FORM FOUR CLUSTER KCSE MODEL 2

CHEMISTRY PAPER 1 ANSWER

1. (a) Radioactive isotopes that undergo radioactivity process.√

   (b) $^{211}_{83}Y$ Atomic no 83 √ (1)

   Mass no 211. √ (1)

2. (a) MnO_4 Oxidation no of decreases from +7 to +2 (1) √(1)

   (b) Green solution turns brown. √ (1)

3. - Add water to the two salts in separate test tubes to form solutions. √(1)

   -To each add $BaCl_2$ / $Ba(No_3)_2$ / $Pb(NO_3)_2$ followed by dilute nitric acid. √ (1)

   - Na_2SO_3 forms white ppt that dissolves in HNO_3 .√(½)

   - Na_2SO_4 forms white ppt that does not dissolve in HNO_3 .√(½)

4. (a) A√ (1) reaction is faster while it has more H^+ per given time/it is a stronger acid. √ (1)

   (b) The number of moles of H^+ is equal to an equal volume √ of gas will be produced. √ (1)

5. (i) 3- methylpent-2 – ene. √(1)

   (ii) Pentane. √ (1)

6. (i) The rate of diffusion of a gas is inversely proportional to the square root of its density at similar conditions of temperature and pressure.

   (ii) $\frac{TN_2}{TCO_2} = \frac{\sqrt{M_{N2}}}{\sqrt{M_{CO_2}}}$

   $\frac{30}{TCO_2} = \frac{\sqrt{28}}{\sqrt{44}}$ √ (1)

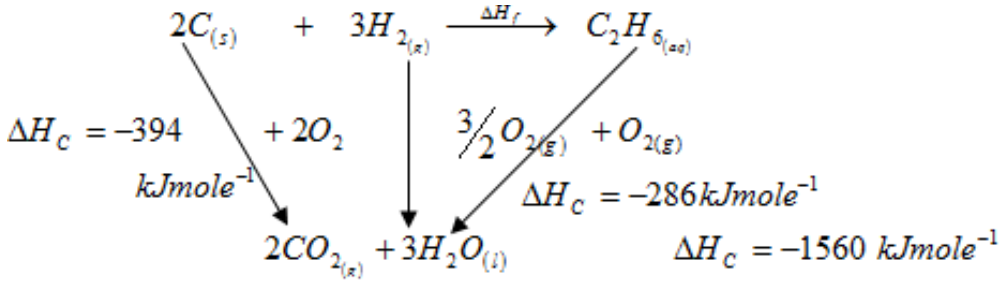
   $TCO_2 = \frac{\sqrt{44}}{\sqrt{28}} \times 30 = 37.61\ Min$ √ (1)

   $\therefore CO_2$ takes 37.61Minutes.

7. (a) Allotropy is the existence of an element in different forms in the same physical state. √ (1)

   (b) - Melts at 1130 C/ 1140 C to form an amber liquid. (Pale yellow) √ (1) which flows easily.
   - On further heating the liquid becomes dark√ (2) and viscous.
   - On further heating it becomes less viscous and finally boils at 4440 C to form a yellow vapour. √

8.



$$\Delta H_f(C_2H_6) = \Delta H_{C_{(C)}} + \Delta H_{(H_2)} - \Delta H_{C(C_2H_6)} \quad \surd(1)$$
$$= 2-(-394)+3(-286)+1560$$
$$= -788-858+1560$$
$$= -1646+1560 \quad \surd(1)$$
$$= -86\ kJ\ mole^{-1}$$

9.
- Add excess ZnO to $HCl / HNO_3 / H_2SO_4$ √ to obtain $ZnCl_2 / Zn(NO_3)_2 / ZnSO_{4_{(aq)}}$ (½)
- Filter to remove unreacted ZnO .√(½)
- To the filtrate add $Na_2CO_3 / K_2CO_{3_{(aq)}}$ to obtain $ZnCO_3$ as precipitate. √(1)
- Filter to get $ZnCO_3$ as residue. (½)

10. (a)(i) Liquid P is water (½)√

(ii)Liquid Q is conc. sulphuric acid√ (½)

(b) Anhydrous calcium chloride/ calcium oxide/ silica gel √(1)

(c) $2\ Na_2O_{2_{(s)}} + 2H_2O_{(l)} \rightarrow 4NaOH_{(aq)} + O_{2_{(l)}}$ √(1)

11. (a) B , A , C √ (1)

(b) C (1) √

(c) K/Na √ (1)

12. Mass of carbon used 1.9053 -1.804
=0.1013 g√ (1)

$12.0g\ C = 6.0\times10^{23}\ atoms$

$0.1013g\ C = \frac{0.1013\times6.0\times10^{23}}{12.0}$ √(1)

$= 0.0507\times10^{23}$

$= 5.07\times10^{21}\ atoms$ √(1)

13. (i) Alkenes √

(ii)Increase in relative molecular mass of the hydrocarbons increases the boiling point. √ (1)

Reason: The strength of the intermolecular forces (Van der waal's forces) increases with increase in molecular mass.

14. (a) $ZnCO_{(3)}$ (1)

(b) $Zn(NO_3)_{2(aq)} + 2NaOH_{(aq)} \rightarrow Zn(OH)_{2(s)} + 2NaNO_{3(aq)}$ √ (1)

(c) It is amphoteric. √ (1)

15. (a) Anode – Oxygen and water √(½)

Cathode – Hydrogen gas √(½)

(b) The solution becomes more concentrated √ (½) because OH^{-1} and H^{+} that make up water are the ones discharged. √ (½)

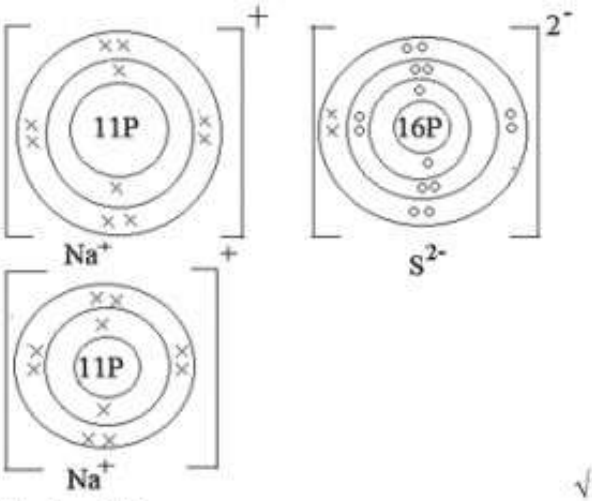
Sodium dissolves in the solution. (1)

16. (a) $CaCO_{3(s)} + H_2SO_{4(aq)} \rightarrow CaSO_{4(s)} + H_2O_{(l)} + CO_{2(g)}$ √(1)

(ii) Insoluble $CaSO_4$ formed coats $CaCO_3$ preventing further reaction. √ (1)

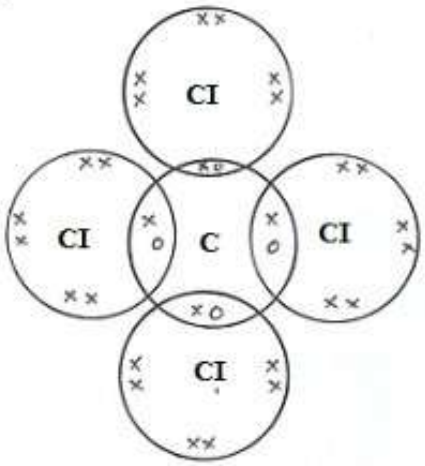
17. (c) PCl_3 has a lower m.p as it has covalent bonds in the molecule and weak van der waals forces √(½) between molecules which are easy to break/has simple molecular structure(1) has strong ionic bonds and giant ionic structures √ (½) so requires a lot of heat to break√(½)

18. (a) (i) Na and S.



√1

(ii) C and Cl.



√1

(b) Compound of C and Cl √ (½) as it is a covalent compound as ethanol. √ (½) (1)

19.

Moles	CO_2	:	H_2O
	$\frac{4.2}{44}$	:	$\frac{1.71}{18}$ (½)
	$\frac{0.0955}{0.095}$	:	$\frac{0.095}{0.095}$ √ (½)
	1	:	1

One mole CO_2 has 1 C
One mole H_2O has 2 H
} Interpretation. (1)

So E.F CH_2(1)

20. (a) Mg produces a lot of heat that breaks the $N \equiv N$ bonds making it react with the nitrogen atoms. √ (½)

Burning splint has less heat and not able to break $N \equiv N$ bond√ (1)

(b) $Mg_{(s)} + N_{2(g)} \rightarrow Mg_3N_{2_{(s)}}$ √ (1)

21. Pass the mixture through NaOH/KOH (aq) to absorb CO2. √ (1)

- Pass the remaining through the conc H_2SO_4 to absorbs moisture and remain with pure CO. (1)

22. Anhydrous $CuSO_4$ absorbs water vapour from atmosphere forming√ hydrated $CuSO_4$ that is heavier. √(1)

23.

(a) $H_2O_{(l)} + Cl_{2(g)} + dye \rightarrow (dye - O) + 2HCl_{(aq)}$ √(1)

$H_2O_{(l)} + SO_{2_{(g)}} + dye - O \rightarrow H_2SO_{4_{(aq)}} + dye$ √ (1)

(b) Manufacture of PVC. √ (1)

Treating domestic water. Any one.

Drugs like DDT (insecticides, herbicides HCl) any 1

24. (a) Element E atomic no √ 13. (1)

(b) Over head cables – light, good conductor of electricity √ (1)

Alloys like duralumin light. (1) Any one

25. (a) Brown fumes (½)

Dark red solid from grey. (½)

(b) $_2$ being less reactive reacts slowly with iron forming √ I_2√ (½) $_2$ reacts faster forming √ (½) 3

26. (a) Rain water contains dissolved which reacts with $CaCO_3$ √ (½)forming soluble

(b) produces required in the reaction. √ (1)

It also reacts to form needed for√ regeneration of

27. (a) Carbon (graphite) reacts with oxygen evolved at high temperature to form carbon (IV) oxide. √(1)

(b) To reduce the melting point of (1)

Uses a large amount of electricity. √ (1)

28. (a) NH_4^+ √(1) it donates H^+ √(1) (2)

(b) Equilibrium position would shift to the light √ (½+½) as the forward reaction is endothermic and proceeds by absorbing heat. √ (½+½) (2)

29.

(c)

No. of moles of $KOH = \frac{20}{1000} \times 0.5$ √(½)

$2KOH_{(aq)} + 2H_2SO_{4_{(aq)}} \rightarrow K_2SO_{4_{(aq)}} + 2H_2O_{(l)}$ √ (½)

$\therefore No.\ of\ moles\ of\ the\ acid = \frac{1}{2} \times \frac{20}{100} \times 0.5$ √ (½)

Molarity $= \frac{1000}{5} \times \frac{1}{2} \times \frac{20}{1000} \times 0.5 = 0.5M$ √ (½)

1 mole of H_2SO_4 weighs 2 +32 +64=98 g

$\therefore 0.5 mole$ of H_2SO_4 weighs 46g

$\therefore$ Con $= \underline{46g / litre.}$ √(1)