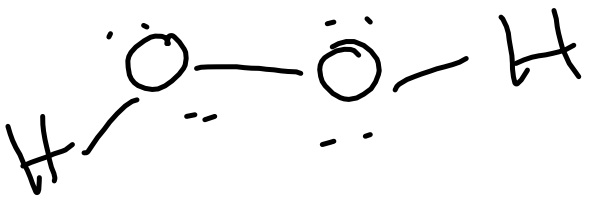
KINDS OF CHEMICAL FORMULAS

(using hydrogen peroxide as an example)

STRUCTURAL 

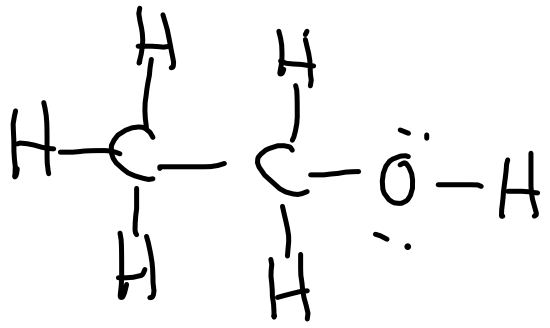
MOLECULAR H_2O_2

EMPIRICAL HO

		EMPIR.
ACETYLENE	C_2H_2	CH
BENZENE	C_6H_6	CH

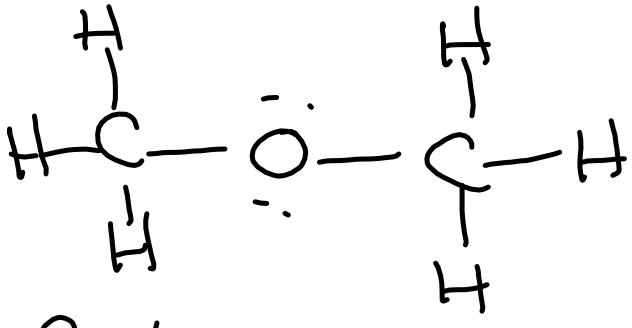
ARE MOLECULAR FORMULAS UNIQUE?

ETHYL ALCOHOL (ETHANOL)



C_2H_6O

DIMETHYL ETHER



C_2H_6O

ETHYL ALCOHOL

C_2H_5OH

CH_3CH_2OH

DIMETHYL ETHER

CH_3OCH_3

$(CH_3)_2O$

A compound of nitrogen and oxygen is analyzed and found to contain 63.65% nitrogen by mass. What is its empirical formula?

100.00 g compound

63.65 g N

36.35 g O

$$63.65\ \text{g N}\left(\frac{1\ \text{mol N}}{14.01\ \text{g N}}\right) = 4.543\ \text{mol N}$$ (like 2)

$$36.35\ \text{g O}\left(\frac{1\ \text{mol O}}{16.00\ \text{g O}}\right) = 2.272\ \text{mol O}$$ (like 1)

$N_{4.543}O_{2.272}$

N_2O

Empirical Formula

$$\frac{4.543}{2.272} : \frac{2.272}{2.272} \quad (N:O)$$

$$2 : 1$$

A 5.000 g sample of an iron-oxygen compound was found to contain 3.497 g of iron. What is the empirical formula of this compound?

$$\% = 100\% \left(\frac{\text{PART}}{\text{WHOLE}} \right)$$

$$\%\,Fe = 100\% \left(\frac{3.497\,g}{5.000\,g} \right) = 69.94\%$$

$$30.06\%\ O$$

$$3.497\ g\ Fe\left(\frac{1\ mol\ Fe}{55.85\ g\ Fe}\right) = 0.06261\ mol\ Fe$$

$$1.503\ g\ O\left(\frac{1\ mol\ O}{16.00\ g\ O}\right) = 0.09394\ mol\ O$$

$Fe_{0.06261}O_{0.09394}$

$$\frac{0.06261}{0.06261} : \frac{0.09394}{0.06261} \quad (Fe:O)$$

$$1 : 1.500$$

$$\downarrow \times 2 \qquad \downarrow \times 2$$

$$2 : 3$$

Fe_2O_3 Empirical Formula

$\frac{1}{2} = 0.5$

$\frac{1}{3} = 0.3333\ldots$

$\frac{1}{4} = 0.25$