

Name of the Student: _____

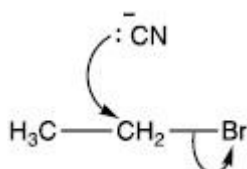
Max. Marks : 24 Marks

Time : 24 Minutes

Mark Schemes

Q1.

(a)

**M1** arrow from lone pair on C of CN⁻ to the C of the CH₂ group**M2** arrow from the C-Br bond to the Br

All arrows are double-headed. Penalise one mark from the total for **2.1** if half headed arrows are used.

Do not penalise the "correct" use of "sticks"

Penalise only once in mechanism for a line and two dots to show a bond

Allow the minus sign to be anywhere on the CN⁻ ion

M2 penalise formal charges or incorrect partial charges on C-Br bond

SN1: allow SN1 mechanism with **M1** for breakage of C-Br bond and **M2** for attack by CN⁻ on correct carbocation

Max 1 of 2 marks for wrong organic reactant

Ignore wrong organic product (if shown)

Extra arrows or incorrect covalent bonds:

Penalise the mark for breaking of C-Br bond for any extra arrows involving Br or covalent bond in KBr

Penalise the mark for attack by CN⁻ for any extra arrows involving CN or covalent bond in KCN

2

(b) propanenitrile

Ignore any gaps, hyphens, commas

Allow propane-1-nitrile

1

(c)

$$\text{M1 } \frac{55(.0)}{108.9+65.1} (\times 100) \quad \text{or} \quad \frac{55(.0)}{174(.0)} (\times 100) \quad \text{or} \quad \frac{55(.0)}{55(.0)+119(.0)} (\times 100)$$

1

M2 31.6(%) (must be 3sf)

1

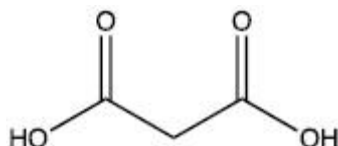
31.6 scores 2 marks; 32 scores 1 mark

no ECF

[5]

Q2.

(a)



Must be a skeletal formula

Need to show the H atoms of OH groups

1

(b)

This is an extended response question and there is a requirement for shaking right at the end. (M6 requires idea of mixing at the end.)

M1 weigh out sample in bottle / boat / container

*Penalise **M1** for weighing out wrong substance or using the acid as a liquid or solution (for **M1**, acid must be a solid that is being weighed). For **M1**, ignore any reference to a specific mass.*

1

M2 transfer to (conical) flask / beaker (or suitable container) and wash all sample in or re-weigh bottle / boat / container or re weigh bottle / boat / container

1

M3 dissolve sample in (deionised / distilled) water (if volume of water is specified, must be less than 250 cm³)

For dissolving, ignore any reference to warming.

Maximum of 4 marks for candidates who add any substance other than water.

1

M4 add into volumetric flask with washings

Allow graduated flask for volumetric flask

1

M5 make up to mark / 250 cm³ in volumetric flask

1

M6 shake / invert (this should be to give a homogenous solution rather than to dissolve; must be after made up to mark; ignore any earlier shaking)

1

Candidates may dissolve sample directly in volumetric flask. Mark scheme for this method:

M1 weigh out sample in bottle / boat / container

M2 add into volumetric flask

M3 wash all sample in or re-weigh bottle / boat / container or re-weigh bottle / boat / container or re-weigh bottle / boat / container

M4 dissolve sample in (deionised / distilled) water (if volume of water is specified, must be less than 250 cm³)

M5 make up to mark / 250 cm³ in volumetric flask

M6 shake / invert (this should be to give a homogenous solution rather than to dissolve; must be after made up to

mark; ignore any earlier shaking)

- (c) **M1** moles of acid = $0.00500 \times \frac{250}{1000}$ (= 0.00125)
130 scores 2 marks
Final answer must be at least 2sf

1

- M2** mass of acid (= $0.00125 \times 104(.0) = 0.130 \text{ g} = 130 \text{ (mg)}$)
Allow ECF from **M1** to **M2**
0.13(0) scores 1 mark
2080 (mg) scores 1 mark

1

[9]

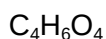
Q3.

(a) $(\text{COOH})_2 = \text{C}_2\text{H}_2\text{O}_4 = 90$

M1

$118 - 90 = 28$ OR C_2H_4

M2



M3

Must be molecular formula

Structural formula can score M1 & M2

(b) Amount NaOH = $(21.60 \times 10^{-3}) \times 0.109$

$= 2.3544 \times 10^{-3} \text{ mol}$

M1 for answer (to 3sfs min)

M1

Amount H_2A in $25 \text{ cm}^3 = 1.177 \times 10^{-3} \text{ mol}$

M2 = $0.5 \times \text{M1}$

M2

Amount H_2A in $250 \text{ cm}^3 = 1.177 \times 10^{-2} \text{ mol}$

M3 = **M2** $\times 10$

M3

Mass = 1.39 g (Must be 3sf)

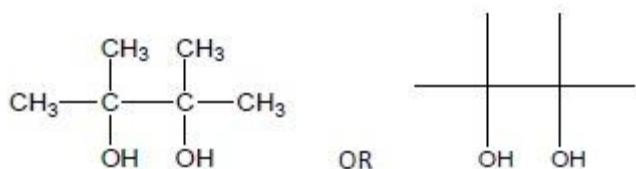
M4 = answer to (**M3** $\times 118$) and must be 3sf

M4

(c) 4 or four

1

(d)



1

(e) The precise (relative molecular) masses are different or write

Allow M_r are different to 2 or more or several dp

Ignore different molecular formula

Ignore accuracy

Penalise fragments

1

[10]