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TRINITY HOUSE HIGH SCHOOL
PHYSICAL SCIENCES GRADE 12 PRELIM EXAMINATION
PAPER 2 - CHEMISTRY MEMO

QUESTION 1

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

[10 x 2 = 20]**QUESTION 2**

2.1 A measure of the tendency of an atom to attract a bonding pair. ✓✓ (2)

2.2.1 H₂O ✓

2.2.2 CH₄ ✓

2.2.3 H₂O ✓

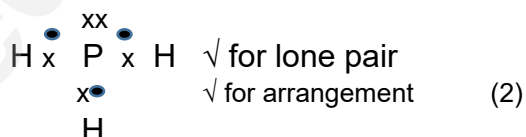
2.2.4 C ✓

2.2.5 KCl ✓

2.2.6 C ✓

2.2.7 KCl ✓ (7)

2.3.1



2.3.2 weaker ✓ (1)

2.4 Van der Waals (london/dispersion) forces between I₂ and Cl₂ molecules that increase in magnitude with an increase in number of electrons and there is more shielding of valence electrons so greater polarisation can happen in I₂ so I₂ exists as a solid. ✓ (2)

[14]

QUESTION 3

3.1.1 A : Energy of the reactants ✓

B: Activation energy ✓

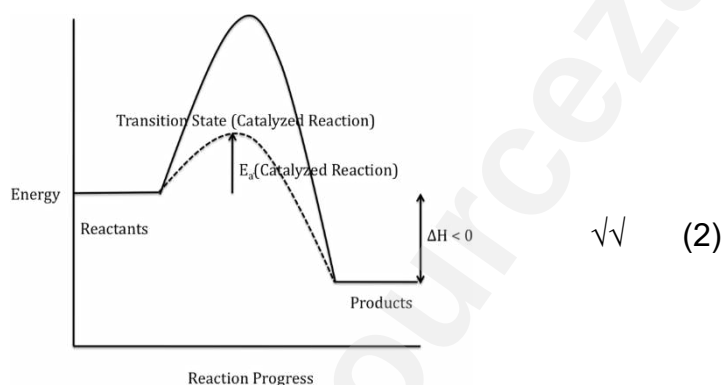
C: Energy of the products ✓

D: A change in enthalpy, ΔH ✓ **OR** Excess energy released from reaction.

E: Energy released from product formation ✓ (5)

3.1.2 Activated complex ✓ **OR** Transition state complex (1)3.1.3 Exothermic ✓, more energy is released than is taken in ✓ **OR** the reaction has a negative change in enthalpy. $E_P < E_R$ (2)

3.1.4

**[10]**

QUESTION 4

4.1 inc in surface area eg powder ✓ = more effective collisions ✓

Inc in temp ✓ = more movement = more effective collisions ✓

Inc in concentration of acid ✓ = more particles in contact = more effective collisions ✓

Add catalyst ✓ lowers E_a to give a new pathway = more effective collisions ✓

(8)

4.2 used up the reactant ✓✓

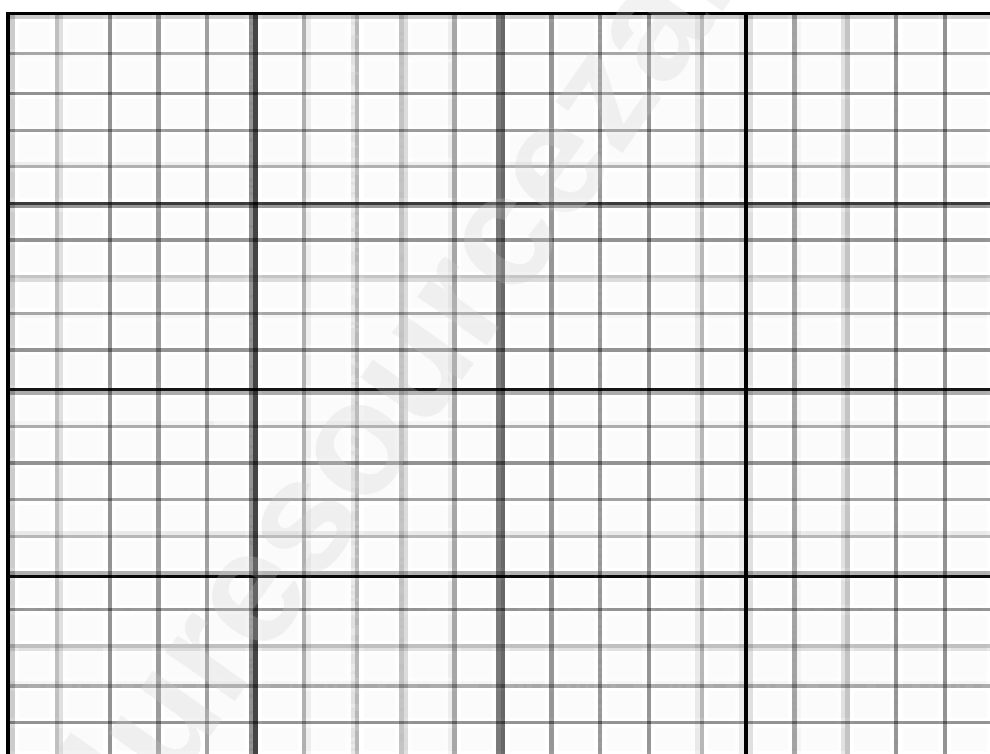
(2)

4.3 any method that will mention how to collect the H_2 gas ✓ and how to measure the volume collected per unit time ✓

(2)

4.3 and 4.4

Volume of hydrogen gas (cm^3) ✓



time (s) ✓

(3)

(3)

[18]

QUESTION 5

5.1 when an external stress (change in pressure, temperature or concentration) is applied to a system in chemical equilibrium, the equilibrium point will change in such a way as to counteract the stress ✓✓ (2)

- 5.2 A INCREASE ✓ B NO EFFECT ✓
 C INCREASE ✓ D INCREASE ✓
 E NO EFFECT ✓ F NO EFFECT ✓
 G DECREASE ✓ H NO EFFECT ✓
 I INCREASE ✓ J NO EFFECT ✓ (10)

5.3

R	2SO ₂	O ₂	2SO ₃
I	0.25	0.1	0
C	0.05	0.025	0.05
E	0.2	0.075	0.05 ✓
$C = \frac{n}{V}$	$= \frac{0.2}{0.25}$ $= 0.8 \text{ mol.dm}^{-3} \checkmark$	$= \frac{0.075}{0.25}$ $= 0.3 \text{ mol.dm}^{-3} \checkmark$	$= \frac{0.05}{0.25}$ $= 0.2 \text{ mol.dm}^{-3} \checkmark$

$$\begin{aligned}
 K_c &= \frac{[\text{products}]}{[\text{reactants}]} \\
 &= \frac{[\text{SO}_3]^2}{[\text{SO}_2]^2[\text{O}_2]} \checkmark \\
 &= \frac{(0.2)^2}{(0.8)^2(0.3)} \checkmark \\
 &= 0.2083 / 2.08 \times 10^{-1} \checkmark \quad (7)
 \end{aligned}$$

5.4 no effect ✓ K_c only influenced by temperature ✓ (2)

5.5 [SO₂] will decrease ✓ as more O₂ will use up more SO₂ to form SO₃ favors forward reaction. (1)

[22]

QUESTION 6

$$6.1 \quad n = m/M$$

$$= 1/252 \checkmark$$

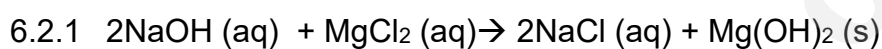
$$= 0.00397 \text{ mol} \checkmark$$

$$N = nN_A$$

$$= 0.00397 \times 6.02 \times 10^{23}$$

$$= 2.39 \times 10^{21} \checkmark$$

$$N_{\text{Cr}} = 2 \times 2.39 \times 10^{21} = 4.78 \times 10^{21} \text{ Cr atoms} \checkmark \quad (4)$$



$$n_{\text{NaOH}} = n_{\text{MgCl}_2} = cV$$

$$= 1 \times 0.03 \checkmark$$

$$= 0.03 \text{ moles} \checkmark$$

$$2 \text{ NaOH} : 1 \text{ MgCl}_2 \checkmark$$

Therefore 0.03 mole NaOH requires 0.015 moles MgCl₂

$$\text{Thus NaOH} = \text{LR} \checkmark \quad (4)$$

$$6.2.2 \quad M_{\text{Mg(OH)}_2} = n \times M$$

$$= 0.015 \times 58 \checkmark$$

$$= 0.87 \text{ g} \checkmark \quad (2)$$

$$6.3 \quad n(\text{Al}) = 5/27$$

$$= 0.185 \text{ mol} \checkmark \quad (0.185/2 \times 3 = 0.278)$$

$$n(\text{DMM}) = 25/230.6 \checkmark$$

$$= 0.108 \text{ mol} \checkmark \quad (0.108/3 \times 2 = 0.072)$$

DMM is LR $\checkmark$

0.108 mol DMM produces $0.108/3 \times 2 = 0.072 \text{ mol TMA} \checkmark$

$$m(\text{TMA}) = nM$$

$$= 0.072 \times 72 \checkmark$$

$$= 5.18 \text{ g TMA} \checkmark$$

$$\% \text{ yield} = \text{act/th} \times 100$$

$$= 4.5/5.18 \times 100$$

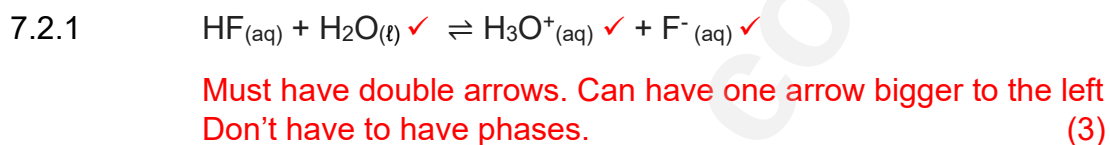
$$= 86.9\% \checkmark \quad (8) \quad [18]$$

QUESTION 7 – ACIDS AND BASES

7.1

- 7.1.1 HCl ✓ (1)
 7.1.2 LiOH ✓ (1)
 7.1.3 H₂CO₃ ✓ (1)
 7.1.4 K₂SO₄ ✓ (1)
 7.1.5 MgNO₃ ✓ (1)

7.2



7.2.2 HBr ✓ will be Beaker 1 since it would have a higher concentration of (free) ions ✓ as it ionises more/ is a stronger acid ✓ (3)

7.2.3 $[\text{H}_3\text{O}^+][\text{OH}^-] = 1 \times 10^{-14}$ ✓ = Kw

$$[\text{OH}^-] = \frac{1 \times 10^{-14}}{0.03}$$
 ✓
 $[\text{OH}^-] = 3,33 \times 10^{-13} \text{ mol} \cdot \text{dm}^{-3}$ ✓ (3)

7.3

7.3.1 as the point where an acid and base have reacted so neither is in excess. ✓✓ (2)

7.3.2 $c = n/v$ ✓

$0,25 = n/0,04$ ✓

$n = (0,25)(0,04)$

$= 0,01 \text{ mols}$ ✓



1 : 1

0,01 : 0,01 ✓

$c = 0,01/0,025$ ✓

$= 0,4 \text{ mol} \cdot \text{dm}^{-3}$ ✓ (5)

7.3.3 between 8-10 ✓ (1)

[22]

QUESTION 8

8.1 conc of electrolyte = 1 mol/dm^3 ; temp = 25°C ✓✓ (2)

8.2 $\text{Mg} \rightarrow \text{Mg}^{+2} + 2\text{e}$ ✓✓ (2)

8.3 $\text{Mg/Mg}^{2+}_{(\text{aq})(1\text{ mol.dm}^{-3})} // \text{Pb}^{2+}_{(\text{aq})(1\text{ mol.dm}^{-3})} / \text{Pb}$ at 25°C
correct species ✓; correct order ✓ // ✓ (3)

8.4 $\text{emf} = E^\circ_{\text{cell}} = E^\circ_{\text{reduction}} - E^\circ_{\text{oxidation}}$ ✓
 $= -0,13 - (-2,37)$ ✓ $= +2,24\text{V}$ ✓ (4)

8.5.1 decrease ✓

8.5.2 increase ✓ (2)

8.6 A to B ✓ Reduction takes place at B, Pb^{2+} ions are removed from the solution ✓

Positive ions need to migrate to ensure there is no build up of negative ions at B ✓✓

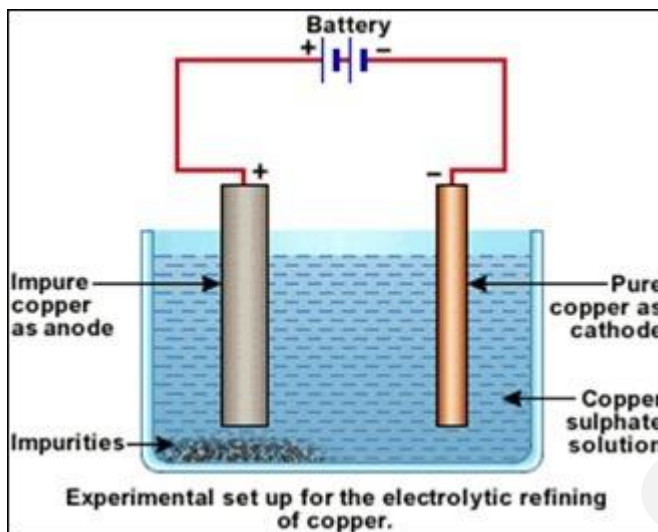
(or opposite) (4)

8.7 by increasing the surface area of the terminals or electrodes ✓ and using a wider, shorter and more conductive salt bridge ✓ (2)

[19]

QUESTION 9

9.1



✓ cells

✓ anode

✓ cathode

✓ acidified CuSO_4
electrolyte

(4)

9.2 the copper will undergo reduction forming $\text{Cu}_{(s)}$ ✓. Cu has a lower reactivity and will not oxidize, it is a stronger oxidising agent than H_2SO_4 ✓ (2)

9.3 Cathode gains mass/ pure copper cathode ✓ (1)

9.4 cathode/ negative electrode ✓ (1)

9.5 $\text{Cu}^{2+} + 2\text{e}^- \longrightarrow \text{Cu}_{(s)}$ ✓✓ (2)

9.5 zinc is more reactive than copper ✓ and will oxidise ✓

Silver and gold are less reactive than copper ✓✓ and will not oxidise ✓ but sink to the bottom as sludge ✓ (6)

[16]

QUESTION 10 –ORGANIC CHEMISTRY

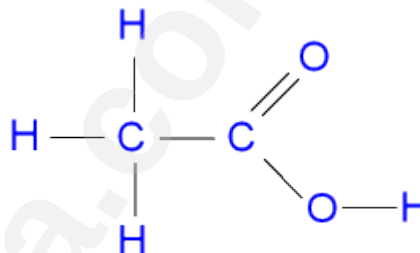
10.1 a series of similar compounds which have the same functional group and have the same general formula✓, in which each member differs from the previous one by a single CH_2 unit ✓ (2)

10.2 alcohols✓ hydroxyl group✓ (2)

10.3 (2)

✓ correct number of atoms

✓the correct bonds between atoms



10.4 carboxyl group. ✓ (1)

10.5

10.5.1 methyl methanoate✓✓ (2)

10.5.2 Propan-2-ol. ✓ (1)

10.6 Propan-1-ol (polar) has a higher boiling point than butane (non-polar) because propan-1-ol has stronger intermolecular forces (hydrogen bonds✓) than methane (London forces✓) ∴ more energy needed to overcome stronger intermolecular forces. ✓

With ethanoic acid, hydrogen bonding can occur between two molecules of acid at two different sites✓, whereas in propan-1-ol, there is only one site for hydrogen bonding✓ to take place. Hence, ethanoic acid has a higher boiling point and needs more energy✓ to overcome the Intermolecular Forces. (6)

10.7

10.7.1 It acts as a catalyst✓ and a dehydrating agent. ✓ (2)

10.7.2 Alcohol is flammable. ✓ (1)

10.7.3 propyl ethanoate✓✓ (2)

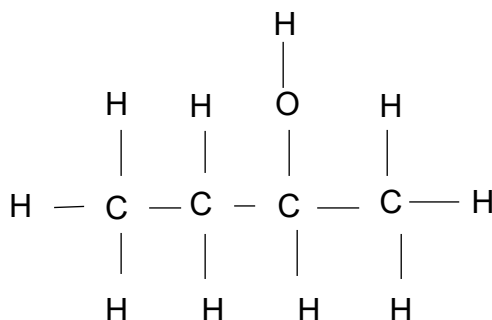
[21]

QUESTION 11 – ORGANIC CHEMISTRY (2)

11.1.1 Give the SPECIFIC NAME for:

- a) dehydrohalogenation✓ (1)
- b) combustion/oxidation✓ (1)

11.1.2



✓ correct place for the OH ✓ correct bonds and atoms

- 1 for any mistake made. (2)

11.1.3 - concentrated NaOH/KOH✓

- in ethanol as the solvent in the absence of water✓

- heat✓ (3)

11.1.4 Reactant 1- HCl✓

Reactant 2- H₂✓. (2)

11.1.5

11.5.1 The reddish brown colour of bromine will discolour✓ and become colourless✓ (2)

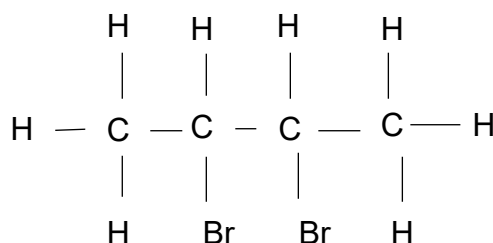
11.5.2 Halogenation✓ (1)

11.5.3

✓ the placing of Bromine

✓ all single bonds

- 1 for any mistake



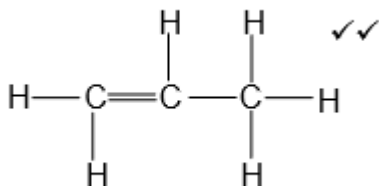
2,3-dibromobutane✓✓ (4)

11.2

11.2.1 Thermal cracking✓

(1)

11.2.2



Propene✓ can accept prop-1-ene

(3)

[20]

TOTAL = 200