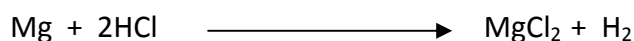


## Mass Calculations, Percentage Yield and Atom Economy

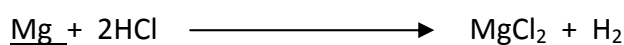
### Mass Calculations

What mass of hydrogen is produced when 18g Mg are reacted with excess hydrochloric acid?

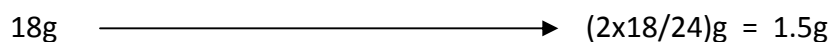
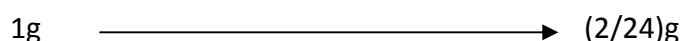
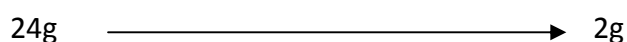
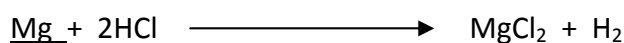
1) Write the balanced equation for the reaction



2) Underline what you are interested in, ie. Mg and H<sub>2</sub>



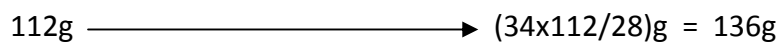
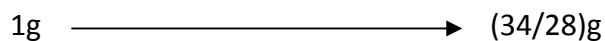
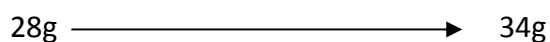
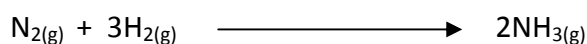
3) Work out the masses of the underlined chemicals



### Percentage Yield Calculations

$$\text{Percentage Yield} = \left[ \frac{\text{Actual Yield}}{\text{Theoretical Yield}} \right] \times 100\%$$

112g of nitrogen gas reacts with excess hydrogen gas to produce 40.8g ammonia.



$$\text{Percentage Yield} = \left[ \frac{40.8\text{g}}{136\text{g}} \right] \times 100\% = 30\%$$

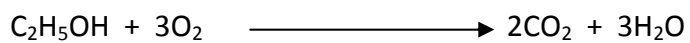
### Atom Economy

Atom economy (atom efficiency) describes the conversion efficiency of a chemical process in terms of all atoms involved (desired products produced).

$$\% \text{ Atom Economy} = \left[ \frac{\text{Mass of Desired Product}}{\text{Mass of Total Reactants}} \right] \times 100\%$$

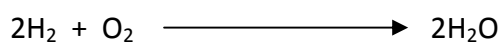
Water can be made by burning ethanol or burning hydrogen. Work out the atom economy for each reaction and state which reaction is more efficient.

Burning Ethanol



$$\% \text{ Atom Economy} = \left[ \frac{54\text{g}}{(46+96)\text{g}} \right] \times 100\% = 38\%$$

Burning Hydrogen



$$\% \text{ Atom Economy} = \left[ \frac{36\text{g}}{(4+32)\text{g}} \right] \times 100\% = 100\%$$

Thus the latter reaction of burning the hydrogen is the more efficient of the two.