Percentage yield and atom economy

Pearson Edexcel 1CH0 Separate Chemistry · Foundation and Higher

Show your working where needed.

Name _____ Date _____

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.

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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.

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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 · Choose a process under constraints (Higher)

Route A has 84% atom economy and theoretical yield 40.0 kg. It delivers 30.0 kg of dry product. Route B has 71% atom economy and theoretical yield 40.0 kg. It delivers 35.2 kg. Find both percentage yields. Choose a route if the minimum output is 32.0 kg per batch and give one environmental drawback to check before adopting it.

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