Name of the Student:_____
Max. Marks : 25 Marks **Time : 25 Minutes**

Mark Schemes

Q1.

(a) **M1** $C_6H_{12}O_6 \longrightarrow$ **2**CH_3CH_2OH + **2**CO_2
($2C_2H_5OH$)

Mark independently
For M1 and M3 ignore state symbols and credit multiples
For M1 and M3 penalise C_2H_6O once only

M2 fermentation

M3 CH_3CH_2OH + **3**O_2 $\longrightarrow$ **2**CO_2 + **3**H_2O
(C_2H_5OH)

M4 A specified process e.g. planting / harvesting / transport / extracting sugar / distilling ethanol solution / fertiliser production etc.

M5 The specified process uses / burns (fossil) fuel that releases CO_2
For M5, "releases / increases carbon emissions" is insufficient as an alternative to releases CO_2

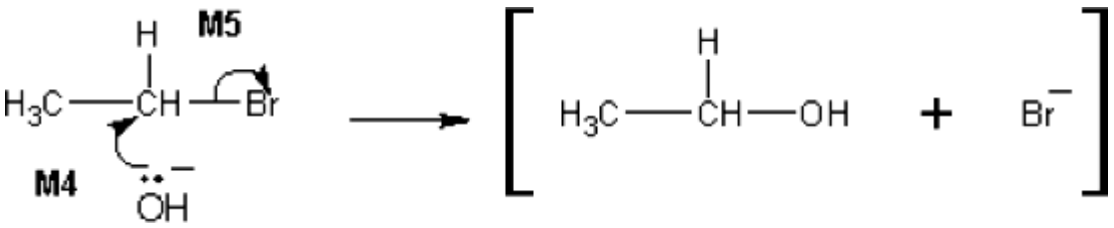
5

(b) **M1** sodium or potassium hydroxide / NaOH / KOH
Mark on to M2 from hydroxide ion

M2 **depends on correct M1**
Ignore OH^- if KOH/ OH^-

warm / heat / reflux and aqueous or (aq) or water
For M2 ignore "dilute"
For M2 penalise T > 100 °C

M3 nucleophilic substitution
Acidified KOH/NaOH or H_2SO_4 with KOH/NaOH loses M1 and M2



For M3, both words required

NB The arrows here are double-headed

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M4 must show an arrow from the lone pair of electrons on the oxygen atom of the negatively charged hydroxide ion to the C atom.

Penalise M4 if covalent NaOH / KOH is used

Penalise one mark from M4 or M5 if half-headed arrows are used

M5 must show the movement of a pair of electrons from the

C— Br bond to the Br atom. Mark M5 independently provided it is from their <u>original molecule.</u>

Penalise M5 for formal charge on C of the C–Br or incorrect partial charges on C–Br

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

For M4 and M5, award full marks for an S_N1 mechanism

For M4 and M5, maximum 1 of 2 marks if wrong reactant is used.

Penalise M5 if an extra arrow is drawn from the Br of the C–Br bond to, for example, K^+

Do not penalise the use of "sticks"

M6 One statement from

- The yield is (very) low / not a high yield OR elimination occurs / ethene formed
- The rate of reaction slow
- <u>Bromoethane</u> has to be manufactured / made first
- <u>Bromoethane</u> is expensive

For M6 ignore references to other costs and expenses

6

(c) **M1** <u>concentrated</u> phosphoric acid / <u>conc</u>. H_3PO_4 **OR** <u>concentrated</u> sulfuric acid / conc. H_2SO_4

Answers in any order

Ignore reference to support medium in M1

M2 hydration or (electrophilic) addition

For M3 and M4 <u>any two</u> from

Do not apply the list principle to these three chosen criteria in M3 and M4

- <u>Excess</u> ethene

  OR <u>Excess</u> steam / water / H_2O

  OR remove the ethanol as it forms

  OR recycle the ethene

- <u>Specified</u> Pressure

  50 atm ≤ P ≤ 100 atm

  OR 5000 kPa ≤ P ≤ 10000 kPa

  OR 5 MPa ≤ P ≤ 10 MPa

- <u>High</u>Temperature unless they give a value that is not in the ranges given here;

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OR 300 °C ≤ T ≤ 600 °C

OR 570 K ≤ T ≤ 870 K

Accept a reference to “low temperature” if they specify a correct temperature range or a correct temperature in the range

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Q2.

(a) $Ca(OH)_2$ OR $Mg(OH)_2$

Ignore name

Could be ionic

1

(b) NaF or sodium fluoride

OR

NaCl or sodium chloride

Either formula or name can score

Do not penalise the spelling "fluoride"

When both formula and name are written,

- penalise contradictions
- if the attempt at the correct **formula** is incorrect, ignore it and credit **correct name** for the mark unless contradictory
- if the attempt at the correct name is incorrect, ignore it and credit **correct formula** for the mark unless contradictory

1

(c) NaClO OR NaOCl

Ignore name (even when incorrect)

The correct formula must be clearly identified if an equation is written

1

(d) **Br_2** (ONLY)

Only the correct formula scores;

penalise lower case "b", penalise upper case "R", penalise superscript

Ignore name

The correct formula must be clearly identified if an equation is written

1

(e) **M1** S OR S_8 OR S_2

M2 I_2 (ONLY)

Ignore names

penalise lower case "i" for iodine,

penalise superscripted numbers

Mark independently

The correct formula must be clearly identified in each case if an equation is written

2

(f) (i) $CH_3CH_2CH=CH_2$

Structure of but-1-ene. Ignore name

Credit "sticks" for C-H bonds

1

(ii) $CH_3CH_2CH_2CH_2OH$

Structure of butan-1-ol. Ignore name

Credit "sticks" for C-H bonds

1

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(iii) $CH_3CH_2CH_3$

Structure of propane. Ignore name
Ignore calculations and molecular formula
Credit "sticks" for C-H bonds
Ignore the molecular ion

1

(iv) CH_3CH_2Br OR $C_2H_5B_r$

Structure of bromoethane.
Ignore name and structure of nitrile
Credit "sticks" for C-H bonds

1

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