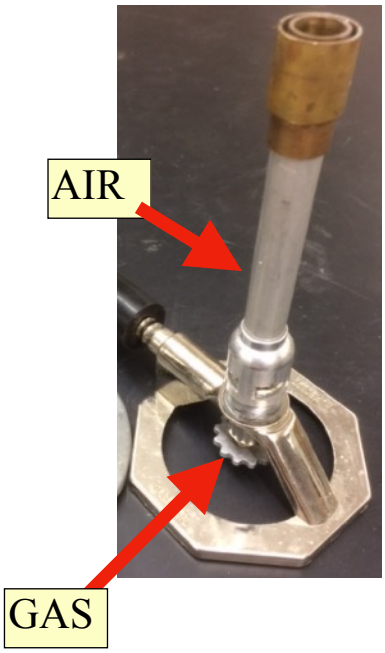
Opener: Tirrill Burner *(Usually misnamed Bunsen Burners)*

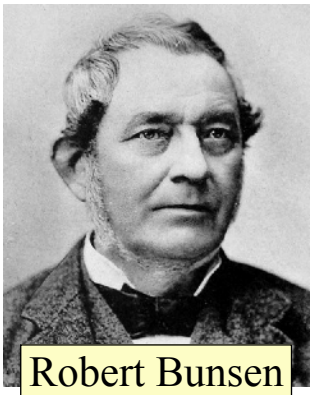
1. Draw an arrow and label GAS to the part used for adjusting the gas on the burner.
2. Draw an arrow and label AIR to the part used for adjusting the air flow on the burner
3. Which adjustment should you make if the burner is loud and seems to be blowing itself out every time you try to light the burner? GAS or AIR?

   If the burner seems to be "blowing itself out" adjust the barrel down for **less air.**

4. When finished with the burner, where/how should the flame be turned off?

   When finished with the burner, shut it off by turning off the gas at the **lab bench valve**.





Robert Bunsen
1811-1899

Opener: Tirrill Burner *(Usually misnamed Bunsen Burners)*

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Opener: **Weighing by not really Weighing**

1. You grab your dog and get on the scale and weigh 151 pounds.
2. Your dog jumps out of your arms, and you weigh 110 pounds.
3. How much does your dog weigh? How do you calculate that?
4. Calculate the ratio of your weight to your dogs weight. Y/D ?

$$\frac{110\,lbs(You)}{41\,lbs(Dog)} = 2.7 \qquad \frac{2.7}{1}$$

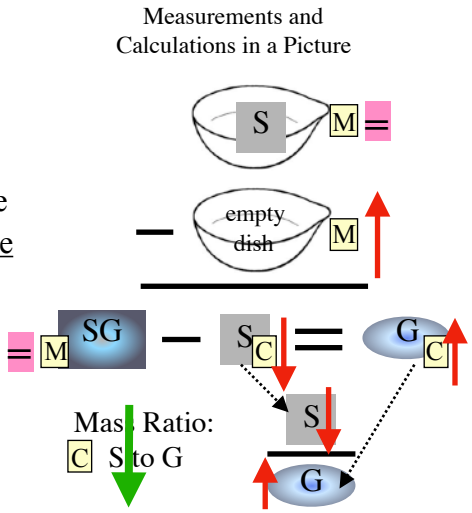
151 lbs you & dog − 110 lbs you = 41 lbs Dog

Opener: **Weighing by not really Weighing**

1. You grab your dog and get on the scale and weigh 141 pounds.
2. Your dog jumps out of your arms, and you weigh 110 pounds.
3. How much does your dog weigh? How do you calculate that?
4. Calculate the ratio of your weight to your dogs weight. Y/D ?

Opener: Measurements vs Calcs & Error Analysis

1. Label each symbolic representation of the data/results as a measurement (M) OR calculation (C)
2. Suppose your partner had wet hands and transferred some water to the evaporating dish before weighing the dish at the beginning of the experiment. Would your final S/G ratio be larger, smaller or the same as the theoretical ratio as a result of this lab error? *(circle one)*



Opener: Measurements vs Calcs

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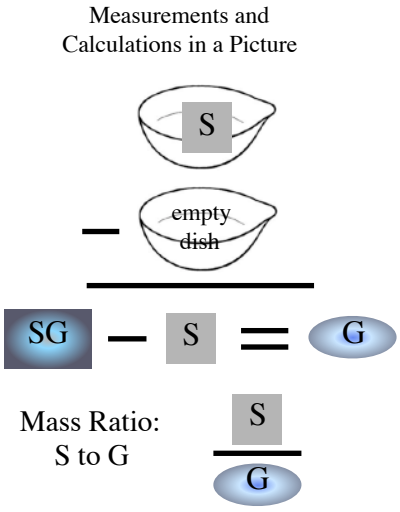
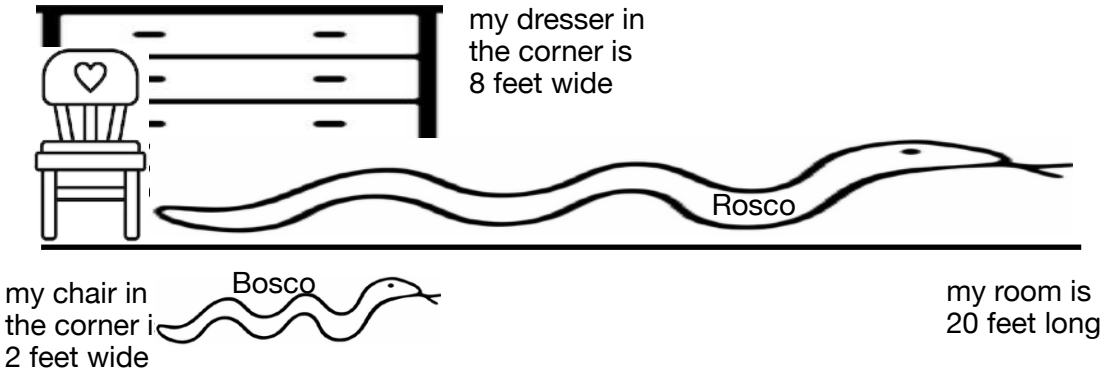


Opener: Calculating lengths without actually measuring

I need your help to figure out how long two of my snakes, Rosco and Bosco are. Use the diagram below to determine the length of Rosco and Bosco.



Bosco must be 6 feet long (8 − 2)

Rosco must be 18 feet long, (20 − 2)

Opener: Calculating lengths without actually measuring

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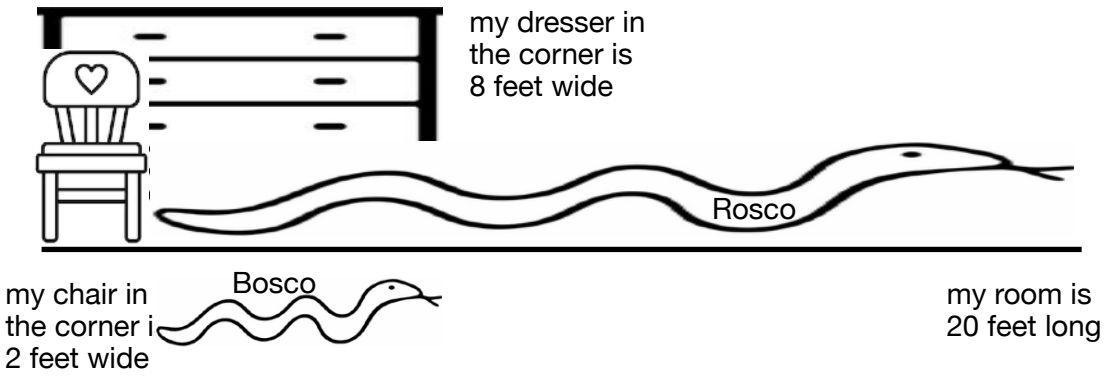


Opener: Balancing Equations for the Decomposition of Water

Let's suppose we don't know as much as you do about hydrogen and oxygen gas. Balance the following mostly incorrect equations.

A) $H_2O \rightarrow H_2 + O$

B) $H_2O \rightarrow H + O_2$

C) $H_2O \rightarrow H + O$

D) $H_2O \rightarrow H_2 + O_2$

E) $H_2O \rightarrow H_2 + O_3$

F) $H_2O \rightarrow H_3 + O_3$

A) $H_2O \rightarrow H_2 + O$ *balanced*

B) $2\ H_2O \rightarrow 4\ H + O_2$

C) $H_2O \rightarrow 2\ H + O$ **

D) $2\ H_2O \rightarrow 2\ H_2 + O_2$ **

E) $3\ H_2O \rightarrow 6\ H_2 + O_3$

F) $3\ H_2O \rightarrow 2\ H_3 + O_3$ **

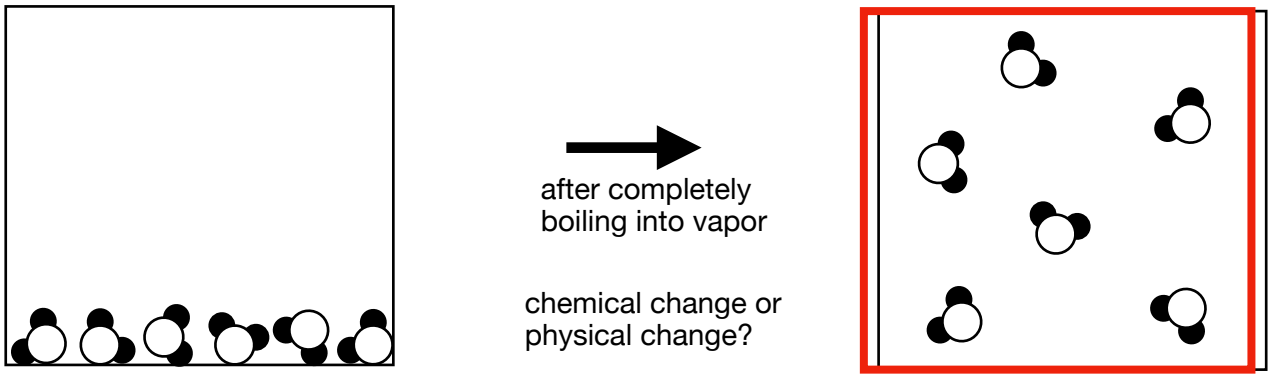
But the reality is that you can see that when we run the electrolysis of water and cause the water to decompose into hydrogen and oxygen gas, two hydrogens volumes form for every one oxygen volume.

Star the reactions above that meet this 2:1 criteria.

After watching the movie, we can see that reacting hydrogen gas and oxygen gas together to produce water in a synthesis reactions, the 2:1 ratio of hydrogen gas to oxygen gas was also confirmed.

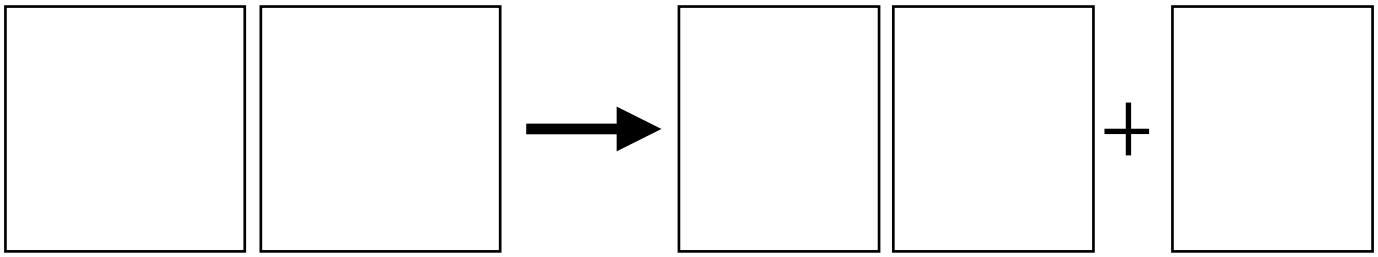
While we can't do the following in class, scientists have learned that it takes **two** water vapor volumes to form the **two** hydrogen gas and **one** oxygen gas volumes. This fact confirms that which **one** of the reactions above is correct? **Highlight or put a bold box around that correct reaction.**

Let's be clear, when water is boiled, the H_2O molecules remain H_2O molecules. This is different from the decomposition of water that we were working on above. In the box on the left, liquid molecules are represented. Show those liquid molecules after they are completely boiled away.



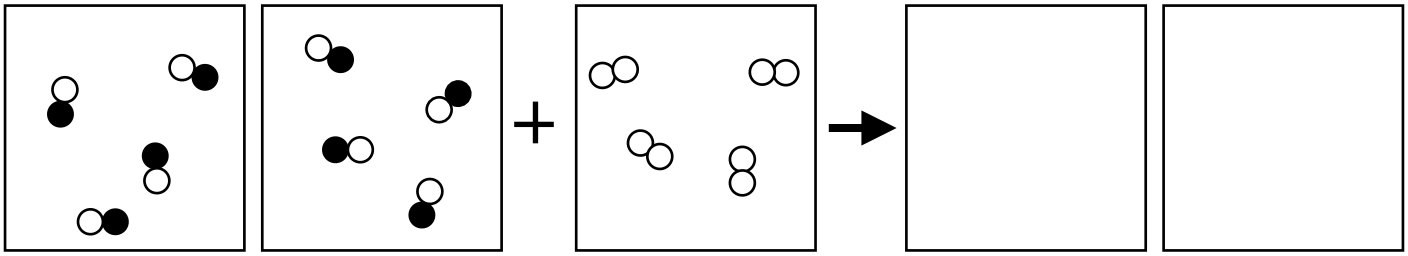
Opener: Particulate Diagrams to describe gases

1. Write the balanced equation for the decomposition of water vapor on the line below, then draw a particulate diagram for the decomposition of water in the boxes below. Box volumes are constant and pressure and temperature are contant?



_____

2. Consider the particulate diagram below in which two volumes of nitrogen monoxide reacts with one volume of oxygen gas to form two volumes of a reddish-brown gas. Deduce the formula of this reddish brown gas and sketch particle representations of its molecules. Then write the balanced equation on the line below. Assume the boxes are the same volume and that the temperature and pressure are constant.



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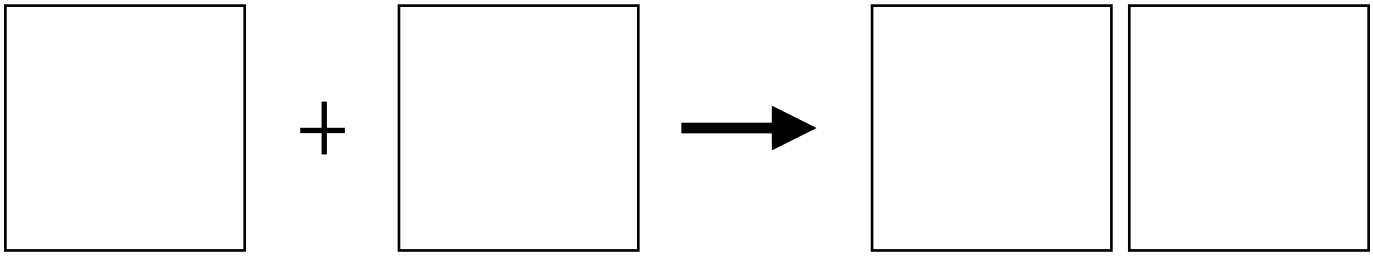
3. Consider the reaction between hydrogen and chlorine. Two volumes of hydrogen chloride are formed. Sketch particle diagrams to represent this reaction using the boxes as a guide. Then write the balanced equation on the line below



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4. Explain why hydrogen and chlorine molecules that have only one atom each cannot account for the observed behavior. Assume the boxes are the same volume and temperature and pressure are constant.

5. Opener: Compounds & Mixtures

- Compare and contrast compounds and mixtures by filling out the table below

	Compound	Mixture
made of what?		
put together how ?		
quantities?		
example?		heterogeneous
		homogeneous

Opener: Compounds & Mixtures

- Compare and contrast compounds and mixtures by filling out the table below

	Compound	Mixture
made of what?	2 or more different elements	elements or compounds or both
put together how ?	chemically combined	physically mixed
quantities?	in fixed ratio	in any ratio
example?	H_2O, CO_2, CO, NaCl	heterogeneous: oil & water, salad
		homogeneous: salt water, air, brass, vinegar

Opener: Mixture Lab

- Franklin mixed together 3.00 g of salt and 2.00 g of sand. He separated them in the same way that you did in the lab and found the recovered salt weighed 126.57 g and the recovered sand weighed 3.60 g.
- Franklin's partner Agnes gasped, and said those recovered masses can not be right. After a moments reflection, the two students agreed that the recovered masses were heavy because the sand was being weighed with the filter paper, and the salt was being weighed with the beaker.
- Agnes suggested they weigh an empty beaker and subtract. But Franklin replied that they could not do that because even similar beakers weighed different amounts. Upon weighing three 250 ml beakers, they found that the beakers each weighed: 125.00 g, 136.00 g, and 120.00 g.
- Washing salt out of a beaker is easy. What would you suggest is the best way for Agnes and Franklin determine the mass of the salt that is in the beaker?

Weigh the beaker with the salt, wash and dry the beaker then weigh again. Do NOT weigh another beaker to use for tare by assuming that two beakers weigh the same. In the future, we will weigh the empty beaker FIRST

- Then they weighed three pieces of filter paper and found them to be 1.33 g, 1.34 g, and 1.34 g
- Scraping sand off filter paper might be more difficult, as some of the sand may get stuck on the paper. What would you suggest is and acceptable way for Agnes and Franklin determine the mass of the sand that is on the filter paper?

Since the masses of the filter paper see fairly consistent, it might be good enough to go ahead and subtract the 1.34 g for the empty filter paper. In the future, we should weight the filter paper FIRST.

- Later they did determine the salt weighed 2.70 g and the sand weighed 2.26 g. Calculate the percent yield for Franklin and Agnes' recovered salt.

$$\frac{2.70g}{3.00g} \times 100 = 90.0\%$$

- Franklin's partner, Agnes suggested that the salt might be low because Franklin did not wash the filter paper after collecting the sand. Franklin disagreed and said that the problem was that Agnes spilled some salt on the way to the balance. Who do you agree with, and why?

Not washing off the sand would leave salt behind making the salt low and sand high - this seems most likely. Spilling salt on the way to the balance would make the salt low, but not have made the sand value high. Thus Agnes is most likely correct.

Opener: Mass Ratio of the Elements in Compounds

When studying the iron(III) oxide compound, which is rust, Agnes needed to calculate the theoretical mass ratio of iron to oxygen. Use the masses from the periodic table in combination with the formula of the compound, Fe_2O_3 to calculate the mass ratio of iron to oxygen.

The chemical formula shows 2 iron and 3 oxygen

$$\frac{2\times 55.85 gFe}{3\times 16 gO} \qquad \frac{111.7 gFe}{48 gO} = 2.33 \qquad \frac{2.33}{1}$$

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Opener: Mass Ratio and amount of elements in Compounds

Pepé was studying carbon dioxide, CO_2.

1. Calculate the theoretical mass ratio of oxygen to carbon in this compound.

$$\frac{2\times 16 gO}{12 gC} \qquad \frac{32 gO}{12 gC} = 2.7 \qquad \frac{2.7}{1}$$

2. If Pepe knew that there was 6.55 g of oxygen in his sample of carbon dioxide, what would be the mass of carbon in his sample?

$$\frac{2.7 gO}{1 gC} = \frac{6.55 gO}{x gC} \qquad x = 2.4 gC$$

3. What would be the total mass of the sample?

6.55 g O + 2.4 g C = 8.9 (or 9.0) g CO_2

Opener: Mass Ratio and amount of elements in Compounds

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Opener: Percent of elements in Compounds

Stella was studying magnesium phosphate $Mg_3(PO_4)_2$

1. Calculate the theoretical percent by mass of each element in this compound.

$$(3\times 24.31 gMg)+(2\times 30.97 gP)+(8\times 16.00) \qquad 48.62 gMg+61.94 gP+128 gO=262.87 gTotal$$

$$\frac{72.93 gMg}{262.87 gTotal}\times 100=27.7\%Mg$$

$$\frac{61.94 gP}{262.87 gTotal}\times 100=23.6\%P$$

$$\frac{128 gO}{262.87 gTotal}\times 100=48.7\%O$$

2. Later when Stella had 4.587 g of magnesium phosphate, what mass of magnesium should she expect to recover from the sample?

$$0.277 Mg\times 4.587 gTotal=1.27 gMg$$

Opener: Percent of elements in Compounds

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2. Later when Stella had 4.587 g of magnesium phosphate, what mass of magnesium should she expect to recover from the sample?