



Diploma Programme
Programme du diplôme
Programa del Diploma

Chemistry
Standard level
Paper 1B

15 May 2026

Zone A afternoon | Zone B afternoon | Zone C afternoon

Session number

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1 hour 30 minutes [Paper 1A and Paper 1B]

Instructions to students

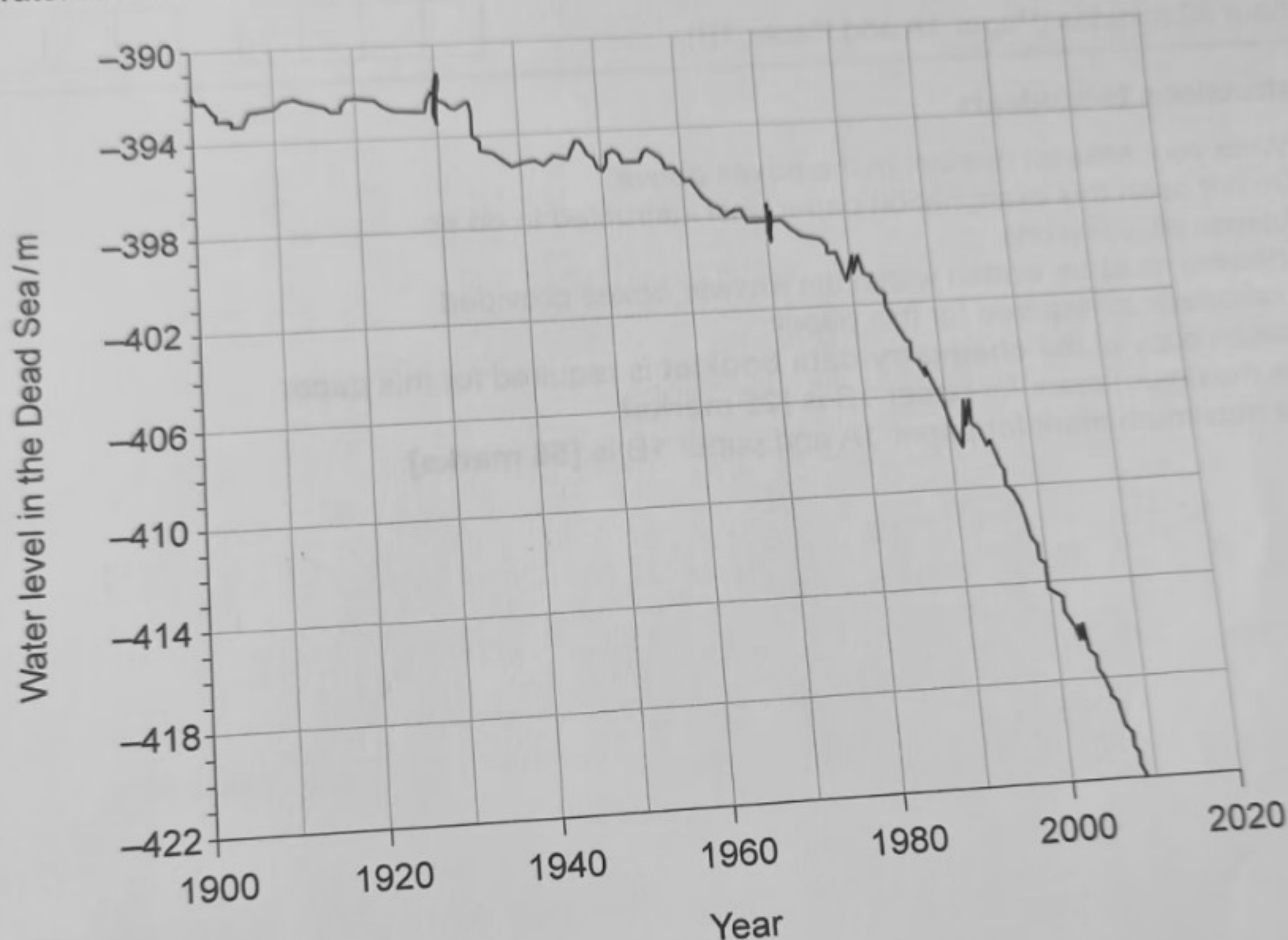
- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- Answer all questions.
- Answers must be written within the answer boxes provided.
- A calculator is required for this paper.
- A clean copy of the **chemistry data booklet** is required for this paper.
- The maximum mark for paper 1B is **[25 marks]**.
- The maximum mark for paper 1A and paper 1B is **[55 marks]**.

2026 May
paper 1b
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Section B

Answer **all** questions. Answers must be written within the answer boxes provided.

1. The level of water in the Dead Sea, a lake that has a high concentration of salt, has been decreasing dramatically.
- (a) The following data were collected over several decades. The reference point for the water level is sea level.



- (i) Suggest why the values on the y axis are negative.

..... water level is below sea level.....

(This question continues on the following page)

(Question 1 continued)

- (ii) The surface area of the Dead Sea was approximately 1020 km^2 from 1930 to 1970.

Estimate the volume, in m^3 , of water that evaporated during this time.

[2]

Water level in 1930 = -392.2
 in 1970 = -398.3
 $1020 \text{ km}^2 \times [-392.2 - (-398.3)] = 6222 \text{ km}^3 \cdot \text{m}$
 $= 6.222 \times 10^9 \text{ m}^3$

- (iii) Suggest **two** environmental factors that could cause the decreasing level of water in the Dead Sea.

[2]

global warming... cause... temperature... increase... the rate of evaporation... increase...
 reduced ~~rain~~ rain fall or drought causing less water fall.

189

(This question continues on the following page)

(Question 1 continued)

- (b) A variety of ions are found in the Dead Sea. The concentrations of the major ions are shown in the table, based on two different sources (both scientific journals).

Ion	Concentration / g dm^{-3} Based on Source 1	Concentration / g dm^{-3} Based on Source 2
Mg^{2+}	40.65 ✓	46 ✓
Na^+	39.15	37
Ca^{2+}	16.86	17
K^+	7.26	8
Cl^-	212.40	225
Br^-	5.12	6

- (i) Suggest **two** reasons for the difference in the concentration of magnesium ions between the two sources, other than experimental errors. [2]

..... Sampling .. difference two .. sample .. may .. ~~to~~ be .. taken .. in .. different
 .. depth .. of .. water; or .. two .. sample .. may .. be .. ~~to~~ taken .. in .. different
 .. season
 the .. apparatus .. used .. may .. be .. different different .. analysis .. method ..

- (ii) Calculate the percentage difference in the concentration of Mg^{2+} ions between Source 2 and Source 1. [1]

$$\frac{40.65 + 46}{2} = 43.33$$

$$\frac{46 - 40.65}{43.33} \times 100\% = 6.2\%$$

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(Question 1 continued)

- (iii) The concentration of some of the ions was determined using a spectrophotometer and a calibration curve. Describe how a calibration curve is constructed using a standard solution of a salt of the ion.

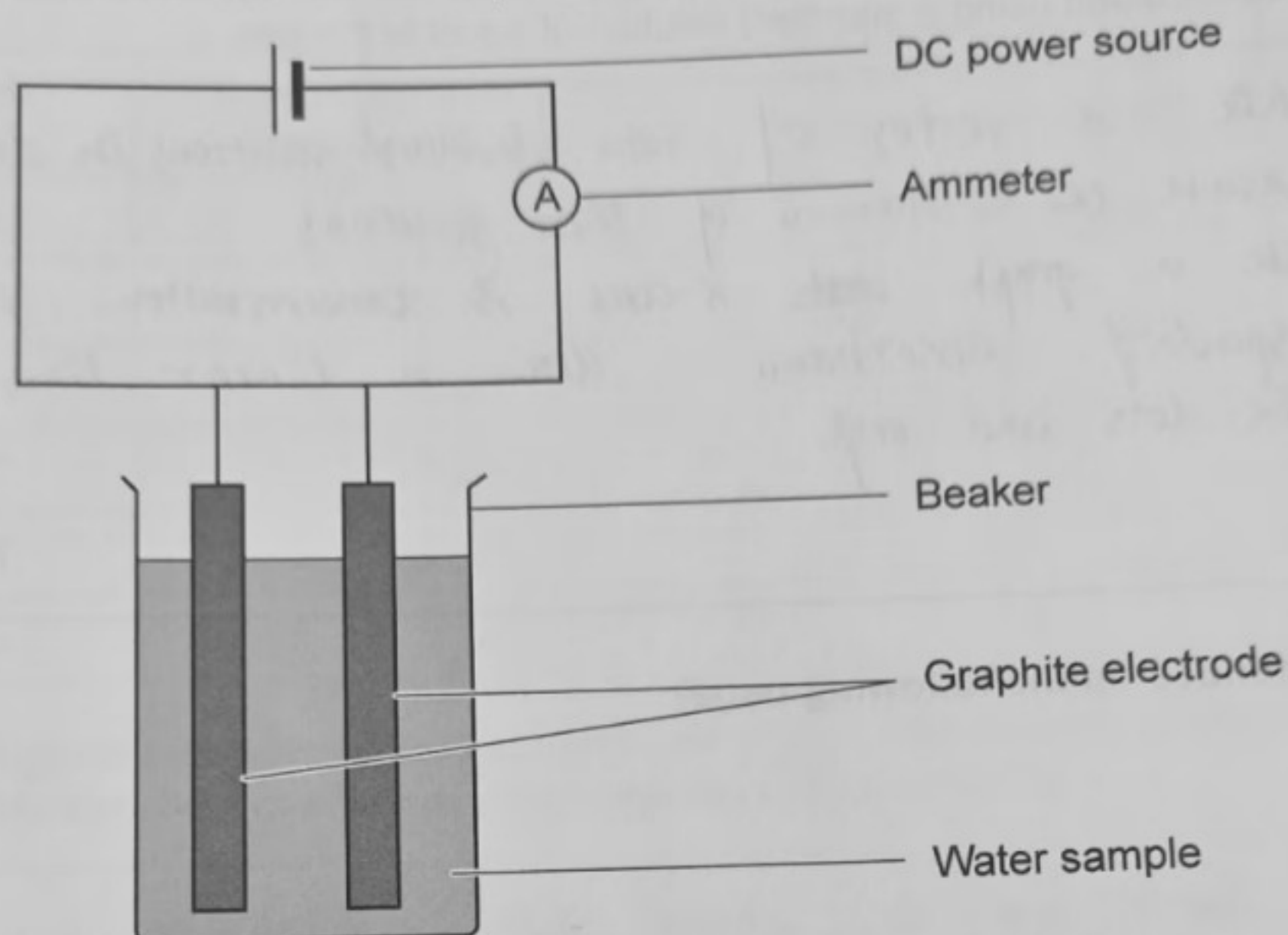
[3]

..... make a series of ~~sets~~ standard solutions in different concentrations.
 measure the absorbance of these solutions
 make a graph ~~with~~ x-axis is concentration y-axis is
 corresponding absorbance draw a linear line passing
 all the dots and origin

(This question continues on the following page)

(Question 1 continued)

- (c) A simple set up was used to compare the conductivity of samples of water obtained from the Dead Sea at different depths.



The following data was obtained:

Depth water sample was obtained from /m ± 0.05 m	Electric current recorded by the ammeter /A ± 0.01 A
5.00	2.52
10.00	2.50
15.00	2.47
20.00	2.21
25.00	2.16

- (i) State the independent and dependent variables in this experiment.

[2]

Independent variable: ... depth water ... sample ... obtained from ...

Dependent variable: ... Electric current recorded by ... amp ammeter ...
... which indicate the conductivity of sample ...

(This question continues on the following page)

(Question 1 continued)

- (ii) Suggest **two** variables, besides temperature, that must be controlled to get a fair comparison of the conductivity of the samples. [2]

Controlled variable 1: ... the voltage ... of ... D.C. power source ...

Controlled variable 2: ... the distance ... between ... two ... graphite electrodes ...

- (iii) Calculate the fractional uncertainty in the electric current at a depth of 5.00 m. State the answer using the appropriate number of significant figures. [1]

$$100\% \times \frac{0.01}{2.52} = 0.4\%$$

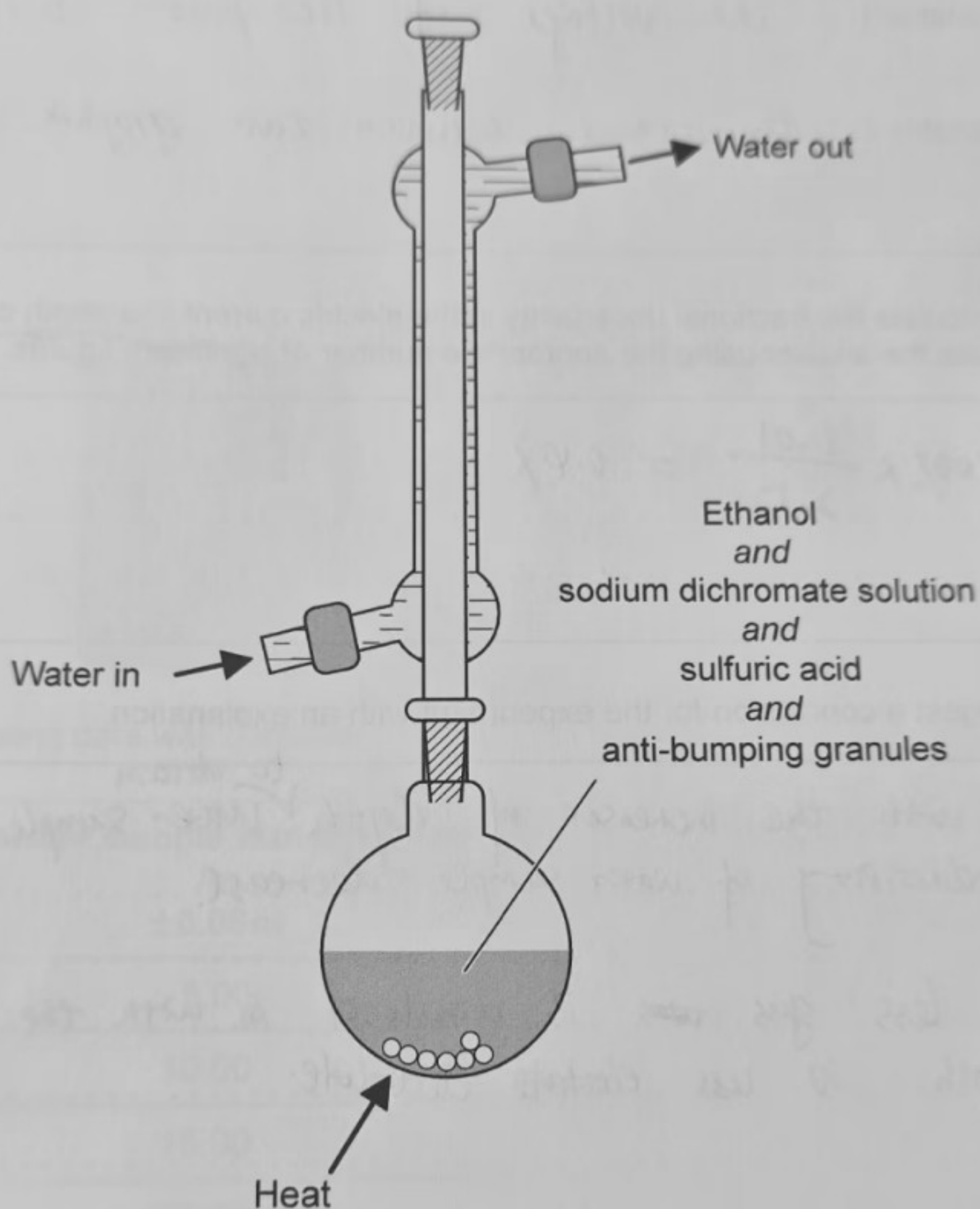
- (iv) Suggest a conclusion for the experiment with an explanation. [2]

Conclusion: ... with the increase of depth ^{to obtain} water sample ~~to~~ the conductivity of water sample decrease.

Explanation: ... less gas ~~was~~ is dissolved in with the increase of water depth so less ~~electrolyte~~ electrolyte.

2. In a student experiment, the apparatus shown was used to prepare ethanoic acid, CH_3COOH , from ethanol, $\text{C}_2\text{H}_5\text{OH}$.

1.60 g of ethanol, excess oxidizing agent (acidified $\text{Na}_2\text{Cr}_2\text{O}_7(\text{aq})$) and a few anti-bumping granules were added to the round bottom flask.



- (a) Outline **two** features of this experiment that ensure that the ethanal intermediate is not a major product.

..... Reflux to consistent heating system
 excess oxidizing agent (..... $\text{Na}_2\text{Cr}_2\text{O}_7/\text{H}^+$) to ensure full
 oxidation

(This question continues on the following page)

(Question 2 continued)

- (b) Outline **two** safety precautions that must be taken during the preparation of ethanoic acid, besides wearing a lab coat and safety goggles.

[2]

..... H_2SO_4 and $\text{Na}_2\text{Cr}_2\text{O}_7$ is corrosive..... gloves must be worn.
 $\text{C}_2\text{H}_5\text{OH}$ is flammable..... even ~~the~~ condenser is used better operated in fume hood.
 system is consistently heated..... use thermal gloves or.....
 wait till system cools down.....

- (c) After 30 minutes, the student stopped heating the mixture and titrated a sample of the solution remaining in the flask with NaOH to determine the experimental yield of ethanoic acid.

Explain why the titrated sample will give an incorrect value of the experimental yield.

[2]

..... the sample contain..... sulfonic acid..... which also react with.....
 NaOH the calculated amount of CH_3COOH is higher than.....
 true value.....

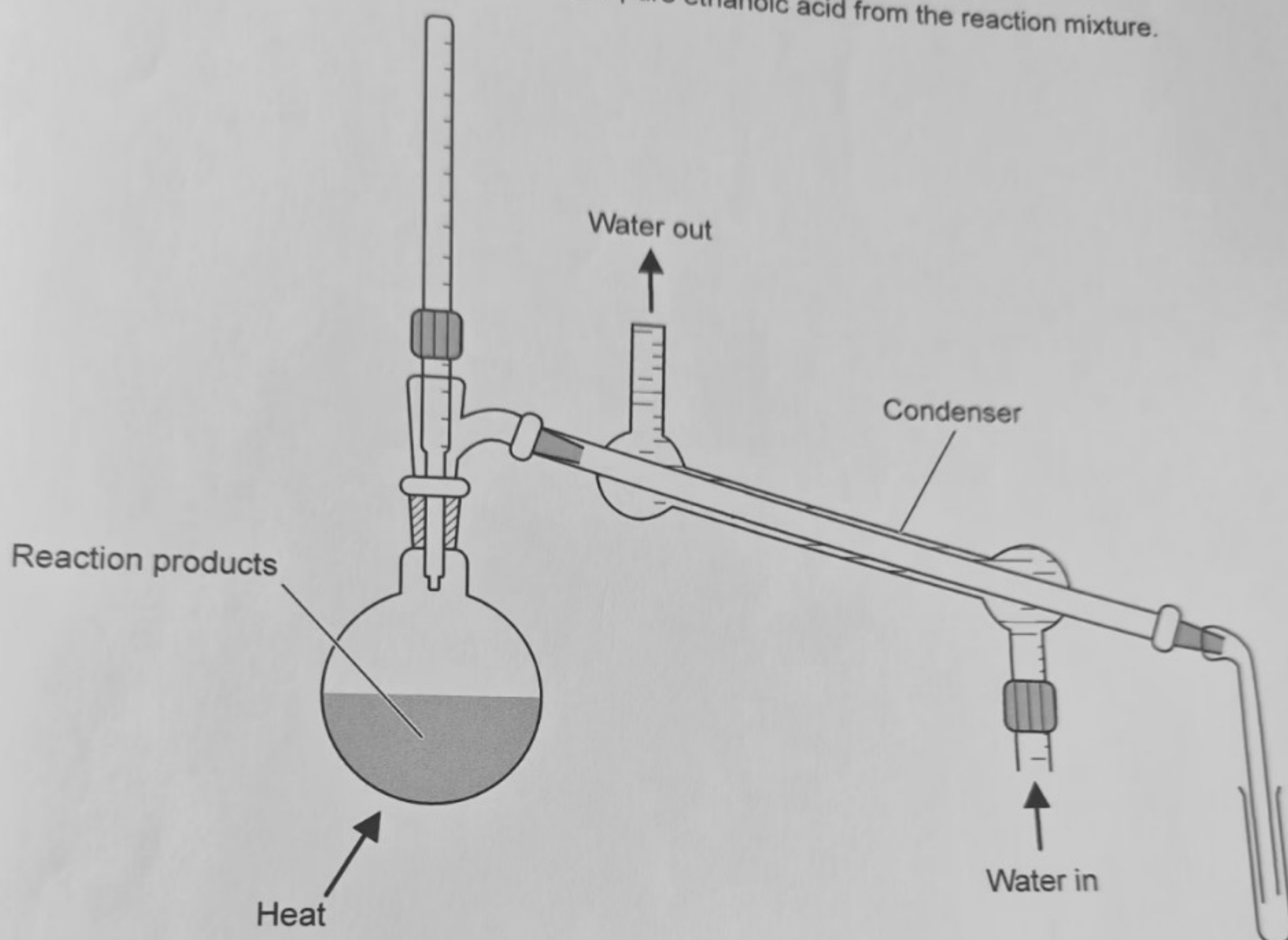
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(Question 2 continued)

- 11 -

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- (d) The student used distillation to obtain pure ethanoic acid from the reaction mixture.



State **two** impurities, apart from unreacted ethanol, that were present in the ethanoic acid before distillation.

[1]

..... Cr^{3+} $\text{Na}_2\text{Cr}_2\text{O}_7$ H_2SO_4 H_2O ~~CH_3COOH~~

..... CH_3CHO