ACTIVITY MEMORANDA

Organic Chemistry

1.1 B ✓✓ 1.2 B ✓✓ 1.4 C ✓✓

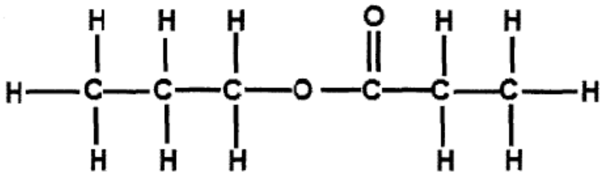
QUESTION 2

2.1. *Functional isomers* are compounds with the same molecular formula, but different functional groups / different homologous series. ✓ ✓ (2)

2.2 B ✓ & E ✓ (2)

2.3

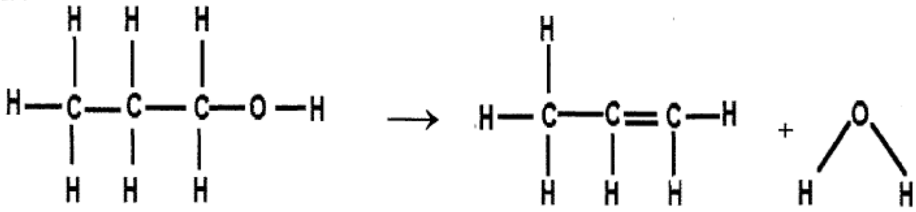
2.3.1



✓✓ (2)

2.3.2 Propylpropanoate ✓ (1)

2.4



✓✓ ✓ (3)

2.5

2.5.1 Dehydration ✓ (1)

2.5.2 Propene✓ (1)

2.6

2.6 .1 Propan-2-one ✓✓ (2)

2.6.2 Aldehydes ✓ (1)

[15]

QUESTION 3

3.1

3.1.1 Functional group ✓ (1)

3.1.2 Melting point. ✓ (1)

3.1.3 Number of C-atoms (All have single bonds). ✓ (1)

3.2 Carboxylic acid ✓✓ (2)

3.3 C_nH_{2n+2} ✓✓ (2)

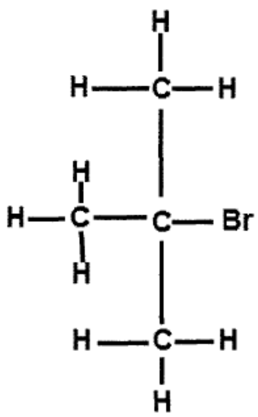
3.4 Melting points increases from **A–C**. ✓✓ (2)

3.5 Compound **A** has weak Van der Waal's forces (London forces) whilst **B** and **C** have strong hydrogen bonds between their molecules.✓ Hence, less energy is needed to break the weak intermolecular forces in **A** than in **B** and **C**.✓ Compound **B** has one site of hydrogen-bonding whilst compound **C** has two sites of H-bonding.✓ Thus, **C** has stronger intermolecular forces between its molecules than **B**,✓ hence more energy is needed to overcome the intermolecular forces in **C** than in **B**. ✓ (5)

[14]

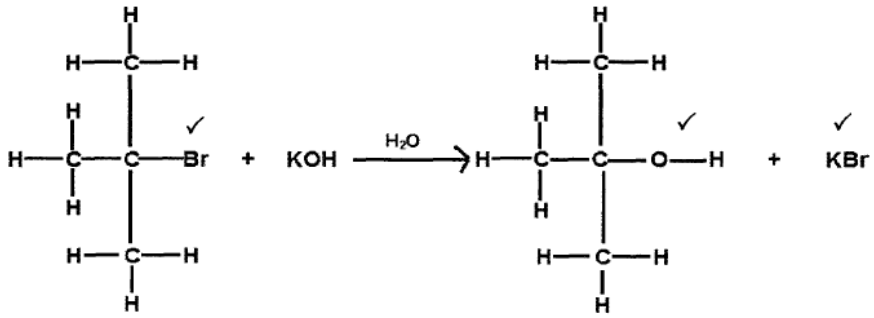
QUESTION 4

4.1.1



✓✓ (2)

4.1.2



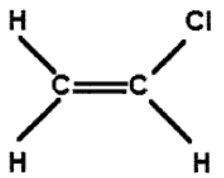
(3)

4.1.3 Ethanol as solvent✓ / NaOH(aq) ✓ or KOH(aq) / Mild heat (2)

4.1.4 Hydrolysis / Substitution reaction ✓ ✓ (2)

4.2.1 *Condensation polymer* is a polymer formed by two monomers with different functional groups ✓ that are linked together in a condensation reaction in which a small molecule (usually water) is lost. ✓ (2)

4.2.2 ✓ ✓ (2)



4.2.3 Chloroethylene /Chloroethene/Vinyl chloride. ✓✓ (2)

4.3.1 Condensation polymer ✓ (1)

4.3.2 Addition polymer ✓ (1)

4.4 ANY of the following:

- Blood transfusion sets✓; - Transparent food packaging trays;
- Plumbing pipes; - Synthetic leather, etc. (1)

[18]

Energy and Rate of Reaction

1.3 B ✓✓

QUESTION 6

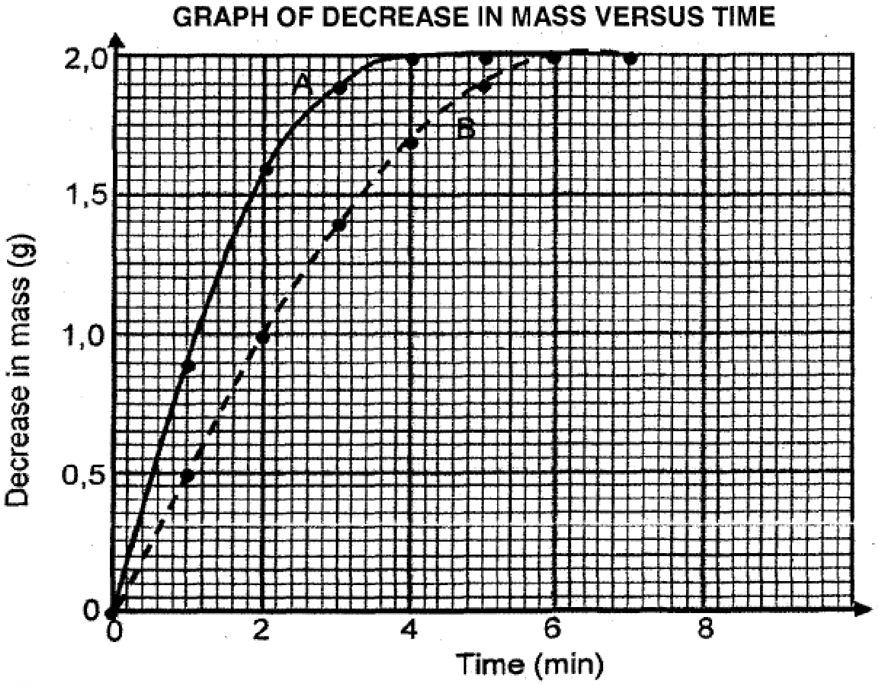
6.1 What is the relationship between the reaction surface or state of division of a solid and the rate of a reaction? / How does reaction surface (or state of division) influence the rate of a chemical reaction? ✓ ✓

OR

What is the relationship between the reaction surface (of a reactant) and the time that reaction takes to progress completely? (2)

6.2 $CaCO_3(s) + 2HCl(aq)$ ✓ $\rightarrow$ $CaCl_2(aq) + H_2O(l) + CO_2(g)$ ✓ bal ✓ (3)

6.3



CHECKLIST	MARK ALLOCATION
Heading	✓
Correct scale on both axes	✓
Correct labelling of both axes	✓
Plotting of points	✓✓
Correct shape of curves	✓

(6)

6.4 Reaction A is faster than Reaction B✓ (1)

6.5 The same (2 g) ✓ (1)

6.6 The greater the reaction surface, the higher the rate of reaction will be.✓ ✓ (2)

[15]

Equilibrium

1.9 B ✓✓

QUESTION 7

7.1 Le Chatelier's principle: When the equilibrium in a closed system is disturbed, the system will re-instate a new equilibrium by favouring the reaction that will oppose the disturbance.

OR

Le Chatelier's principle: When conditions (concentration, temperature and pressure) are changed in equilibrium in a closed system, equilibrium is shifted to the side which opposes the change. (2)

7.2.

OPTION 1: CALCULATION USING CONCENTRATION

	1 H_2	**1CO**	**1H_2O**	**1CO**
Initial concentration	X/10	0,03 ✓	0	0
Reacted/produced	0,02	0,02	0,02 ✓	0,02 ✓
Equilibrium	X/10 - 0,02	0,01	0,02	0,02 ✓

$$K_C = \frac{[CO][H_2O]}{[H_2][CO_2]} ✓$$

$$4 ✓ = \frac{(0{,}02)(0{,}02)}{X/10 - 0{,}02)(0{,}01)} ✓$$

$$X = 0{,}3$$

$n(H_2) = 0{,}3$ mol ✓

No Kc expression, correct substitution	Max. 7/8
Wrong Kc expression	Max. 4/8

OPTION 2: CALCULATION USING NUMBER OF MOLES

	1H_2	**1CO_2**	**1H_2O**	**1CO**	
Initial quantity (mol)	X	0,3	0	0	
Change (mol)	-0,2	-0,2	0,2	0,2	Mole ratio ✓
Quantity at equilibrium (mol)	X-0,2	0,1	0,2 ✓	0,2	✓
Equilibruim concentration ($mol.dm^{-3}$)	$\frac{X-0{,}2}{10}$	0,01	0,02	0,02	Divide by 10 ✓

$$K_C = \frac{[CO][H_2O]}{[H_2][CO_2]} ✓$$

$$4 ✓ = \frac{(0{,}02)(0{,}02)}{X/10 - 0{,}02)(0{,}01)} ✓$$

$X = 0{,}3$ Thus $n(H_2) = 0{,}3$ mol ✓ (8)

7.3. -ve marking

Exothermic ✓

A decrease in K_c value at a higher temperature implies the reverse reaction (endothermic)/ the reaction that uses energy is favoured. ✓Results in lower product concentration (less products) OR higher reactant concentration (more reactants). ✓ Equilibrium position shifts to the right/ lies to the right. ✓ (4)

[14]

Electrochemistry

1.7 A ✓✓ 1.8 A ✓✓

QUESTION 8

8.1 - Temperature of 25 ^{0}C ✓

- Concentration of 1mol·dm^{-3} ✓ (2)

8.2 $Ag^+(aq) + e^- \rightarrow Ag(s)$ ✓ ✓ (2)

8.3 Ni ✓ (1)

8.4 The emf decreases. ✓ (1)

8.5 $Ni(s) + 2Ag^+(aq)$ ✓ $\rightarrow Ni^{2+}(aq) + 2Ag(s)$. ✓✓ (3)

8.6 $Ni \rightarrow Ni^{2+} + 2e^-$

mol ratios: from the balanced equation is

0,2 : 0,2 : 0,4

m = n(Ni). M ✓

= 0,2 x 59 ✓

= 11,8g of Ni is lost from the anode. ✓ (3)

8.7 -ve marking

Second (2nd) or **B**. ✓

Magnesium (Mg) is a better reducing agent than Nickel (Ni) and its potential difference is -2,36 V whilst that of Ni is -0,27 V. ✓

Silver (Ag) has the same oxidising ability in both galvanic cells. ✓ (3)

[15]

QUESTION 9

9.1 The process in which electricity is used to bring about a chemical change in an electrolytic cell/ decompose /break compounds into components. ✓✓

OR

A process in which electrical energy is converted to chemical energy. (2)

9.2 **P**✓, it is the positive electrode/ anode. ✓

Oxidation takes place at the positive electrode /anode. ✓ (3)

9.3 $Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$ ✓ ✓ (2)

9.4 The rate at which copper is oxidised (at the anode) is equal to the rate at which copper ions are reduced (at the cathode). ✓ ✓

OR

Rate of oxidation equals the rate of reduction. (2)

9.5 - Ornaments ✓; Electrical conductors ✓/Jewellery (2)

[11]

Acids and Bases

1.5 D ✓✓ 1.10 C ✓✓

QUESTION 5

5.1 An acid is a proton donor. ✓ ✓ (2)

5.2

5.2.1 H_2O ✓ (1)

5.2.2 H_3O^+ ✓ (1)

5.3

5.3.1 Ionises / dissociates completely (in water) ✓ ✓ (2)

5.3.2 pH = -log $[H_3O^+]$

Ratio: 1: 2

0,025 mol H_2SO_4 $\rightarrow$ 0,05 mol H_3O^+ ✓

pH = -log $[H_3O^+]$ ✓

= -log [0,05] ✓

= 1,3 ✓ (4)

5.4

5.4.1 OH^- ✓ (1)

5.4.2 DECREASE ✓ (1)

5.5 $n(H_2SO_4)$ = cV ✓ = $(0,4)(15\times10^{-3})$ ✓

= 6×10^{-3} mol ✓

n(NaOH) = cV = $(0,2)(25\times10^{-3})$ ✓

= 5×10^{-3} mol ✓

From the balanced equation:

1 mol of H_2SO_4 = 2 mol of NaOH

Hence, n(NaOH) needed to neutralise the acid = $2(6\times10^{-3})$ = 12×10^{-3} mol ✓

Therefore insufficient NaOH was added to the acid since 5×10^{-3} mol is less than the required 12×10^{-3} mol ✓ (6)

[18]

Fertilizer Industry

QUESTION 10

10.1 $4NH_3(q) + 5\,O_2(aq)$ ✓ $\longrightarrow$ $4NO(g) + 6H_2O(g)$ ✓ ✓ (3)

10.2 Pt or Platinum ✓ (1)

10.3 Catalytic oxidation of NH_3 ✓✓ (2)

10.4 HNO_3 ✓ (1)

10.5 Ostwald (process). ✓ (1)

10.6
- Brown or yellow scorching around the edges of the leaves. ✓
- Flowers become dull and sparse. ✓
- Fruit yield low and of poor quality. (2)

[10]