

Empirical/Molecular Formulas KEY

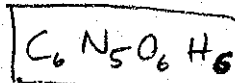
① Assume 100g of acetylene:

Element	mass	mol	mol ratio	simplest ratio
C	92.3g	7.69 mol	1	1
H	7.7g	7.7 mol	1	1

CH

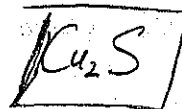
② Assume 100g

Element	Mass	Mol	Mol Ratio	Simplest Ratio
C	29.5g	2.46 mol	1.2	6
N	28.7g	2.05 mol	1	5
O	39.3g	2.46 mol	1.2	6
H	2.5g	2.5 mol	1.2	6



③ Assume 100g

Element	Mass	Mol	Mol Ratio	Simplest Ratio
Cu	79.9g	1.26 mol	2	2
S	20.1g	0.63 mol	1	1

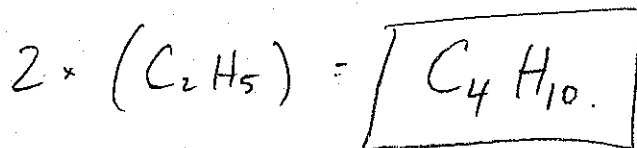


④ Assume 100g

Element	Mass	Mol	Mol Ratio	Simplest Ratio
C	82.7g	6.9 mol	1	2
H	17.3g	17.3 mol	2.5	5

empirical:
 C_2H_5

$$\frac{\text{Molar Mass}}{\text{Empirical Mass}} = \frac{58.0\text{g}}{29.0\text{g}} = 2$$



⑤ Assume 100 g.

Element	Mass	Mol	Mol. Ratio	Simplest Ratio
N	30.4 g	2.17 mol	1	1
O	69.6 g	4.35 mol	2	2

empirical: NO₂

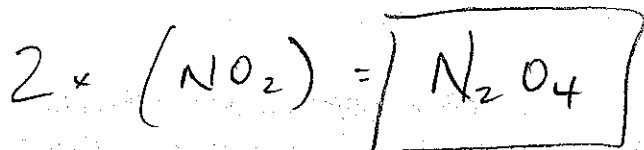
$$\frac{\text{Molar Mass}}{\text{Empirical Mass}} = \frac{92.1 \text{ g/mol}}{46.0 \text{ g/mol}} = 2$$

Molar Mass:

$$1.0 \text{ L} \times \frac{1 \text{ mol}}{22.4 \text{ L}}$$

$$= 0.045 \text{ mol gas}$$

$$\text{MOLAR MASS} = \frac{4.11 \text{ g}}{0.045 \text{ mol}} = 92.1 \text{ g/mol}$$



⑥ $\frac{0.500 \text{ L}}{22.4 \text{ L}} \times 1 \text{ mol} = 0.0223 \text{ mol}$

$$\text{Molar mass} = \frac{1.43 \text{ g}}{0.0223 \text{ mol}} = 64.06 \text{ g/mol}$$

⑦ Assume 100 g.

$$\text{M.F.C} = \frac{\text{Molar Mass}}{\text{Emp. Mass}} = \frac{64.06 \text{ g/mol}}{32.0 \text{ g/mol}} = 2 \quad \boxed{\text{C}_2\text{H}_8\text{O}_2}$$

Element	Mass	Mol	Mol. Ratio	Simplest Ratio
C	52.2 g	4.35 mol	2	2
H	13.0 g	13.0 mol	6	6
O	34.8 g	2.18 mol	1	1

empirical C₂H₆O

$$\frac{\text{Molar Mass}}{\text{Empirical Mass}} = \frac{46.0 \text{ g/mol}}{46.0 \text{ g/mol}} = 1$$

Molecular formula = C₂H₆O