Percentage yield and atom economy

AQA 8462 Separate Chemistry · Foundation and Higher

Answer on your own paper. Show your working where needed.

1. Percentage yield

The theoretical yield is 25.0 g. A student obtains 18.5 g of pure, dry product. Calculate the percentage yield.

2. Mass of product

A process has a theoretical yield of 36.0 g and gives a percentage yield of 65.0%. Calculate the mass of pure product obtained.

3. Atom economy

$CaCO_3 \rightarrow CaO + CO_2$. The desired product is calcium oxide. $M_r(CaO) = 56$, $M_r(CO_2) = 44$. Calculate the percentage atom economy.

4. Copper production

$2Cu_2O + C \rightarrow 4Cu + CO_2$. Copper is the desired product. $A_r(Cu) = 64$ and $M_r(CO_2) = 44$. Calculate the atom economy to one decimal place.

5. Two claims about a reaction

$2Mg + O_2 \rightarrow 2MgO$. A student gets 85% yield and claims the atom economy is also 85%. Assess the claim using the equation. Give one reason the yield could be below 100%.

6. An unexpectedly high mass

A student expects up to 10.0 g of dry product. Immediately after filtering, it weighs 11.2 g. Find the apparent percentage yield. Explain a possible cause and suggest a check.

7. Yield from calcium carbonate (Higher)

$CaCO_3 \rightarrow CaO + CO_2$. Heating 15.0 g of pure $CaCO_3$ gives 6.30 g of pure CaO. Calculate the percentage yield. $M_r(CaCO_3) = 100$, $M_r(CaO) = 56$.

8. Choosing a production route (Higher)

Route A gives 86% atom economy and 72% yield. Route B gives 65% atom economy and 90% yield.

A manager chooses B because it has a higher yield. Explain one advantage of each route. Name one other factor the manager should consider.

9. Extra challenge · Review a factory report

$CuCO_3 \rightarrow CuO + CO_2$. At full conversion a batch gives 80.0 g CuO and 44.0 g CO_2. The measured dry CuO from this batch is 68.0 g. Calculate percentage yield and atom economy for CuO. The report says the higher percentage measures the fraction of the total reactant mass that should become the desired product. Check the claim.

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