Take an empirical formula and go back into a molecular formula for that compound.

WARMUP :

Give three different things to call this molecule:

Its name: "hydrazine"

Its molecular formula: N_2H_4

Its empirical formula: N_1H_2

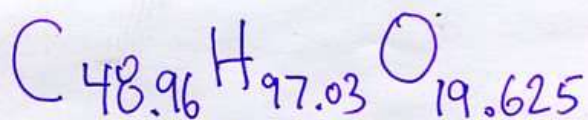# THE NOTES TODAY ARE A SINGLE LONG STORY PROBLEM TO ANSWER TODAY'S PURPOSE.

Everything with an orange line around it is part of this single story problem.

If a substance is burned and gives off
588 grams carbon
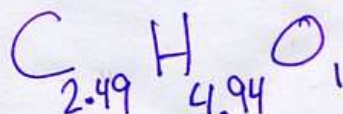98 grams hydrogen
314 grams oxygen

And we know the molar mass of the whole molecule weighs 102 grams per MOLE

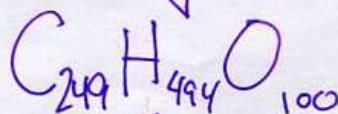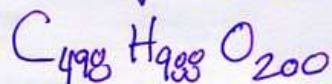The empirical formula is:
$C_?H_?O_?$

$C_?H_?O_?$

$C_{48.96}H_{97.03}O_{19.625}$

$\left(\begin{array}{l} \text{MAYBE} \\ \text{divide by} \\ \qquad 19.625 \end{array}\right)$

$C_{2.49}H_{4.94}O_1$

$\left(\text{times } 100 \right.$

$C_{249}H_{494}O_{100}$

↓ double all

$C_{498}H_{988}O_{200}$

↓ round

$C_{500}H_{1000}O_{200}$

↓ ÷ 100

$C_5H_{10}O_2$
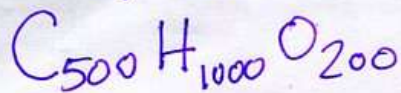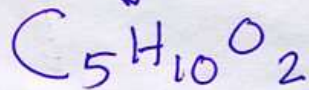
Is the empirical formula

NOW, FIND THE MOLECULAR formula.

We just found Empirical formula.

The ~~molecular mass of~~
molar mass of that is

O_1H_1 is 17.01 $\frac{grams}{mol}$

But we were told that the
molecule weighs 34.02 $\frac{grams}{mole}$

This is $\boxed{\dfrac{34.02g}{17.01g} = 2}$ two times

34.02 $\frac{grams}{mole}$

bigger than O_1H_1, so our
answer is

O_2H_2 molecular
formula

Empirical

CheMistry: http://genest.weebly.com

Stop in for help every day at lunch and Tues & Thurs after school!

Name _____

Period _____

Convert each of the following into an empirical formula: *I usually write a "one" but you can omit the number "one" if you wish.*

1. Co_3H_9 Co_1H_3 (or CoH_3)

2. $C_6H_{12}O_6$ (fructose) $C_1H_2O_1$

3. $C_{24}H_{32}O_4$ $C_6H_8O_1$

4. N_2H_4 N_1H_2

5. CH_2O (formaldehyde – a carcinogen) $C_1H_2O_1$ (or CH_2O)

6. $C_2H_4O_2$ (acetic acid – vinegar flavor) $C_1H_2O_1$

7. Which of the compounds above have the exact same empirical formula? #5 and #6 and #2

Key to understanding the cartoons on this sheet:				
1 chlorine atom	1 hydrogen atom	1 oxygen atom	1 nitrogen atom	1 carbon atom
⊕	●	○	⊜	⊗
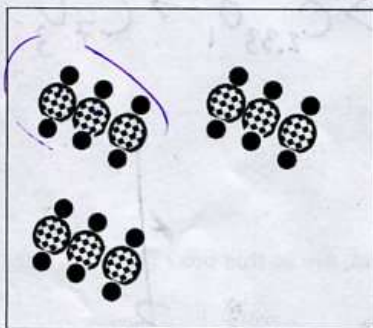
8. How many <u>atoms</u>, total, are in this box? 27 atoms

9. How <u>molecules</u> are in this box? 3 molecules

10. What is the molecular formula of this compound? C_3H_6

11. What is the empirical formula? C_1H_2

12. Of all the shapes in this square, what percent are X's?

```
O O H X X O O O X
O X H Q O O H X X O
O O X O X H O H X X
X X H X X X X
```

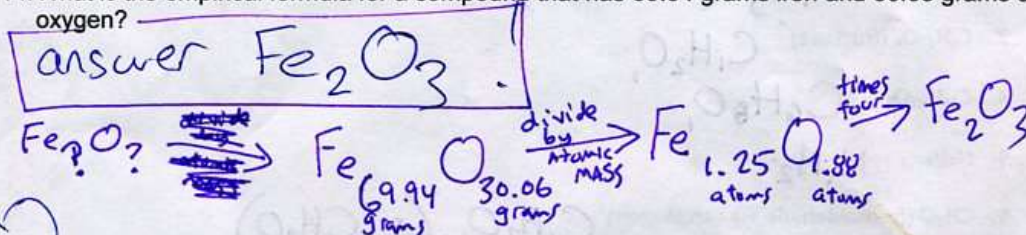There are 16 X's / 36 shapes total   so....

$\frac{16}{36} \times 100 = 44\%$ X's

13. What is the molecular mass of C_7H_{16}?

$C: 7 \times (12.01) = 84.07$ grams/mol

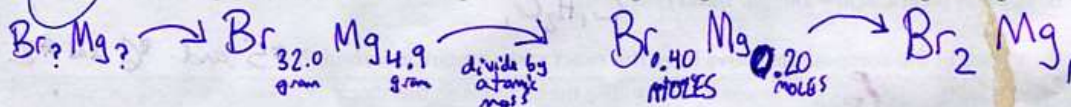$H: 16 \times (1.01) = 16.16$ grams/mol

$\overline{\qquad\qquad\qquad 100.23}$ grams/mol

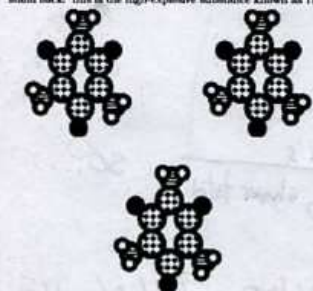14. What is the empirical formula for a compound that has 69.94 grams iron and 30.06 grams of oxygen?

answer Fe_2O_3 .

$Fe_?O_? \xrightarrow{} Fe_{(9.94\ grams)}O_{30.06\ grams} \xrightarrow[\text{Atomic mass}]{\text{divide by}} Fe_{1.25\ atoms}O_{.88\ atoms} \xrightarrow{\text{times four}} Fe_2O_3$

15. Find the empirical formula of a compound containing 32.0 g of bromine and 4.9 g of magnesium.

$Br_?Mg_? \xrightarrow{} Br_{32.0\ gram}Mg_{4.9\ gram} \xrightarrow[\text{atomic mass}]{\text{divide by}} Br_{0.40\ moles}Mg_{0.20\ moles} \xrightarrow{} Br_2Mg_1$

16. What is the empirical formula of a carbon-oxygen compound, given that a 95.2 g sample of the compound contains 40.8 g of carbon and the rest oxygen?

now divide by periodic table weights

play around using algebra

$C_{95.2\ grams}O_{54.4\ grams} \xrightarrow{} \ldots \xrightarrow{} C_{2.33}O_1 \to C_7O_3$

$C_{7.927}O_{3.4}$

NOTICE! THIS IS NOT 95.2 g Why. Read the problem carefully!!
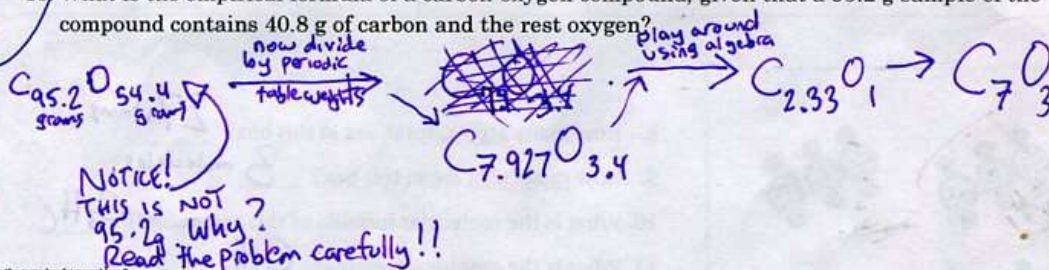
use the same key from problem 8:

stand back! this is the high-explosive substance known as TNT.
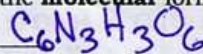
17. How many <u>atoms</u>, total, are in this box? 54

18. How many <u>molecules</u> are in this box? 3

19. The What is the **molecular** formula of this compound? $C_6N_3H_3O_6$

20. What is the **empirical** formula of this compound? $C_2N_1H_1O_2$