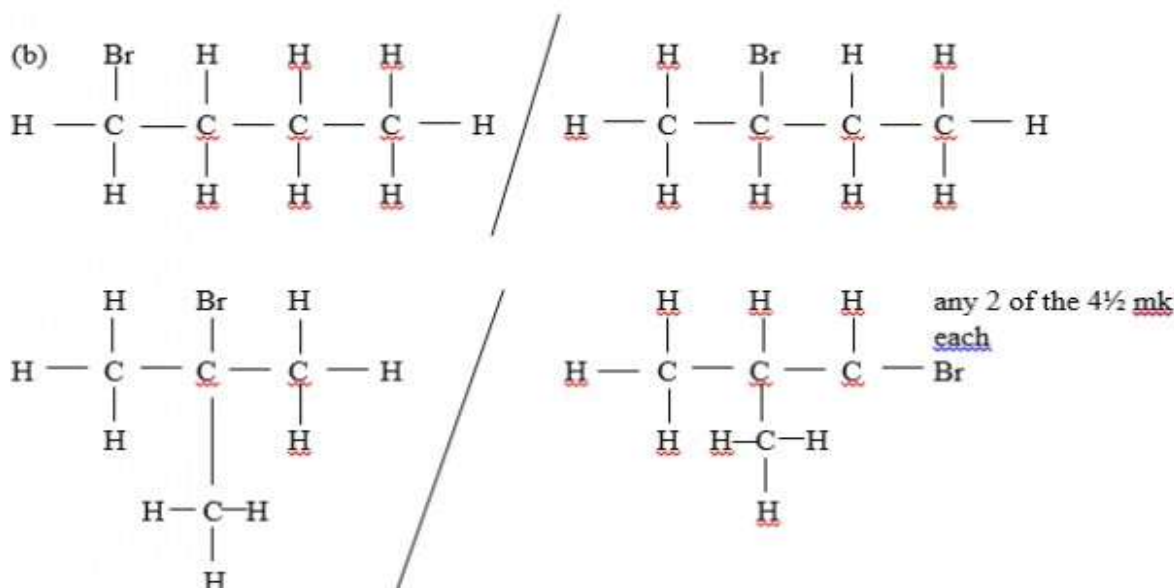
$$\text{Moles of } NH_3 = \frac{0.1345}{3} \times 2 = 0.08967 \quad \checkmark/½$$

$$\text{Volume of } NH_3 = 0.08967 \times 24 = 2.152 dm^3 \quad \checkmark/½$$

4. (a)



(b)

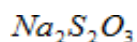


5. (a) $NaCl_{(aq)} + NH_4HCO_3_{(aq)} \rightarrow NH_4Cl_{(aq)} + NaHCO_3_{(s)}$ (Any after possible collect equation)

(b) Filtration. ✓✓

6. (a) To lower the melting point of NaCl about 8000 C //this is economical because it lowers on electricity used in heating. ✓1
- b) Calcium has a higher melting point compared to sodium therefore during cooling calcium crystallizes first leaving sodium which is tapped. ✓1

7. (a) (i) Deliquescence. ✓1
 (ii) Efflorescence. ✓1
 (b)



$$(+1 \times 2) + 2x + (-2 \times 3) = 0 \quad \checkmark \frac{1}{2}$$

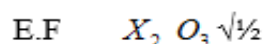
$$2 + 2x - 6 = 0$$

$$2x - 4 = 0 \quad \checkmark \frac{1}{2}$$

$$x = +2$$

8.
 Mass of metal $5.272 - 5.160 = 0.112 \text{ g} \quad \checkmark \frac{1}{2}$
 Mass of oxygen $5.320 - 5.272 = 0.048 \text{ g} \quad \checkmark \frac{1}{2}$

	X	O
Composition by mass	0.112	0.048
Moles	$\frac{0.112}{56}$	$\frac{0.048}{16} \checkmark \frac{1}{2}$
	0.002	$0.003 \checkmark \frac{1}{2}$
Divide by the smallest	$\frac{0.002}{0.002}$	$\frac{0.003}{0.002} \checkmark \frac{1}{2}$
	1x2	$\frac{3}{2} \times 2$
	2	3



9. (i) The pigments have different solubility rates/adsorption/stickiness. ✓1
 (ii) Cut out the part of filter paper with pigment D ✓1.
 Put the cut piece in an organic ✓1 solvent to dissolve the pigment.
 Evaporate ✓1 to get the pigment.
 10. (a) A ✓1

(b) Covalent: $\sqrt{1/2}$ It involves sharing of electrons.

Both elements are non-metals.

(c) - Alkaline earth metal $\sqrt{1}$

-Reject alkali earth metals.

-Reject group II elements

11. (a) Ethanol. $\sqrt{1/2}$ few drops of conc $\sqrt{1/2}$ 4 2SOH /Heat.

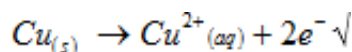
(b) Sodium propoxide $\sqrt{1/2}$ and Hydrogen gas $\sqrt{1/2}$

(c) Addition/bromination/hydrogen gas $\sqrt{1}$

12. (a) The intensity of the white colour of the suspension decreases//the mixture becomes more colourless. $\sqrt{1}$ The concentrated hydrochloric acid dissolves $\text{BiOCl}_{(s)}$ to give a colourless solution//addition of the acid increases the chloride ions concentration and redissolves the ppt. The equilibrium will shift from right to left to remove excess HCl and therefore backward reaction occurs.

(b) Dynamic equilibrium = The rate of forward reaction is equal to the rate of backward reaction. $\sqrt{1}$

13. . (a)



(b) $Q = 1 \text{ t}$

$$= 0.3 \times 6 \times 60 \times 60 \sqrt{1/2}$$

$$= 6,480C \sqrt{1/2}$$

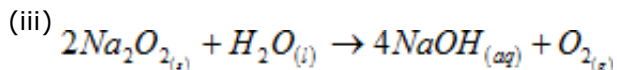
$$2 \times 9,6500C = 63.5$$

$$6,480C = ? \quad \sqrt{\sqrt{1/2} \sqrt{1/2}}$$

$$\frac{6,480 \times 63.5}{2 \times 96,500} = 2.132g$$

14. (i) Q- Sodium peroxide/ 2 2ONa

(ii) CO₂ $\sqrt{1/2}$ formed by burning candle slightly dissolves in water forming an acidic solution. $\sqrt{1/2}$



15.

$$Q = MC\Delta T$$

$$= \frac{75}{100} \times 4.2 \times 12 \sqrt{\frac{1}{2}}$$

$$= -3.78 \text{ kJ} \sqrt{\frac{1}{2}}$$

$$\begin{aligned} \text{Moles of } CuCl_2 &= \frac{0.15 \times 75}{1000} \sqrt{\frac{1}{2}} \\ &= 0.01125 \text{ moles} \sqrt{\frac{1}{2}} \end{aligned}$$

$$\begin{aligned} \therefore \frac{0.0125 \text{ moles}}{1} &= \frac{-3.78 \text{ kJ}}{0.0125} \sqrt{\frac{1}{2} \times \frac{1}{2}} \\ &= -336 \text{ kJ/mol} \end{aligned}$$

16. (a) L has few delocalized electrons // Aluminium has 3 valence electrons while L has only two.

(b) Not corroded easily // low density // light.

(c) Amphoteric oxides. $\sqrt{\frac{1}{2}}$

e.g.

Zinc oxide. $\sqrt{\frac{1}{2}}$
// Lead (II) oxide

17. (i) $M \sqrt{\frac{1}{2}}$

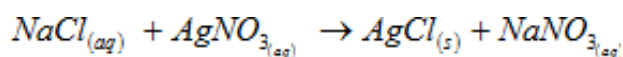
(ii) $P \sqrt{\frac{1}{2}}$ it's a strong alkali. $\sqrt{1}$

18. (a) Calcium $\sqrt{1}$ oxide // CaO

(b) White/yellow solid changes to grey // colourless liquid forms on the collar parts of the combustion tube.

(c) Zinc oxide is reduced $\sqrt{1}$ to zinc metal // Ammonia is oxidized to nitrogen and water.

19.



$$RFM \text{ of } AgCl = 143.5 \sqrt{\frac{1}{2}}$$

$$\text{moles of } AgCl = \frac{2.1525}{143.5} = \underline{\underline{0.015 \text{ moles}}}$$

RFM of NaCl=58.5✓½

Mass of NaCl reacted=58.5 x0.015=0.8775 g✓½

Mass of water =2.63 g-0.8775 g=1.7525 g✓½

$$\text{Solubility of NaCl} = \frac{0.8775}{1.7525} \times 100 = 50.07 \text{ g / 100 g } H_2O \checkmark \frac{1}{2}$$

20. -Hydrogen burns to produce steam which is non-pollutant.✓1

-Hydrogen has a high energy content//very small amount produces a lot of heat energy.✓1

21. Red glow, bright white flame and a white powder formed.✓1

22. (a) A-Sulphur✓½

B-Air.✓½

(b) Vanadium (V) oxide. ✓1 (V_2O_5)

-It is not easily poisoned

(c) To prevent the possible poisoning of the catalyst//to prevent the catalyst from being rendered ineffective.✓1 23

23. (a) To prevent//stop the copper powder from being blown into the syringes.✓1

(b) Magnesium is more reactive✓than copper.

The reaction is highly exothermic and hence magnesium reacts with both oxygen and nitrogen.✓gases in the air

24. (i) $M=208+8=216$ ✓½

$N=82+4-2=84$ ✓½

(ii)

$$80 \xrightarrow{t \frac{1}{2}} 40 \xrightarrow{t \frac{1}{2}} 20 \xrightarrow{t \frac{1}{2}} 10 \xrightarrow{t \frac{1}{2}} 5$$

$$= 4t \frac{1}{2} = 5 \checkmark \frac{1}{2}$$

$$t \frac{1}{2} = \frac{5}{4} = 1 \frac{1}{4} \text{ yrs } \checkmark \frac{1}{2}$$

25.

$$160 \text{ cm}^2 \rightarrow 4 \text{ seconds}$$

$$150 \text{ cm}^3 \Rightarrow \frac{150 \times 4}{160} \sqrt[1/2]{} = 3.75 \text{ s}$$

$$\frac{3.75}{8} = \frac{\sqrt{32}}{\sqrt{M_x}} \sqrt[1/2]{}$$

$$\sqrt{M_x} = \frac{8 \times \sqrt{32}}{3.75} \sqrt[1/2]{}$$

$$M_x = \left(\frac{8 \times \sqrt{32}}{3.75} \right)^2 \sqrt[1/2]{}$$

$$= 145.6 \sqrt[1/2]{}$$

26. (i) Froth flotation.✓

(ii) Zinc is more reactive than iron.✓ Hence it is oxidized in preference to iron.

(iii) Oil and air cause zinc ore to float and impurities sink.

27. (i)

$$\Delta H_{sol} = 2493 + -1891 + (-840 \times 2)$$

$$= 602 - 1680$$

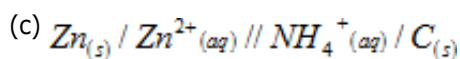
$$= -1078 \text{ kJ mol}^{-1}$$

(ii) $\text{P}\sqrt[1/2]{}$ and $\text{N}\sqrt[1/2]{}$

28. (a) To oxidize the hydrogen produced $\sqrt[1/2]{}$ to water and therefore prevent polarization: carbon $\sqrt[1/2]{}$ increases the surface area for the reaction.

$$(b) +0.74 - -0.76 = +1.5V.$$

Note: + Sign MUST appear on the answer.



29. .(a) A $\rightarrow$ giant metallic structure ; reject metallic structure. $\sqrt[1/2]{}$

C $\rightarrow$ Giant ionic structure. $\sqrt[1/2]{}$

(b) In solid state ions are fixed but in molten state ions are mobile. $\sqrt[1/2]{}$