**Welcome to Jeff's CHEM 4 lecture!**

We'll be starting in just a bit…

**While you are waiting:**

1) Go to LearningCatalytics.com to prepare for today's clicker questions. Login with your MasteringChemistry login. Session ID = _____

2) I can throw pottery. Do you have any talents that people might not know about?

*Let us know about your hidden talent/skill in the chat.*

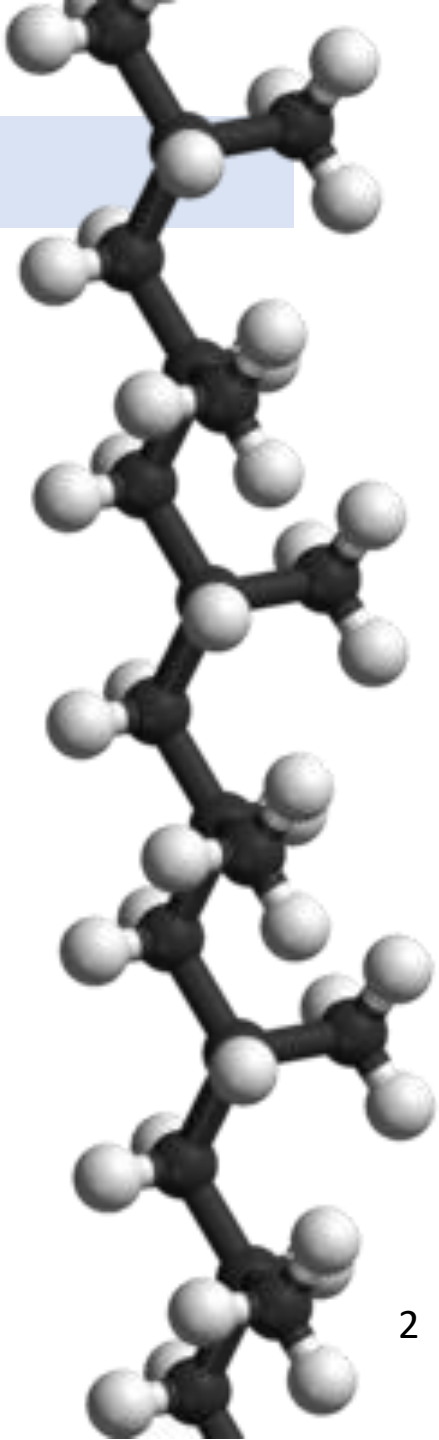
## Are up keeping up with CHEM 4?

- ✓ **Website: tinyurl.com/SacStateChem4**
  - ✓ Check our **August/September calendar** for daily assignments.
  - ✓ PowerPoint slides, reading assignments, and links to homework.

- ✓ **Homework:**
  - ✓ Ideally, do it after every lecture so you are prepared for next class.
  - ✓ If you occasionally do your homework late, you will get credit for it.

- ✓ **Clickers:**
  - ✓ Automatic 2 pts for each time you vote (right or wrong).
  - ✓ If you are here, but unable to vote, message me in Zoom chat.

- ✓ **Optional:**
  - ✓ *Peer Assisted Learning (PAL)* – MW 12 noon is full.
  - ✓ *Commit to Study (C2S)* – Allows you to drop lowest exam.



**Review clicker question (This question was given to you at the end of last lecture)**
Go to LearningCatalytics.com and login with your MasteringChemistry login.

1) Rubidium has two isotopes: Rb-85 (mass = 84.9118 amu) and Rb-87 (mass = 86.9092 amu). What is the % abundance of the lighter isotope?

A) roughly 26%
B) roughly 28%
C) roughly 30%
D) roughly 31%
E) roughly 69%
F) roughly 70%
G) roughly 72%
H) roughly 74%

See worked answer on next slide…

**Review clicker question (This question was given to you at the end of last lecture)**
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1) Rubidium has two isotopes: Rb-85 (mass = 84.9118 amu) and Rb-87 (mass = 86.9092 amu). What is the % abundance of the lighter isotope?

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**Answer:**

from periodic table | Unknown = **X** | given | Unknown = **Y** | given

**Atomic mass = (fraction isotope 1)(mass isotope 1) + (fraction isotope 2)(mass isotope 2)**

$$85.47 = (84.9118)(X) + (86.9092)(Y)$$

*Because we have 1 equation and 2 unknowns, we need to find another equation. Since the two % add up to 100%, the two fractions add up to 1:*

$$X + Y = 1$$

*Solving for Y:* $Y = 1 - X$

*Substituting into our 1st equation:* $85.47 = (84.9118)(X) + (86.9092)(1-X)$

*Distribute:* $85.47 = 84.9118(X) + 86.9092 - 86.9092(X)$

*Group like terms:* $-1.4392 = -1.9974(X)$

*Solve for X:* $X = 0.7205$

*Convert back to %:* 72.05% of Rb-85 (the lighter isotope)

**Review clicker question (This question was given to you at the end of last lecture)**
Go to LearningCatalytics.com and login with your MasteringChemistry login.

2) Which of the following statements is true?

A) All atoms of a given element are identical.

B) All atoms of a given element have the same atomic number.

C) All atoms of a given element have the same mass.

D) All atoms of a given element have the same mass number.

E) All atoms of a given element have an identical nucleus.

F) All atoms of a given element have the same number of neutrons.

**CHEM 4 lecture**

Monday – September 14, 2020

*Sec 5.1 – 5.3*

Compounds

**Reading clicker question (covers material from today's assigned reading)**
Go to LearningCatalytics.com and login with your MasteringChemistry login.

3) Which of the following statements is false?

A) Compounds are substances composed of 2 or more elements in fixed, definite proportions.

B) The properties of the elements typically change when they combine to form compounds.

C) The law of constant composition states that every sample of a given compound will have the same elements present in the same ratio.

D) For a given compound, subscripts in its chemical formula can change, depending on how much of the compound you have.

E) A compound's chemical formula indicates which elements are present and in what relative ratio.

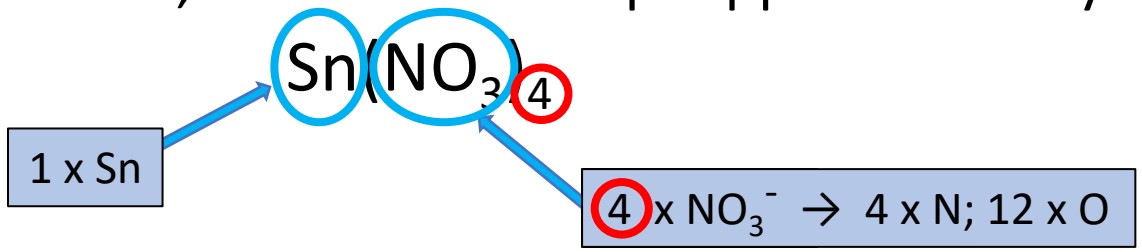
## **Background:** Compounds

**Compound** – A substance composed of ≥ 2 elements in fixed definite proportions.

- *Not* diatomic elements like $H_2$, $O_2$; they don't have 2 or more elements
- Properties of elements versus compounds:
  - Example: $Na(s) + Cl_2(g)$ = table salt  $C(s) + H_2(g) + O_2(g)$ = sugar
  - Natural diversity and life only possible because the elements combine to form an infinite number of compounds.

**Chemical formulas** – Show number and each type of atom present.

- Subscripts always refer to the element directly before it.
- For clarity, ( ) can used; then the subscript applies to everything in the ( ).
  - Example:



## Progress clicker question (covers material we are learning now)

4) How many total atoms are in one formula unit of: $Al_2(Cr_2O_7)_3$

A) 11
B) 25
C) 3
D) 33
E) 29
F) 15

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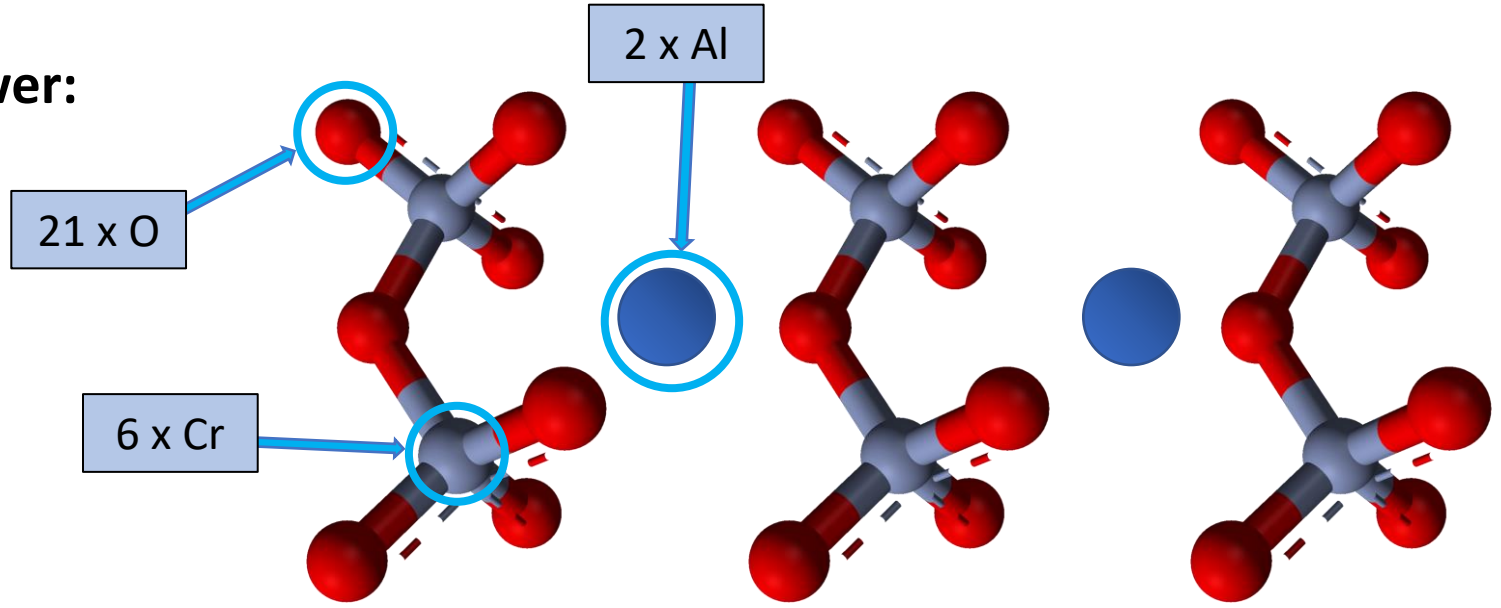
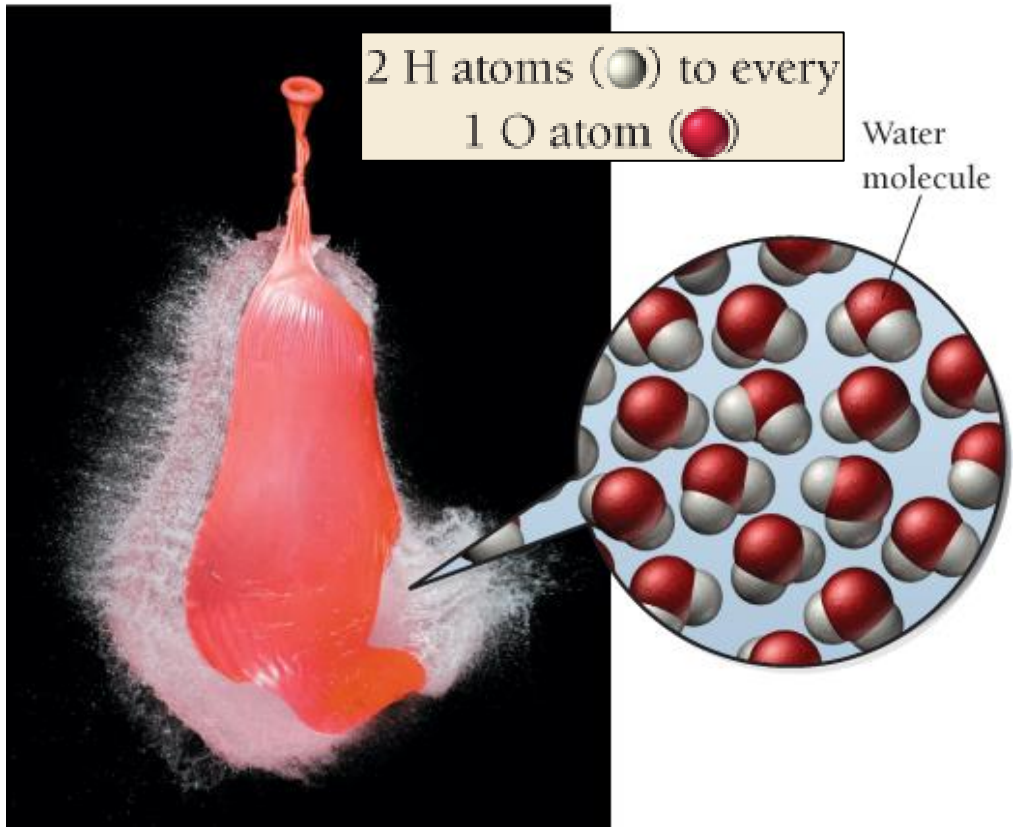
**Answer:**



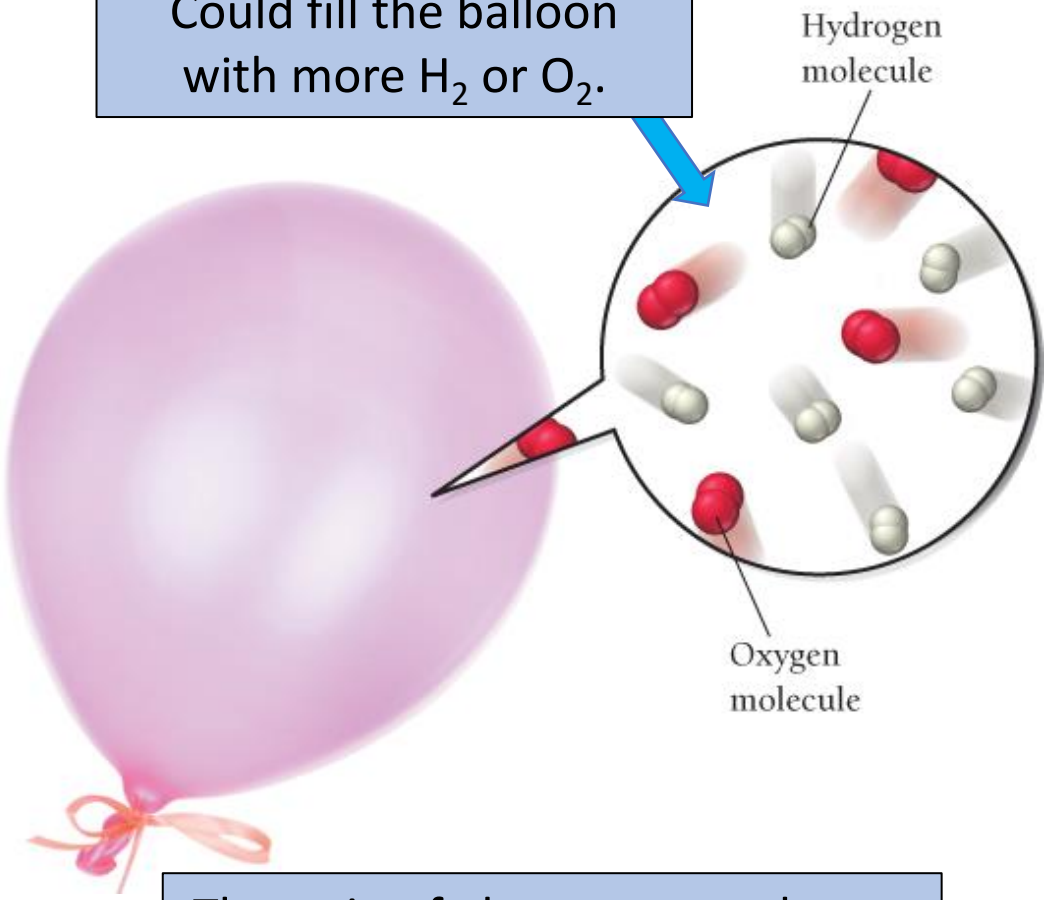
# **Background:** Compounds

**Law of Constant Composition** – Every sample of a given compound will have the same elements present in the same ratio.




No matter how much water you have, the ratio of elements can't change = **compound**

Could fill the balloon with more $H_2$ or $O_2$.




The ratio of elements can change = **mixture** (not a compound)

## **Background:** Constant composition calculations

**Example:** A sample of the compound, nitric acid ($HNO_3$) has 0.088 g of H, 1.22 g of N and 4.19 g of O. A 2nd sample of $HNO_3$ contains 6.02 g of N, how may grams of O are in this 2nd sample?

**Answer:** Make a table to see what info you have and what is missing…

| | g of H | g of N | g of O | g total |
|---|---|---|---|---|
| Sample #1 | 0.088 g | 1.22 g | 4.19 g | 5.50 g |
| Sample #2 | | 6.02 g | X | |

Because it is a compound, the ratio of O:N is the same in sample #1 and #2:

$$\frac{\text{grams O in sample \#1}}{\text{grams N in sample \#1}} = \frac{\text{grams O in sample \#2}}{\text{grams N in sample \#2}}$$

$$\frac{4.19\ g\ O}{1.22\ g\ N} = \frac{X\ g\ O}{6.02\ g\ N}$$

$$X = 20.68\ g\ O$$

## Progress clicker question (covers material we are learning now)

5) A 3rd sample of $HNO_3$ contains 1.66 g of H, how many g of N are in this 3rd sample? **Note:** Because $HNO_3$ is a compound, the table from the previous question still holds.

A) 0.368 g
B) 7.48 g
C) 0.134 g
D) 23.0 g
E) 0.483 g
F) 5.70 g

| | g of H | g of N | g of O | Total mass |
|---|---|---|---|---|
| Sample #1 | 0.088 g | 1.22 g | 4.19 g | 5.50 g |
| Sample #2 | | 6.02 g | 20.68 g | |
| Sample #3 | 1.66 g | X | | |

**Answer:**

$$\frac{\text{grams N in sample \#1}}{\text{grams H in sample \#1}} = \frac{\text{grams N in sample \#3}}{\text{grams H in sample \#3}}$$

$$\frac{1.22\ g\ N}{0.088\ g\ H} = \frac{X\ g\ N}{1.66\ g\ H}$$

X = 23.0 g N

## Progress clicker question (covers material we are learning now)

6) A sample of rust ($Fe_2O_3$) contains 13.5 g Fe and 5.80 g O. How many grams of O are in a second sample of rust if the sample has a total mass of 13.1 g?

A) 30.5 g
B) 3.94 g
C) 20.8 g
D) 5.63 g
E) 43.6 g
F) 0.0229 g

**Answer:**

| | g of Fe | g of O | Total mass |
|---|---|---|---|
| Sample #1 | 13.5 g | 5.80 g | 19.3 g * |
| Sample #2 | | X g | 13.1 g |

$$\frac{\text{grams O in sample \#1}}{\text{grams total in sample \#1}} = \frac{\text{grams O in sample \#2}}{\text{grams total in sample \#2}}$$

* total grams of Sample #1 = 13.5 g + 5.80 g = 19.3 g

$$\frac{5.80\ g\ O}{19.3\ g\ total} = \frac{X\ g\ O}{13.1\ g\ total}$$

X = 3.94 g O