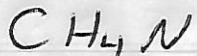


# Molecular Formula

## Sample Problem

① Calculate the molecular formula for a compound with a molar mass of  $60.0 \text{ g/mol}$  and empirical formula of  $\text{CH}_4\text{N}$ .

- Find molar mass of empirical formula



$$1 \times \text{C} = 1 \times 12.01 \text{ g/mol} = 12.01 \text{ g/mol}$$

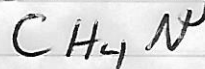
$$4 \times \text{H} = 4 \times 1.01 \text{ g/mol} = 4.04 \text{ g/mol}$$

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

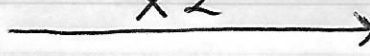
$$\underline{30.06 \text{ g/mol}}$$

Empirical

$$30.06 \text{ g/mol}$$

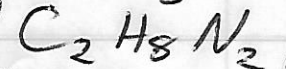


$\times 2$



Molecular

$$60.0 \text{ g/mol}$$



$\times 2$

\* What whole number do you multiply the molar mass of the empirical formula by to get the molar mass of the molecular formula? (In this case = 2)

Multiply the empirical formula by the same number to get the molecular formula.

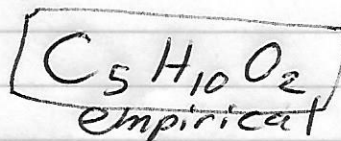
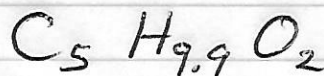
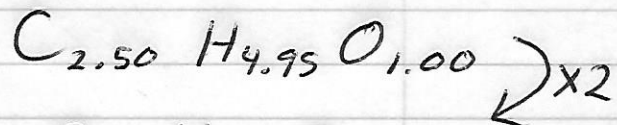
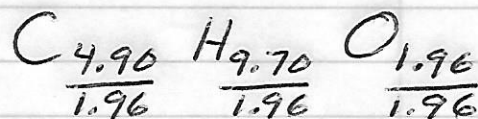
② Find the molecular formula of a substance that is 58.8% C, 9.8% H, 31.4% O and has a molar mass of 102 g/mol.

• Find the empirical formula first

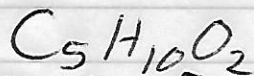
$$\frac{58.8 \text{ g C}}{12.01 \text{ g/mol}} = 4.90 \text{ mol C}$$

$$\frac{9.8 \text{ g H}}{1.01 \text{ g/mol}} = 9.70 \text{ mol H}$$

$$\frac{31.4 \text{ g O}}{16.00 \text{ g/mol}} = 1.96 \text{ mol O}$$



Empirical



$$5 \times \text{C} = 5 \times 12.01 \text{ g/mol} = 60.05 \text{ g/mol}$$

$$10 \times \text{H} = 10 \times 1.01 \text{ g/mol} = 10.10 \text{ g/mol}$$

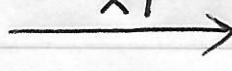
$$2 \times \text{O} = 2 \times 16.00 \text{ g/mol} = 32.00 \text{ g/mol}$$

$$\underline{102.15 \text{ g/mol}}$$

Empirical

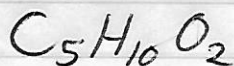
$$102.15 \text{ g/mol}$$

$\times 1$

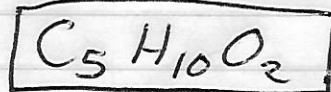
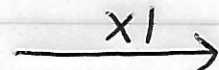


Molecular

$$102 \text{ g/mol}$$



$\times 1$



Molecular

Formula