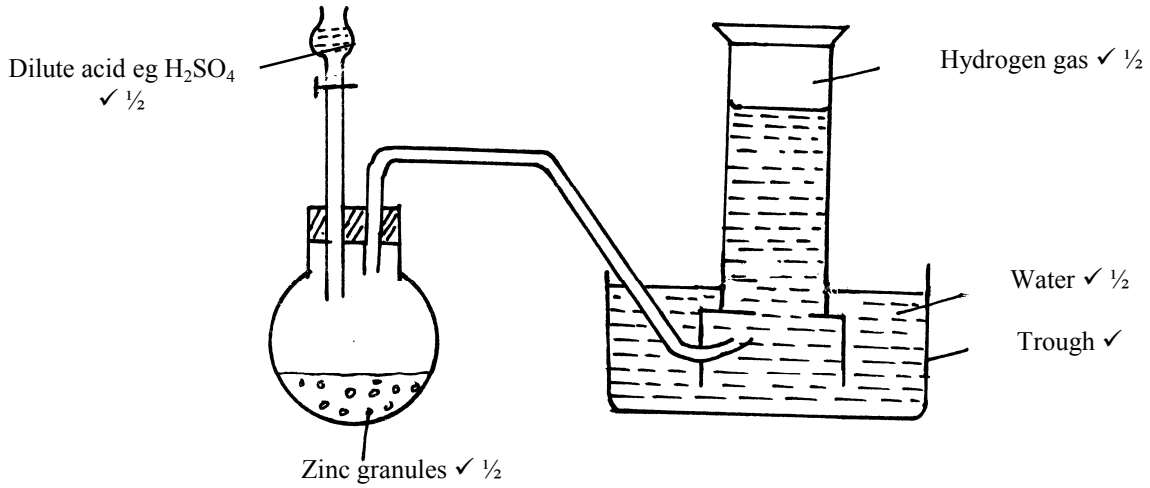
MARKING SCHEME
SAMPLE PAPER 8
233/1
PAPER 1

Note:

(i) Equations should have correct formulae of substances and balanced. State symbols should be correct or else deny (½ mk)
(ii) Alternative correct methods of calculation are acceptable.
(iii) Write stands for words to that effect for cases of explanations and parallel answer that are acceptable.

1.



2. a) Fractional crystallization✓1
b) - In solvay process during the separation of ammonium chloride from sodium hydrogen carbonate.
- During the separation of sodium chloride from trona. (Any 1 (1mk)

3. (i) Inner part of the flame ✓ ½ has unburnt gas which passes through glass tube and burns✓ ½
ii) Outer part of non-luminous flame✓ ½ hotter due to complete combustion of gas✓ ½ (1mk)
iii) Production soot ✓ ½ and hot due to incomplete combustion of gases ✓ ½ (1mk)

4. (i) $2Pb(NO_3)_{2(S)} \xrightarrow{Heat} 2PbO_{(s)} + 4NO_{2(g)} + O_{2(g)}$ (1mk)

(ii) Reacting masses
RFM $Pb(NO_3)_2 = 207 + (14x2)+(3x16)_2$✓ ½ = 331 g
RFM PbO = 223g✓ ½
1 mole $Pb(NO_3)_2 \longrightarrow$ 1 mole PbO

331g ⟶ 223g
2.7g ⟶ ?

$\frac{2.7x223}{331}$ = <u>1.819g; PbO</u>

OR

Moles of $Pb(NO_3)_2 = \frac{2.7}{331} = 0.008157$✓1 Moles

Ratio $Pb(No_3)_2$: PbO
1 : 1

∴ Moles PbO = 0.008157✓ ½

RFM PbO = 223g

⇒ Mass = (0.008157x223)g
= <u>1.819g</u>✓ ½

5. - Methanoic acid (CHOOH) ✓
- It is a proton donor✓ (2mks)

6. a) $5\ Fe^{2+}{}_{aq} + Mn^{O-}{}_{aq} + 8\ H + aq \longrightarrow Mn+)_{aq)} + 4\ H_2\ O)_{l)} +$

b) Oxidation number of Mn in MnO_4^- is
Mn + -8 = -1 Mn = +7 ✓1

7. (i) M✓1
(ii) K✓1
(iii) Y✓1 (3mks)

8. (i) $\frac{11.2}{22.4}$ ✓ ½ = 0.5 moles✓ ½ (1mk)

(ii) 0.5 x 64✓ ½ = 32g✓ ½
OR
$\frac{11.2x64}{22.4}$ ✓ ½ = 32g✓ ½ (1mk)

9. a) Mass of Nitrogen = 2.0g – 1.44g = 0.56g✓ ½

Element	Mg	N
Mass	1.44	0.56
Moles	$\frac{1.44}{24} = 0.06$ ✓ ½	$\frac{0.56}{14}$ =0.04✓ ½
Simple ratio	$\frac{0.06}{0.04} = 1.5$	$\frac{0.04}{0.04} = 1$
	1.5x2	1x2
	3	2

∴ <u>Mg_3N_2</u> ✓ ½

b) $3Mg_{(s)} + N_{2\ (g)} \longrightarrow Mg_3N_{2(s)}$
Balance – ½
State - ½
Not bal. O

10. (i)

$So_3^- Na^+$

accept B

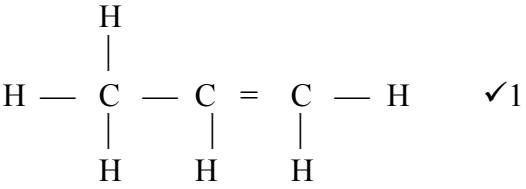
(1mk)

(ii) Does not form scum/ lather readily in water containing $Mg^{2+}(aq)$ (1mk)

(iii) Its non-biograble especially if hydrocarbon chain in branched. ✓ (1mk)

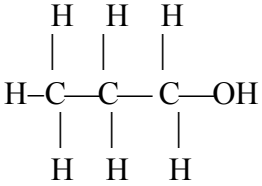
11. - Has low melting point✓1
- Its insoluble in water✓1 (2mk)

12. (i)



✓1 (1mk)

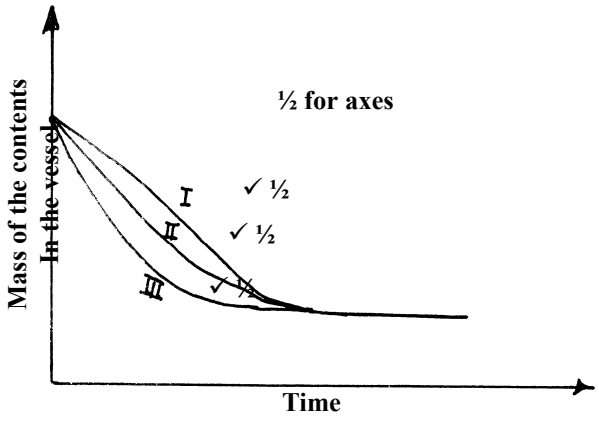
(ii) (I) Propan -l-ol // $CH_3CH_2CH_2OH$ //



(1mk)

(II) $2CH_3CH_2CH_2OH_{(l)} + 2Na_{(s)} \longrightarrow 2CH_3CH_2CH_2ONa_{(aq)} + H_{2(g)}$ (1mk)

13.



14. a)CaO reacts with hydrogen✓ ½ Chloride gas to form ✓ ½ Calcium chloride and water. ✓ ½

$CaO_{(s)} + HCL_{(g)} \longrightarrow CaCL_{2(s)} + 2H_2O_{(l)}$ ✓1 (2mks)

b) Concentrated sulphuric (vi) acid
Anhydrous Calcium chloride. Any one (1mk) reject formula.

15. (i) A ppt of $Pb(OH)_2$ ✓ ½ was building up hindering transmission of light.

ie $Pb(No_3)_{2(aq)} + 2NaOH_{(aq)}$ ✓1 $\longrightarrow$ $Pb(OH)_{2(s)} + 2NaNo_{3(aq)}$ ✓ ½

or

$Pb^{2+}_{(aq)} + 2OH^-_{(aq)} \longrightarrow Pb(OH)_{2(s)}$

NB. Penalize ½ mk for wrong / missing states. Rej. Equation altogether if $Pb(OH)_{2(s)}$ is aqueous.

(ii) $Pb(OH)_2$ dissolves in excess✓ ½ $NaOH_{(aq)}$

Or

ie $Pb(OH)_{2(s)} + 2NaOH_{(aq)} \longrightarrow Pb(OH)_4^{2-}{}_{(aq)} + 2Na^+_{(aq)}$ (1 ½ mks)

$Pb(OH)_{2(s)} + 2OH^-_{(aq)} \longrightarrow Pb(OH)_4^{2-}{}_{(aq)}$

Note: Penalize ½ for wrong / missing states. Rej. Equation altogether if product is not in aqueous state.

16. Forms molecular structure, does not have✓1 free electrons in its structure. Also being a molecular structure does not contain ions✓1
(2mks)

17. a) Nitrogen (i) oxide✓1 (1mk)
b) $NH_4NO_{3(s)} \longrightarrow N_2O_{(g)} + 2H_2O_{(g)}$ ✓1 (1mk)
c) Colourless insoluble in water ✓1 (1mk)

18. a) $S^{2+}_{(aq)}$ ✓1

b) $R_{(s)} \longrightarrow R^{2+}_{(aq)} + 2e^-$ $E^\theta = +2.04v$ (1mk)

$S^{2+}_{(aq)} + 2e^- \longrightarrow S_{(s)}$ $\underline{E^\theta = -0.47v}$
$+1.57v_{)}$ ✓1 (1mk)

Or

E^θ cell = ER – Eo
R= 0
= -0.47 – (-2.04)
= $\underline{+1.57v}$

c) $R_{(s)} / R^{2+}_{(aq)} // S^{2+}_{(aq)} / S_{(s)}$ ✓1 $E^\theta = +1.57v$ (1mk)

19. a) State of balance ie Rate of forward reaction is equal to backward reaction. ✓1 (1mk)

b) Forward reaction is favoured ✓1
Orange $Cr_2O_7^{2-}$ turns yellow CrO_4^{2-} ✓1 (2mks)

20. a) In K; Zn^{2+} In M; Pb^{2+}
b) Carbonate Radical (ion) Rej. Co_3^{2-}
- Nitrat radical (ion) Rej. NO^-_3

21. $AgNO_{3\,(aq)} + KCl_{(aq)} \longrightarrow AgCl_{(s)} + KNO_{3(aq)}$
RFM KCl = 39 + 35.5 = 74.5
RFM AgCl = 108 + 35.5 = 143.5

ie 143.5g AgCl $\longrightarrow$ 74.5gKcl ✓ ½

$\Rightarrow$ 11.4; Agcl $= \frac{11.4x74.5}{143.5} = \underline{5.918g\ Kcl}$ ✓ ½ (3mks)

$\therefore$ mass of $NaNo_3$ = 8-5.918; ✓ ½

= 2.082g ✓ ½

$\Rightarrow$ % of $NaNo_3 = \frac{2.82}{8} x100 = \underline{26.025\%}$

22. Chlorine bleaches through oxidation ✓1 hence permanent sulphur (iv) oxide gas bleaches through reduction hence temporary. ✓1
(2mks)

23. a) Anode: Hydrogen gas ✓ ½
Cathode: Oxygen ✓ ½ (1mk)

b) The concentration of the electrolyte ✓1 increases since water is being discharged ✓1 /removed from solution. (2mks)

c) $4OH^-_{(aq)} \longrightarrow 2H_2O_{(l)} + O_{2(g)} + 4e^-$ ✓1 (1mk)

24. (i) L ✓1
(ii) K ✓1
(iii) J ✓1 (3mks)

25. $2CO_{(g)} + O_{2(g)} \longrightarrow 2CO_{2(g)}$ ✓1 Balance equation.

2Vol	excess	2vol
2mol		2mol ✓1
$40cm^3$		

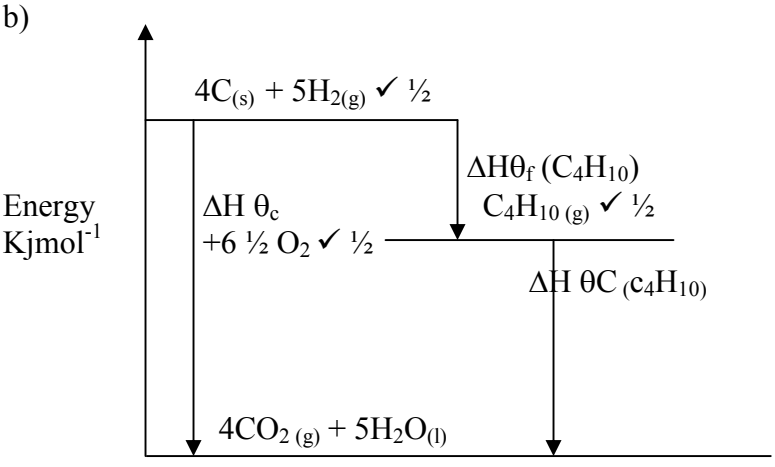
(3mks)

2 mol CO $\longrightarrow$ 2 mol CO_2

$\therefore$ Vol of CO_2 produced $40cm^3$ ✓1

26. a) $4C_{(s)} + 5H_{2(g)} \longrightarrow C_4H_{10(g)}$ ✓1 (1mk)

b)



Reaction path ✓ ½

(2mks)

27. Mass of $KClO_3$ = 17.96 – 16.96 = 1g ✓ ½

Mass of water = 26.95 – 17.96= 8.99g✓ ½
ie 8.99g water = 1g $KclO_3$ (2mks)

$\Rightarrow$Solubility of $KClO_3 = \frac{1}{8.99}$ X100✓ ½

= 11.12g / 100gH_2O✓ ½

28. a) $5\ {}^{4}_{2}He$ ✓ 1

b) - Sterilize hospital equipment
- Monitor growth in bones
- Provide power in heart pace setters.
- Iodine 131 used in patients with defective thyroid any two.

29. Haematite Fe_2O_3
Magnetite Fe_3O_4
Siderite $FecO_3$ (any one 2mks)

30. Measure 25cm^3 of H_2SO_4 (exact) Add Zinc powder in small portions to the dilute H_2SO_4 and stir until effervescence stops. Filter to obtain excess Zinc (unreacted Zinc) as residue while $ZnSO_4$ as filtrate. Evaporate the filtrate to saturation and cool it under shade to obtain crystals.
(3mks)

31. a) Physical ✓1
b) Chemical ✓1
c) Chemical ✓1
d) Physical ✓1 (4mks)