

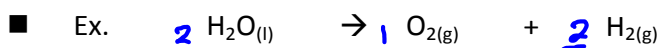
## Outcome 2

### Topic 1 - Law of Combining Volumes

Joseph Gay-Lussac measured the relative volumes of gases involved in chemical reactions

His studies led to the Law of Combining volumes

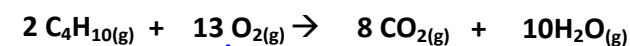
- When measured **at the same T and P**, volumes of gaseous reactants and products of a chemical reaction are always in simplest ratios of whole numbers.



|         |       |   |       |
|---------|-------|---|-------|
| Ratio   | 1     | : | 2     |
| Volumes | 1.0 L |   | 2.0 L |

#### Example:

Use the law of combining volumes to predict the volume of oxygen required for the complete combustion of 120mL of butane gas from a lighter.



120mL

V

$$V_{\text{O}_2} = \frac{13}{2} \times 120\text{mL} = 780\text{mL}$$

#### Example:

How many litres of nitrogen and hydrogen need to be used to make 15 L of ammonia gas?



$V = ??$

$V = ?$

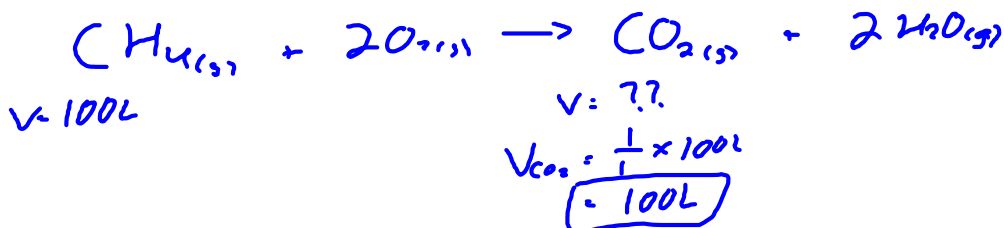
$V = 15\text{L}$

$$V_{\text{N}_2} = \frac{1}{2} \times 15\text{L} = 7.5\text{L}$$

$$V_{\text{H}_2} = \frac{3}{2} \times 15 = 22.5\text{L} = 23\text{L}$$

#### Example:

What volume of carbon dioxide would be produced by the combustion of 100 L of methane gas?



$V = 100\text{L}$

$V = ??$

$$V_{\text{CO}_2} = \frac{1}{1} \times 100\text{L} = 100\text{L}$$

