

AS level Chemistry A

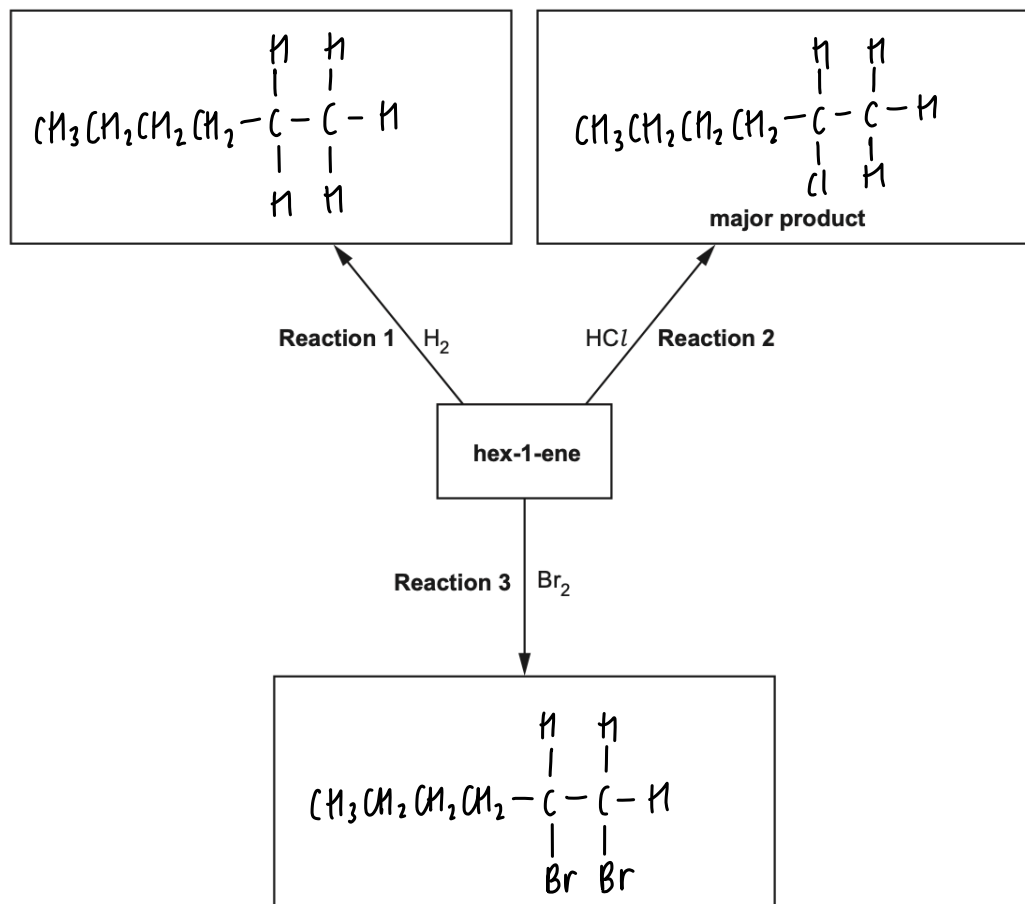
H032/02 Depth in chemistry

Question Set 18

1. This question is about hex-1-ene, $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}=\text{CH}_2$.

(a) Hex-1-ene is reacted with H_2 , HCl and Br_2 as shown in the flowchart below.

(i) Complete the flowchart to show the structures of the organic products of these reactions. [3]



(ii) State the catalyst needed in reaction 1. Nickel [1]

(iii) What would you observe in reaction 3? [1]

solution changes from orange to colourless

(b) Hex-1-ene is a liquid with a boiling point of 63 °C and a density of 0.67 g cm⁻³.

Hex-1-ene can be prepared by refluxing hexan-1-ol (boiling point 157 °C) with an acid catalyst.

Hexan-1-ol is a liquid with a boiling point of 157 °C and a density of 0.82 g cm⁻³.

The equation is shown below.



After reflux, the resulting mixture contains unreacted hexan-1-ol, hex-1-ene and water.

The mixture is then purified.

The expected percentage yield of hex-1-ene from hexan-1-ol is 62.5%.

(i)* A student plans to prepare 4.20 g of hex-1-ene by this method.

Calculate the mass of hexan-1-ol that the student should use and explain how you could obtain pure hex-1-ene from the mixture obtained after reflux.

[6]

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

$$0.625 = \frac{\text{actual}}{4.20} \Rightarrow \text{actual mass of hex-1-ene} = 0.625 \times 4.2 = 2.625 \text{ g}$$

$$\text{moles} = \frac{\text{mass}}{M_r} = \frac{2.625}{84} = 0.03125$$

$$\text{mass of hexan-1-ol} : 0.03125 \times 102 = 3.1875 \text{ g} \\ = \underline{\underline{3.2 \text{ g of hexan-1-ol}}}$$

Method to obtain a pure sample of hex-1-ene:

1. Put the mixture in a separating funnel and add sodium hydrogencarbonate solution. Shake and release pressure build up due to CO₂ gas formed.
2. Allow the layers to separate and discard the lower aqueous layer.
3. Run the organic layer into a clean, dry conical flask and add 3 spatulas of anhydrous sodium sulfate.
4. Decant the liquid into a round bottomed flask and distil to collect pure product.

- (ii) Another student suggested that hex-1-ene could be prepared from hexan-2-ol by the same method.

Would you expect the percentage yield of hex-1-ene to be greater than, less than or about the same as when using hexan-1-ol?

Explain your answer.

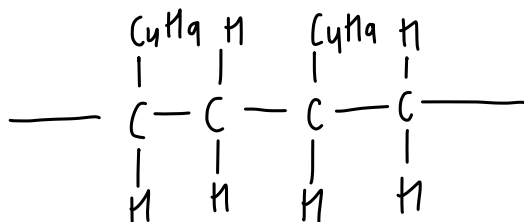
[2]

less than because there are 2 different products that can form from hexan-2-ol; hex-1-ene and hex-2-ene.

- (d) Hex-1-ene can also be polymerised to form poly(hex-1-ene).

Draw a section of poly(hex-1-ene) containing **two** repeat units.

[1]



State **two** other methods of disposing of polymers that can be beneficial to the environment.

[2]

- recycling
- reusing

Total Marks for Question Set 5: 16

b) i)

ii)

d)

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