Molecular Formula
Practice Problems

① CH_2N

$1 \times C = 1 \times 12.01\ g/mol = 12.01\ g/mol$
$2 \times H = 2 \times 1.01\ g/mol = 2.02\ g/mol$
$1 \times N = 1 \times 14.01\ g/mol = 14.01\ g/mol$
$28.04\ g/mol$

Empirical $28.04\ g/mol$ $\xrightarrow{\times 4}$ Molecular $112.16\ g/mol$

CH_2N $\xrightarrow{\times 4}$ $\boxed{C_4H_8N_4}$

② CH_3O

$1 \times C = 1 \times 12.01\ g/mol = 12.01\ g/mol$
$3 \times H = 3 \times 1.01\ g/mol = 3.03\ g/mol$
$1 \times O = 1 \times 16.00\ g/mol = 16.00\ g/mol$
$31.04\ g/mol$

Empirical $31.04\ g/mol$ $\xrightarrow{\times 2}$ Molecular $62\ g/mol$

CH_3O $\xrightarrow{\times 2}$ $C_2H_6O_2$

③ $\frac{82.5\ g\ C}{12.01\ g/mol} = 6.87\ mol\ C$

$\frac{17.5\ g\ H}{1.01\ g/mol} = 17.33\ mol\ H$

$C_{\frac{6.87}{6.87}}\ H_{\frac{17.33}{6.87}}$

$C_{1.00}H_{2.52}$ $\xrightarrow{\times 2}$

C_2H_5

C_2H_5
$2 \times C = 2 \times 12.01\ g/mol = 24.02\ g/mol$
$5 \times H = 5 \times 1.01\ g/mol = 5.05\ g/mol$
$29.07\ g/mol$

Empirical → ×2 → Molecular

29.07 g/mol → 58 g/mol

C_2H_5 → ×2 → C_4H_{10}

④ $\frac{30.4\text{ g N}}{14.01\text{ g/mol}} = 2.17\text{ mol N}$

$\frac{69.6\text{ g O}}{16.00\text{ g/mol}} = 4.35\text{ mol O}$

$\frac{N_{2.17}}{2.17}$ $\frac{O_{4.35}}{2.17}$

$N_{1.00}O_{2.00}$

NO_2

NO_2

$1 \times N = 1 \times 14.01\text{ g/mol} = 14.01\text{ g/mol}$

$2 \times O = 2 \times 16.00\text{ g/mol} = 32.00\text{ g/mol}$

46.01 g/mol

Empirical → ×2 → Molecular

46.01 g/mol → 92 g/mol

NO_2 → ×2 → N_2O_4