EMPIRICAL & MOLECULAR FORMULAE

© Lian Soh 2014
sciencescribe.co.nz

EXAMPLE

Pantoic acid has a percentage mass composition of 48.6% carbon, 8.16% hydrogen and 43.2% oxygen with a molar mass of **148 g mol^{-1}**
M(C) = 12.0 g mol^{-1}, M(H) = 1.00 g mol^{-1} and M(O) = 16.0 g mol^{-1}
Find the empirical and molecular formula for pantoic acid

PROCESS

	C	H	O
STEP ONE Percentages as masses	48.6g	8.16g	43.2g
STEP TWO Find moles using $n = \frac{m}{M}$	$\frac{48.6}{12.0}$ = 4.05 mol	$\frac{8.16}{1.00}$ = 8.16 mol	$\frac{43.2}{16.0}$ = 2.70 mol
STEP THREE Divide everything by the smallest number	$\frac{4.05}{2.70}$ = 1.5	$\frac{8.16}{2.70}$ ≈ 3	$\frac{2.70}{2.70}$ = 1
STEP FOUR If you don't have whole numbers, multiply by 2, 3 or 4	**x2** = 3	**x2** = 6	**x2** = 2

STEP FIVE Show empirical formula

Empirical Formulae is $C_3H_6O_2$

STEP SIX Find molar mass of EF

$M(C_3H_6O_2)$ = 3(12.0) + 6(1.00) + 2 (16.0)
= 74.0 g mol^{-1}

STEP SEVEN Find the factor

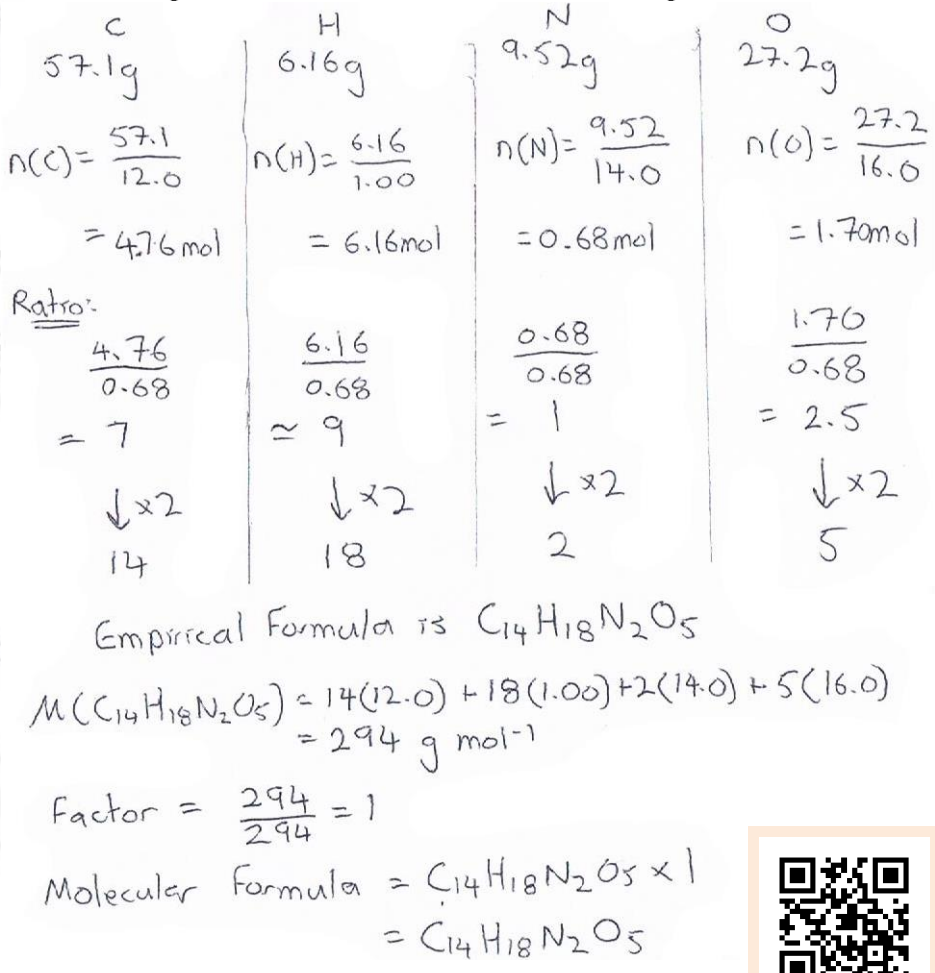
FACTOR = $\frac{148}{74.0}$ ≈ **2**

STEP EIGHT Show molecular formula

Molecular Formulae is $C_3H_6O_2$ x 2 = $C_6H_{12}O_4$

HOW IT LOOKS ON PAPER

Aspartame has a percentage mass composition of 57.1% carbon and 6.16% hydrogen, 9.52% nitrogen and 27.2% oxygen.
It has a molar mass of 294 g mol^{-1}
M(C) = 12.0 g mol^{-1}, M(H) = 1.00 g mol^{-1} ,
M(O) = 16.0 g mol^{-1} and M(N) = 14.0 g mol^{-1}
Find the empirical and molecular formula for aspartame



Scan the QR code or visit youtu.be/d2zS47A3zYE