

## **AS level Chemistry A**

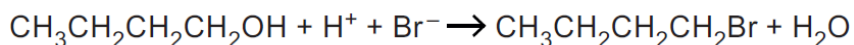
**H032/02** Depth in chemistry

### **Question Set 11**

1. (a) 1-Bromobutane is an organic liquid with a boiling point of 102 °C.

A student prepares 1-bromobutane by reacting butan-1-ol with sulfuric acid and sodium bromide. The student boils the mixture for one hour.

The equation is shown below.



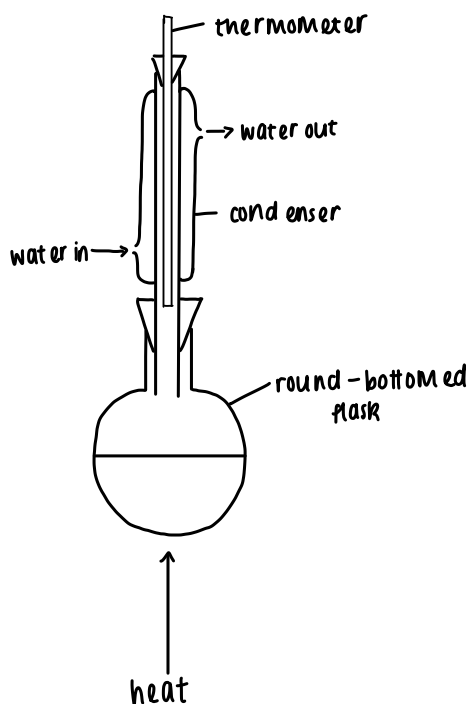
The student obtains a reaction mixture containing an organic layer (density = 1.27 g cm<sup>-3</sup>) and an aqueous layer (density = 1.00 g cm<sup>-3</sup>).

(i)\* Draw a labelled diagram to show how you would safely set up apparatus for the preparation.

Outline a method to obtain a pure sample of 1-bromobutane from the reaction mixture.

[6]

apparatus for reflux :



purification :

1. Separate the organic and aqueous layers using a separating funnel. Lower organic layer as density greater.
2. Dry organic layer using anhydrous magnesium sulfate (MgSO<sub>4</sub>)
3. Redistil the product and collect the fraction distilling at 102 °C.

(ii) The student used 0.150 mol of butan-1-ol. The student obtained a 61.4% percentage yield of 1-bromobutane.

Calculate the mass of 1-bromobutane obtained.

Give your answer to **three** significant figures.

[2]

$$\% \text{ yield} = \frac{\text{actual mass}}{\text{theoretical mass}}$$

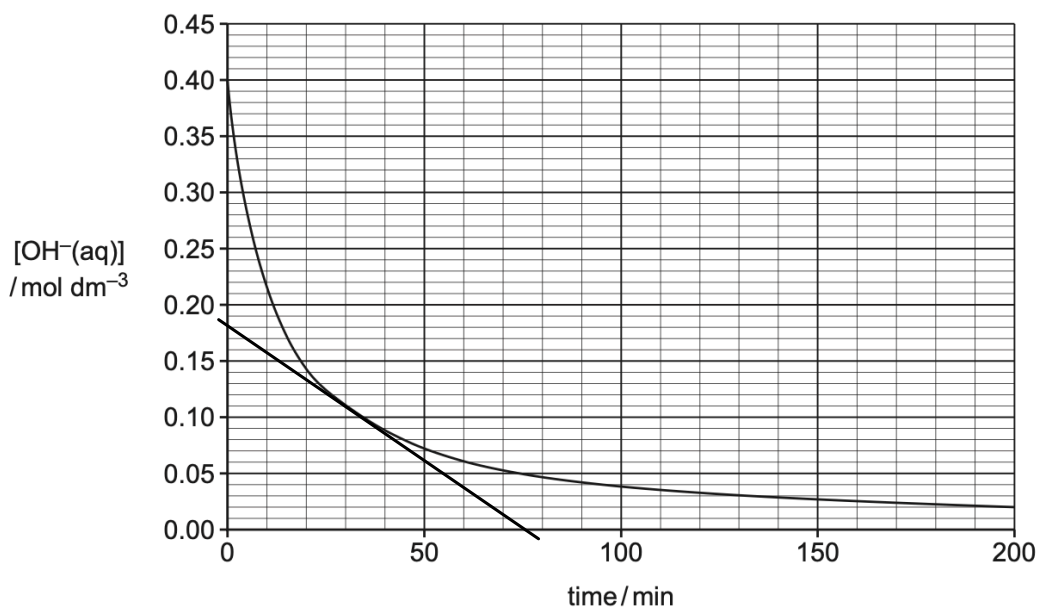
$$\begin{aligned} \text{theoretical mass} &: 0.15 \times 136.9 \\ &: 20.535 \text{ g} \end{aligned}$$

$$0.614 \times \text{theoretical mass} = \text{actual mass}$$

$$\text{actual mass} = 0.614 \times 20.535 = 12.6 \text{ g}$$

- (b) A student investigates the rate of reaction of 1-bromobutane with aqueous hydroxide ions.

The graph shows how the hydroxide ion concentration,  $[\text{OH}^-(\text{aq})]$ , changes during the reaction.



Using the graph, calculate the rate of reaction, in  $\text{mol dm}^{-3} \text{min}^{-1}$ , at 30 minutes. Show your working on the graph and in the space below.

$$\frac{0.18 - 0}{75 - 0} = 0.0024$$

$$\text{rate of reaction} = 0.0024 \text{ mol dm}^{-3} \text{min}^{-1}$$

[2]

**Total Marks for Question Set 5: 10**

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