



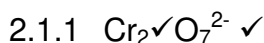
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Grade 12 Trials Paper 2
MEMO

Question 1 – MC

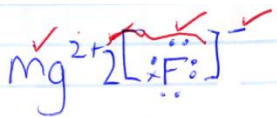
- 1.1 D
- 1.2 C
- 1.3 C
- 1.4 B
- 1.5 B
- 1.6 D
- 1.7 C
- 1.8 A
- 1.9 B
- 1.10 A

[2x 10 = 20]

Question 2

(6)

2.2



(3)

2.3.1 B ✓ conducts elec. when molten. ✓

(2)

2.3.2.1 A – Diamond ✓

E – Iodine ✓

(2)

2.3.2.2 m.pt ✓. diamond ↑ ✓ m.p than I_2 . Diamond giant covalent network / many strong covalent bonds ✓ I_2 weak (✓) London forces ✓.

(4)

2.3.3 Solubility ✓✓ NaCl can form ion-dipole interactions with H_2O whereas I_2 cannot as non polar

(2)

Question 3

3.1 To determine the relationship between concentration ✓ of a solution and reaction rate ✓.

(2)

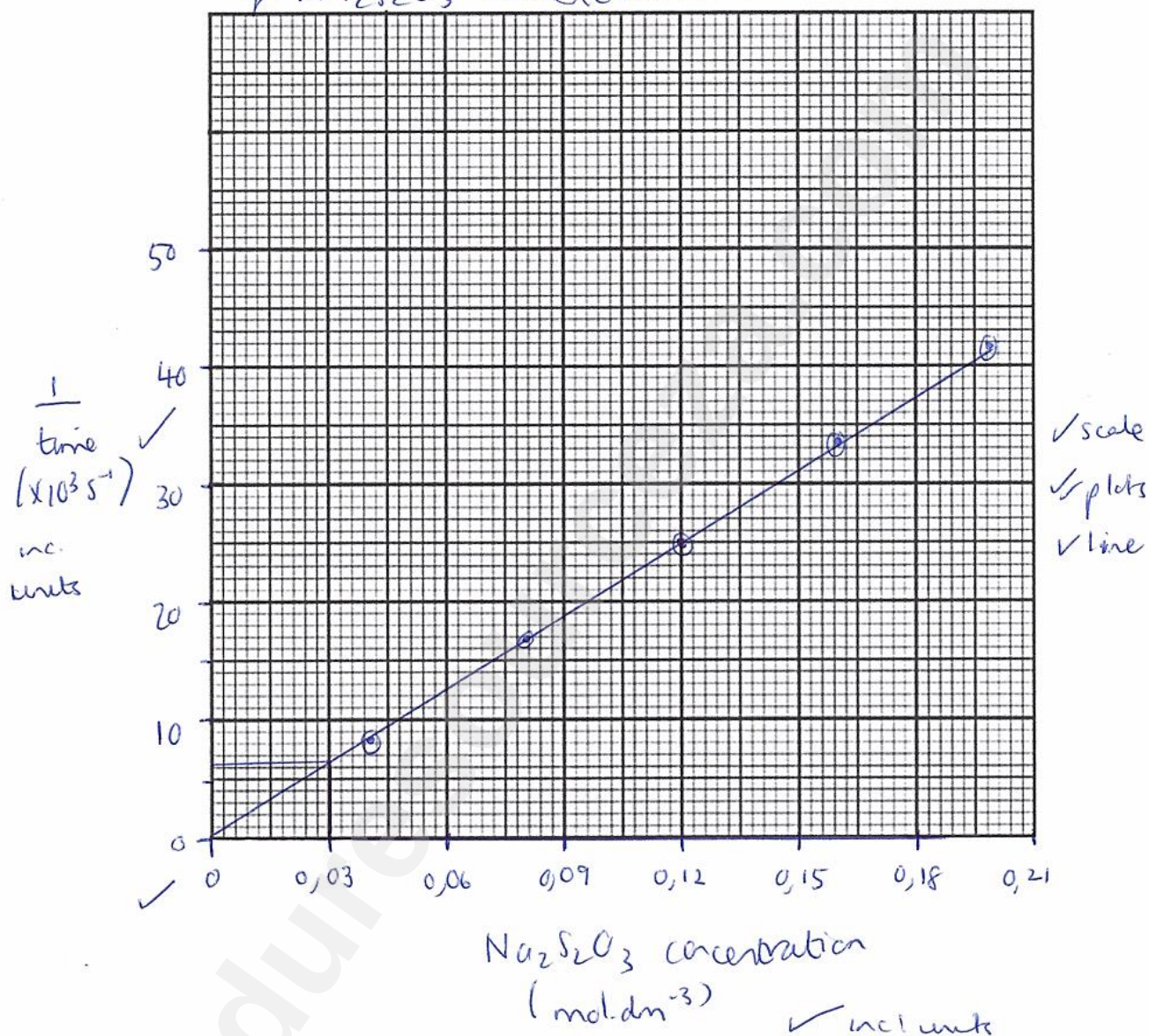
3.2 Conc. of acid ✓ OR
Volume of $\text{Na}_2\text{S}_2\text{O}_3$

(1)

3.3

Question 3.3

Graph to show relationship between the inverse of time
of $\text{Na}_2\text{S}_2\text{O}_3$ concentration ✓



(8)

- 3.4 The rate of reaction is directly ✓ proportional to the concentration ✓.
y vs x . (As the concentration increases, the rate of the reaction increases.) (2)
- 3.5 The greater the number of particles ✓ per unit volume ✓ the greater number of effective collisions per unit time ✓ therefore greater rate. (3)
- 3.6 $\frac{1}{t} \times 1000 = 6,5$ ✓ from graph

$$t = 154 \text{ s} \quad (2)$$

3.7 Collected SO_2 gas and measured volume of gas with syringe ✓

OR

Decrease in mass of contents of conical flask ✓ (1)

$$\begin{aligned} 3.8 \quad n &= CV \\ &= (0,2) \left(\frac{250}{100} \right) \checkmark \\ &= 5 \times 10^{-2} \text{ mol} \end{aligned}$$

$$\begin{aligned} m &= nMr \\ &= (5 \times 10^{-2})(2(23) + 2(32)) \checkmark + 3(16) + 10(1) + (16)(5) \\ &= (5 \times 10^{-2})(248) \\ &= \underline{12,4 \text{ g}} \checkmark \end{aligned} \quad (3)$$

$$3.9 \quad n \text{ in } 0,2 \text{ mol. dm}^{-3} = 5 \times 10^{-2} \text{ mol}$$

If you use 30 cm^3 of $0,2 \text{ mol. dm}^3$ solution to dilute would have
 $n = CV$

$$\begin{aligned} &= (0,2) \left(\frac{30}{1000} \right) \checkmark \\ &= 0,006 \text{ mol.} \checkmark \end{aligned}$$

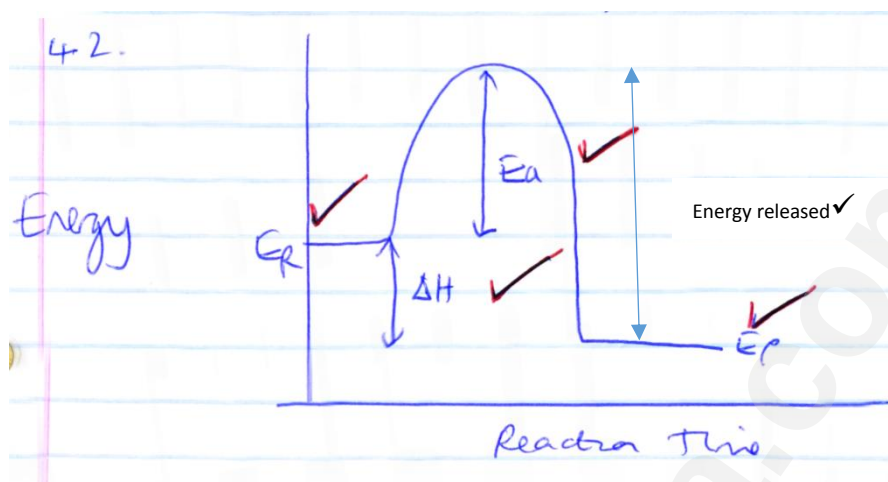
$$\begin{aligned} V_{\text{dil}} &= \frac{n}{c} = \frac{0,006}{0,12} = 0,05 \text{ dm}^3 \times 1000 \\ &= 50 \checkmark \text{ cm}^3 \end{aligned}$$

$\therefore$ add $20 \checkmark \text{ cm}^3 \text{ H}_2\text{O}$ to 30 cm^3 of $0,2 \text{ mol. dm}^{-3}$ solution (4)

Question 4

4.1 Net change of chemical potential energy of system ✓✓ (2)

4.2



E_a = activation energy $E_p < E_R$

E_r = energy reactions

E_p = energy products

(4)

4.3.1 ↓ □ □ ✓ of NO as fwd rxn favoured ✓
↑ P favours rxn which makes less ✓ moles to reduce P.

(3)

4.3.2 increase concentration of NO ✓
Reverse rxn fav ✓ as endothermic (✓) to absorb heat ✓ to ↓ T

(3)

4.4.1 $K_c = \frac{[NO_2]^2}{[NO]^2[O_2]}$ ✓

(2)

4.4.2 No change ✓✓

(2)

4.5.1 Yes ✓. Concentrations N_2O_4 and NO_2 are constant ✓

(2)

4.5.2 ↑ ✓ in pressure ✓

(2)

4.5.3 According to balanced reaction
1 mol N_2O_4 is made when ✓ 2 mol of NO_2 is used ∴ 1x uses 2x ✓

(2)

4.6

	P	Q	R
moles	1	1	2
I	1	1	0
C	x		
E	1-x	1-x	2x

4.6.1

2x ✓

$$4.6.2 \quad 3,6 = \frac{(2x)^2}{(1-x)(1-x)} \quad \text{square root both sides} \quad (1,8973)(1-x) = 2x$$

$$1,8973 - 1,8973x = 2x$$

$$x = 0,48 \checkmark \text{ mol. dm}^{-3} \text{ therefore } R = (2)(0,46) = 0,97 \text{ mol. dm}^{-3} \checkmark \quad (3)$$

Question 5

5.1 An acid that ionises almost completely in an aqueous solution $\checkmark \checkmark$ (2)

5.2 oxalic acid $\checkmark$. $\uparrow K_c$ value $\checkmark$ (2)

5.3.1 Proton acceptor $\checkmark \checkmark$ (2)

5.3.2 $H_2O \checkmark + (COO^- \checkmark)_2$ (2)

5.4.1 Volumetric flask $\checkmark$ (1)

5.4.2 Methyl orange $\checkmark$ (1)

5.4.3 Point where an acid + base have reacted $\checkmark$ so neither is in excess $\checkmark$ (2)

$$5.4.4 \quad Av = \frac{23,1 + 23,95 + 23,2 + 23,15}{4} \checkmark$$

$$= 23,35 \text{ cm}^3 \checkmark \quad (2)$$

5.4.5 Not precise $\checkmark$ as reading 2 is not close in value $\checkmark$ to 1, 3, 4 (2)

$$5.4.6 \quad n = CV$$

$$= (0,1) \left(\frac{23,35}{1000} \right) \checkmark$$

$$= 0,0023 \text{ mol} \checkmark \quad (3)$$

$$5.4.7 \quad HCl : Na_2CO_3$$

$$2 : 1 \checkmark$$

$$0,0023 : x \checkmark$$

$$x = 0,0012 \text{ mol} \checkmark \quad (3)$$

$$5.4.8 \quad 0,0012 \text{ in } 25 \text{ cm}^3$$

$$x \text{ in } 250 \text{ cm}^3$$

$$x = 0,012 \checkmark \text{ mol in } 250 \text{ cm}^3$$

$$M = nMr$$

$$= (0,012)(106) \checkmark$$

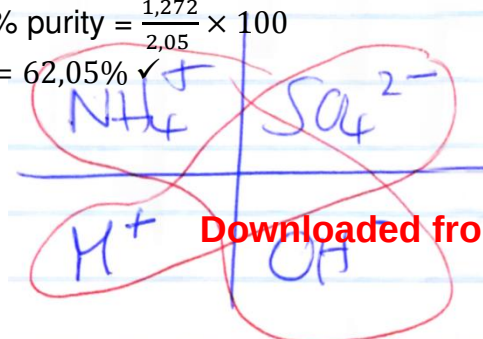
$$= 1,272 \text{ g}$$

$$Mr(Na_2CO_3) = 2(23) + 12 + 3(16) = 106 \text{ g mol}^{-1}$$

$$\% \text{ purity} = \frac{1,272}{2,05} \times 100$$

$$= 62,05\% \checkmark \quad (3)$$

5.5



NH_4SO_4 dissociates to form $NH_4^+ + SO_4^{2-}$. If NH_4^+ and OH^- combine remain combined as weak base ✓ but if $H^+ + SO_4^{2-}$ combine will remain ionised as strong acid ✓. $>$ conc. of H^+ than OH^- therefore weakly acid / $pH < 7$ ✓ (4)

Question 6

6.1 Dilute hydrochloric acid ✓

1 mol. dm^{-3} ✓ (2)

6.2 - for aluminium as better reducing agent ✓/will be oxidised than H_2 whereas silver + as weaker RA/will be reduced ✓ (2)

6.3 $\text{Pt} / H_2 / H^+ // Ag^+ / Ag$ ✓ (3)

6.4.1 Chemical energy ✓ $\rightarrow$ electrical ✓ energy (2)

6.4.2 Cl^- ions would combine with Ag^+ causing a ppt ✓ therefore ionic neutrality not maintained ✓ / no complete circuit. (2)

6.4.3 Electrode ✓ where oxidation ✓ takes place. (2)

6.4.4 $Al \rightarrow Al^{3+} + 3e^-$ ✓ (2)

6.4.5 $E^\circ = E_{cat} - E_{an}$ ✓
 $= 10,8 - (-1,66)$ ✓
 $= 2,46 \text{ V}$ ✓ (3)

6.4.6 $\uparrow$ EMF ✓ as more Ag^+ can be reduced $\therefore \uparrow$ rate of e^- transfer ✓ (2)

6.4.7 $\frac{n}{Al} = \frac{3,2}{27}$
 $= 0,12 \text{ mol}$ ✓
 $Al : Ag$
 $1 : 3$
 $0,12 : x$
 $x = 0,36$ ✓
 $m = 0,36 \times 108$
 $= 38,88g$ ✓ (3)

Question 7

- 7.1 Membrane cell is less expensive ✓ to run and does not pollute environment i.e. not carcinogenic or toxic (2)
- 7.2 $\text{Na}^+ \checkmark + (\text{H})^+$ (1)
- 7.3 $2\text{NaCl} + 2\text{H}_2\text{O} \rightarrow 2\text{NaOH} + \text{Cl}_2 + \text{H}_2$ (2)
- $\underbrace{\hspace{10em}}_{\checkmark} \quad \underbrace{\hspace{10em}}_{\checkmark}$
- 7.4 Cl^- ions are weaker ✓ RA than H_2O but because solution is concentrated ✓ there are so many more Cl^- ions ✓ than H_2O molecules they are preferentially discharged. (3)

Question 8

- 8.1 Bauxite (1)
- 8.2 Carbon ✓/graphite (1)
- 8.3 Oxidation ✓ (1)
- 8.4 Reduce *m.pt* ✓ of Al_2O_3 (1)
- 8.5 $\text{Al}^{3+} + 3\text{e}^- \rightarrow \text{Al} \checkmark$ (2)
- 8.6 $n = \frac{0,5}{27} \times 1000 \checkmark$
 $= 18,52 \text{ mol} \checkmark$
 $\text{Al} : \text{e}^-$
 $1 : 3$
 $18,52 : x$
 $x = 55,56 \checkmark \text{ mol e}^-$
- $Q = 55,56 \times 96\,500 \checkmark$
 $= 5361111,11 \text{ C} \checkmark$ (5)
- 8.7. Cathode : $2\text{H}_2\text{O} \checkmark + 2\text{e}^- \rightarrow \text{H}_2 + 2\text{OH}^- \checkmark$ (2)

QUESTION 9

- 9.1 Cracking ✓ (1)
- 9.2 Series of similar compounds which have the same functional group and have the same general formula, each member differs from the previous one by a single CH_2 unit. ✓✓ (2)
- 9.3 Alkanes ✓ (1)

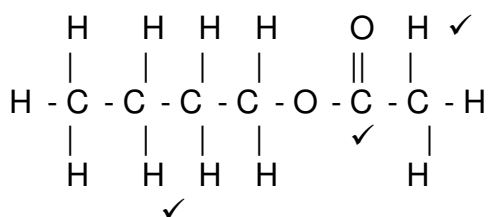
- 9.4
- $$\begin{array}{c}
 \text{H} \quad \text{H} \\
 \diagdown \quad \diagup \\
 \text{C} = \text{C} \\
 \diagup \quad \diagdown \\
 \text{H} \quad \text{H}
 \end{array}
 \quad \checkmark \quad \text{Correct Cs and Hs} \quad \checkmark$$
- (2)
- 9.5 $2 \text{C}_8\text{H}_{18} + 25 \text{O}_2 \checkmark \rightarrow 16\text{CO}_2\checkmark + 18 \text{H}_2\text{O} \checkmark\checkmark$ bal (4)
- 9.6.1 2 $\checkmark$ - bromobutane $\checkmark$ (2)
- 9.6.2 butan - 2 - ol
 $\checkmark \quad \checkmark$ (2)
- 9.6.3 Substitution $\checkmark$ (1)
- 9.6.4 KOH $\checkmark$ concentrated in ethanol $\checkmark$ (2)
- 9.6.5 H_2O ./ water $\checkmark$ (1)
- 9.6.6 Compound where there is at least one double +/ or triple bond between carbon atoms. $\checkmark\checkmark$ (2)
- 9.6.7
- $$\begin{array}{c}
 \text{H} \quad \text{H} \\
 | \quad | \\
 \text{H} - \text{C} \checkmark = \text{C} - \text{C} - \text{H} \\
 | \quad | \\
 \text{H} \quad \text{H} \\
 | \quad | \\
 \text{H} - \text{C} - \text{H} \\
 | \\
 \text{H}
 \end{array}
 \quad \text{Correct Cs and Hs} \quad \checkmark$$
- (2)
- 9.6.8 $\text{C}_4\text{H}_9\text{OH} \quad \checkmark$ (OH + 1H) (1)
- 9.6.9 Addition $\checkmark$ /Hydration (1)

QUESTION 10

10.1 Esters ✓

(1)

10.2



(3)

10.2 Butanol has a lower b. pt ✓ than ethanoic acid as can only form one Hydrogen bond ✓ whereas the carboxylic acid can form two ✓ hydrogen bonds per molecule. Stronger IMF > energy required. ✓

(4)

10.3 Carboxyl group ✓

(1)

10.4 Hexanoic ✓ acid ✓

(2)