

Name of the Student: _____

Max. Marks : 22 Marks

Time : 22 Minutes

Mark Schemes

Q1.

(a) Amount Diester = $1 - \frac{x}{2}$

M1

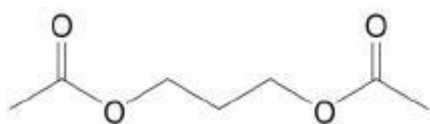
Amount Water = $1 - x$

M2

Amount Diol = $\frac{x}{2}$

M3

(b)



Allow other versions of the structure (abbreviated or displayed)

1

(c) $K_c = \frac{0.452^2 \times 0.273}{0.971 \times (\text{amount H}_2\text{O})^2}$ or $\frac{[\text{acid}]^2 \times [\text{diol}]}{[\text{diester}] \times [\text{H}_2\text{O}]^2}$
 $(\text{Amount H}_2\text{O})^2 = \frac{0.452^2 \times 0.273}{0.161 \times 0.971}$ or $\frac{[\text{acid}]^2 \times [\text{diol}]}{[\text{diester}] \times K_c} = (0.357)$

M1

$$K_c = \frac{\left(\frac{0.452}{\cancel{v}}\right)^2 \times \left(\frac{0.273}{\cancel{v}}\right)}{\left(\frac{0.971}{\cancel{v}}\right) \left(\frac{\text{amount H}_2\text{O}}{\cancel{v}}\right)^2}$$

M2

Amount H₂O = $\sqrt{0.357} = 0.597 \text{ mol}$

M3

[7]

Q2.

(a)



1

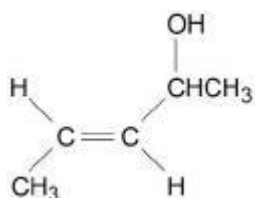
(b) Use Plane polarised light

M1

rotates (the plane of) in opposite directions

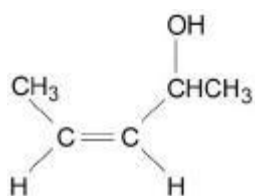
M2

(c)



Must be E isomer

M1

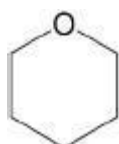


Must be Z isomer

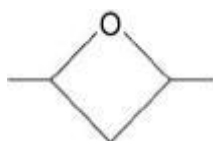
Allow 1 mark out of 2 for 2 correct structures but shown in the wrong boxes

M2

(d)



M1

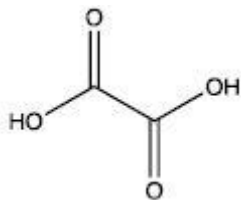


M2

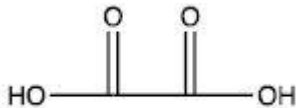
[7]

Q3.

(a)



Any correct skeletal representation, but alcohol H's should be shown and C atoms should not be shown



1

- (b) **M1** acidified potassium dichromate(VI) or sulfuric acid & potassium dichromate(VI)

M1 H_2SO_4 and $\text{K}_2\text{Cr}_2\text{O}_7$ or H^+ and $\text{K}_2\text{Cr}_2\text{O}_7$

do not need (VI), but if oxidation state given it must be correct

allow other strong acids

1

M2 reflux

M2 need an attempt at an oxidising agent in **M1**

1

- (c) **M1** amount of $\text{H}_2\text{C}_2\text{O}_4 = 0.400 \times \frac{10}{1000} = 0.004 \text{ mol}$

1

NaOH in excess

M2 amount of NaOH = $0.200 \times \frac{50}{1000} = 0.010 \text{ mol}$

NaOH in excess: allow ECF from **M1/2** to **M3** as long as the amounts do have NaOH in excess

1

M3 amount of NaOH needed for reaction = 0.008 mol or amount of left over NaOH needed for reaction = 0.002 mol or 0.005 mol of $\text{H}_2\text{C}_2\text{O}_4$ needed for all NaOH to react

M3 Allow any reasoned justification using moles to show that NaOH is in excess (it must take into account the 2:1 ratio in some way)

1

Yield

M4 amount of $\text{Na}_2\text{C}_2\text{O}_4$ formed = 0.004 mol

1

M5 mass of $\text{Na}_2\text{C}_2\text{O}_4 = 134.0 \times 0.004 = 0.536 \text{ g} = 536 \text{ mg}$

Yield: allow ECF from **M1** to **M4**, and from **M4** to **M5**

536 mg scores **M1,4,5**

0.536 g scores **M1,4**

1

[8]