Percentage Yield

① In an experiment to produce a sample of hex-1-ene, 10·2g of hexan-1-ol was heated with an excess of phosphoric (V) acid. (The phosphoric (V) acid simply acts as a dehydrating agent, removing water from the hexan-1-ol).

After purification of the hex-1-ene, 5·04g was produced. Calculate the percentage yield.

$$\underset{\text{hexan-1-ol}}{CH_3CH_2CH_2CH_2CH_2CH_2OH} \rightarrow \underset{\text{hex-1-ene}}{CH_3CH_2CH_2CH_2CH=CH_2} + H_2O$$

(2) A sample of 1-bromobutane was made by treating $8.0cm^3$ of butan-1-ol with an excess of sodium bromide and concentrated sulphuric acid. After purification $3.7cm^3$ of 1-bromobutane had been produced. Calculate the percentage yield.

$$C_4H_9OH + NaBr + H_2SO_4 \rightarrow C_4H_9Br + NaHSO_4 + H_2O$$

butan-1-ol — 1-bromobutane

Densities: butan-1-ol = $0.810 g cm^{-3}$

1-bromobutane = $1.28 g cm^{-3}$

③ $4.0 cm^3$ of phenylamine was treated with $6.0 cm^3$ of ethanoic anhydride under suitable conditions, and the solid product (N-phenylethanamide) was purified. 4.15g was produced. Calculate the percentage yield.

$$(CH_3CO)_2O + C_6H_5NH_2 \longrightarrow CH_3CONHC_6H_5 + CH_3COOH$$

ethanoic anhydride — phenylamine — N-phenylethanamide — ethanoic acid

Densities: ethanoic anhydride = $1.08 g cm^{-3}$

phenylamine = $1.02 g cm^{-3}$

④ A student had to produce some magnesium sulphate crystals, ~~MgSO4~~ $MgSO_4.7H_2O$. He reacted 1·20g of magnesium with a slight excess of sulphuric acid to give magnesium sulphate solution, and then evaporated off about three-quarters of the liquid, before leaving it to crystalise. He separated the crystals from the remaining liquid, dried them and weighed them. 9·84g of crystals had been produced. Calculate the percentage yield.

making the solution: $Mg + H_2SO_4 \longrightarrow MgSO_4 + H_2$.

Crystallising the solution: $MgSO_4 + 7H_2O \longrightarrow MgSO_4.7H_2O$