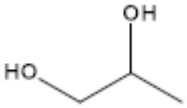
AQA Chemistry A-Level

Mark Scheme for
Organic Practical Skills Questions

M1.(a) 

Any correct skeletal formula (both OH groups must be shown)

1

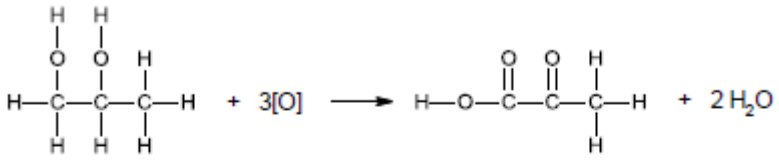
(b) M1 Displayed formula of correct product

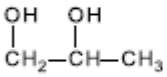
Incorrect organic product CE=0

Must be displayed formula but can be shown separately or in the equation

1

M2 Balanced equation





$CH_2OHCHOHCH_3$

$C_3H_8O_2$

Allow any correct structural formula (or molecular formula $C_3H_4O_3$) for product in balanced equation

Allow any correct formula of propane-1,2-diol (including its molecular formula $C_3H_8O_2$)

1

(c) M1 flask with condenser vertically above it (without gaps between flask and condenser)

Distillation diagram CE = 0

Condenser must have outer tube for water that is sealed at top and bottom; condenser must have two openings for water in/out (that are open, although these openings do not need to be labelled)

Penalise M1 if apparatus is sealed (a continuous line across the top and/or bottom of the condenser is penalised)

1

M2 flask and condenser labelled

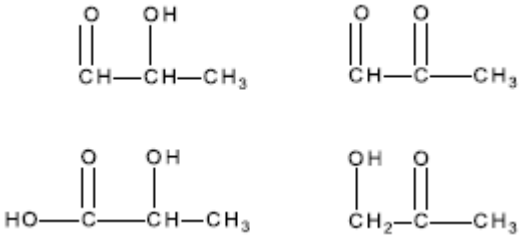
Allow condensing tube for condenser label

1

(d) Form small(er) bubbles or prevent large bubbles

1

(e) Any one of these four structures:



Allow any correct structural / displayed / skeletal formula

For reference:

Carbon 1	Carbon 2
aldehyde	alcohol
carboxylic acid	alcohol
aldehyde	ketone
alcohol	ketone

1

[7]

M2.(a) To prevent vigorous boiling / uneven boiling / bubbling vigorously

Reference to an effect on 'reaction' here loses this mark.

1

(b) Condenser

Accept 'condensation chamber' or 'condensation tube'.

1

Should show effective water jacket and central tube

If a flask is also drawn then the condenser must be at an appropriate angle.

Apparatus must clearly work.

Ignore direction of water flow.

Diagram must have a clear flow of vapour and water eg unblocked central tube or flow indicated by arrows.

1

[3]

M3.(a) (i) M_r N−phenylethanamide = 135.0

1

Theoretical yield = 135.0 × 2 (1.15 / 284.1) = 1.09 g

1

Answer recorded to 3 significant figures.

1

(ii) $\frac{0.89}{\text{Ans to (a)}} \times 100$

= 81.4 %

Mark consequentially to (a)
Allow 81 to 82

1

(b) (i) Dissolve the product in the **minimum** volume of water / solvent (in a boiling tube / beaker)

If dissolving is not mentioned, CE = 0 / 4

1

Hot water / solvent

Steps must be in a logical order to score all 4 marks

1

Allow the solution to cool and allow crystals to form.

1

Filter off the pure product under reduced pressure / using a Buchner funnel and side arm flask

Ignore source of vacuum for filtration (electric pump, water pump, etc.)

1

(ii) Measure the melting point

1

Use of melting point apparatus or oil bath

1

Sharp melting point / melting point matches data source value

1

(iii) Any **two** from:
Product left in the beaker or glassware
Sample was still wet
Sample lost during recrystallisation.
Do not allow "sample lost" without clarification.

2 Max

(c) An identified hazard of ethanoyl chloride
E.g. "Violent reaction", "harmful", "reacts violently with water"
Do not allow "toxic", "irritant" (unless linked with HCl gas).

1

HCl gas / fumes released / HCl not released when ethanoic anhydride used

1

[15]

M4.(a) Side-arm flask / side-arm test tube
Do not allow sealed side-arm flask.

1

Flat-bottomed filter funnel with filter paper clearly shown
Either Buchner or Hirsch versions are suitable.
Allow Hirsch funnel and horizontal filter paper.
Allow three-dimensional filter funnels.
Do not allow standard Y-shaped funnel.
Do not allow sealed funnel.
If it is not clearly air-tight between the funnel and the flask, maximum 1 mark.

1

(b) Heat melting point tube in an oil bath
Accept 'melting point apparatus' or Thiele tube.
Do not accept water bath.

1

slowly near the melting point

Ignore any additional correct details.

Apply list principle for additional incorrect details.

1

[4]

M5.(a) Melting range would be
wide (>3 deg C) / not sharp

Allow melts over a range of temperatures.

1

below / before the true m.p.

Do not allow 'above or below'.

1

(b) Temperature on thermometer not the same as the sample

Allow sample heats up at a different / higher / lower rate than thermometer.

1

[3]

M6. Minimum volume and hot water:

Note that this question is worth a total of 5 marks.

Any **two** from:

to obtain saturated solution

to increase yield / reduce amount left in solution

enable crystallisation (on cooling)

Do not allow 'because acid doesn't dissolve well in cold water'.

Max 2

Filtered hot: to remove insoluble impurities / to prevent crystals forming during filtration

1

Cooled in ice: to increase amount of crystals that are formed

Do not allow 'to cool quickly'.

1

Washed with cold water: to remove soluble impurities

Allow 'washing with hot water would dissolve some of the crystals'.

1

[5]

M7.(a) H_2SO_4

Allow H_3PO_4 or HCl

1

(b) Dichromate / Cr(VI) reduced or Cr(III) formed.

Allow Cr^{6+} and Cr^{3+}

1

(c) The alcohol is flammable

Allow enables temperature to be controlled

1

(d) Tollens'

1

Silver mirror
OR Fehling's
Red precipitate
OR Benedict's
Red precipitate

1

[5]

M8.(a) **Wear plastic gloves:**

Essential – to prevent contamination from the hands to the plate

1

Add developing solvent to a depth of not more than 1 cm^3:

Essential – if the solvent is too deep it will dissolve the mixture from the plate

1

Allow the solvent to rise up the plate to the top:

Not essential – the R_f value can be calculated if the solvent front does not reach the top of the plate

1

Allow the plate to dry in a fume cupboard:

Essential – the solvent is toxic

Allow hazardous

1

(b) Spray with developing agent or use UV

1

Measure distances from initial pencil line to the spots (*x*)

1

Measure distance from initial pencil line to solvent front line (*y*)

1

R_f value = *x* / *y*

1

(c) Amino acids have different polarities

1

Therefore, have different retention on the stationary phase or different solubility in the developing solvent

1

[10]

M9.(a) A mixture of liquids is heated to boiling point for a prolonged time

1

Vapour is formed which escapes from the liquid mixture, is changed back into liquid and returned to the liquid mixture

1

Any ethanal and ethanol that initially evaporates can then be oxidised

1

(b) $CH_3CH_2OH + H_2O \longrightarrow CH_3COOH + 4H^+ + 4e^-$

1

(c) Mixture heated in a suitable flask / container

A labelled sketch illustrating these points scores the marks

1

With still head containing a thermometer

1

Water cooled condenser connected to the still head and suitable <u>cooled</u> collecting vessel

1

Collect sample at the boiling point of ethanal

1

Cooled collection vessel necessary to reduce evaporation of ethanal

1

(d) Hydrogen bonding in ethanol and ethanoic acid or no hydrogen bonding in ethanal

1

Intermolecular forces / dipole-dipole are weaker than hydrogen bonding

1

(e) Reagent to confirm the presence of ethanal:

Add Tollens' reagent / ammoniacal silver nitrate / aqueous silver nitrate followed by 1 drop of aqueous sodium hydroxide, then enough aqueous ammonia to dissolve the precipitate formed

OR

Add Fehling's solution

1

Warm

M2 and M3 can only be awarded if M1 is given correctly

1

Result with Tollen's reagent:

Silver mirror / black precipitate

OR

Result with Fehling's solution:

Red precipitate / orange-red precipitate

1

Reagent to confirm the absence of ethanoic acid

Add sodium hydrogencarbonate or sodium carbonate

1

Result; no effervescence observed; hence no acid present

1

M5 can only be awarded if M4 is given correctly

OR

Reagent; add ethanol and concentrated sulfuric acid and warm

Result; no sweet smell / no oily drops on the surface of the liquid,

hence no acid present

[16]