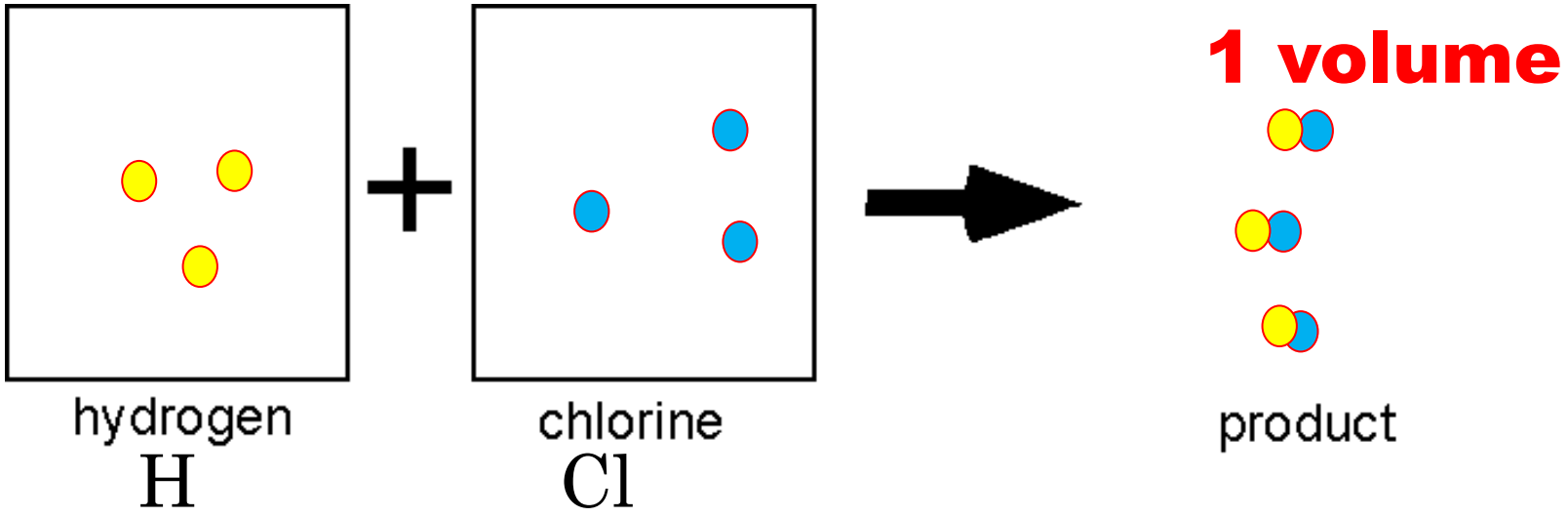
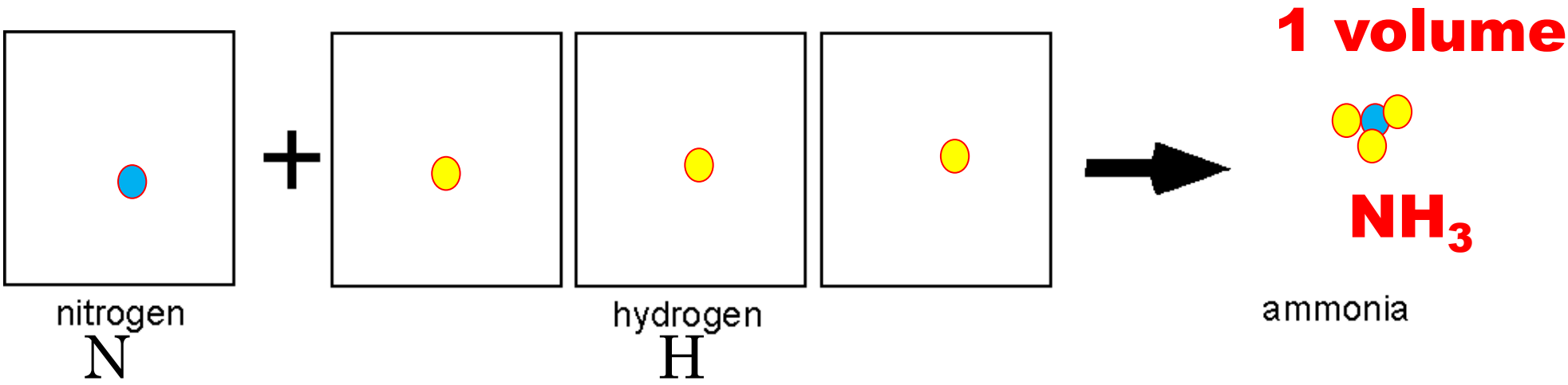
Bell Work, Nov 11 - 14, 2013

Mixtures, Avogadro' Law, Dalton's Theory, Moles,

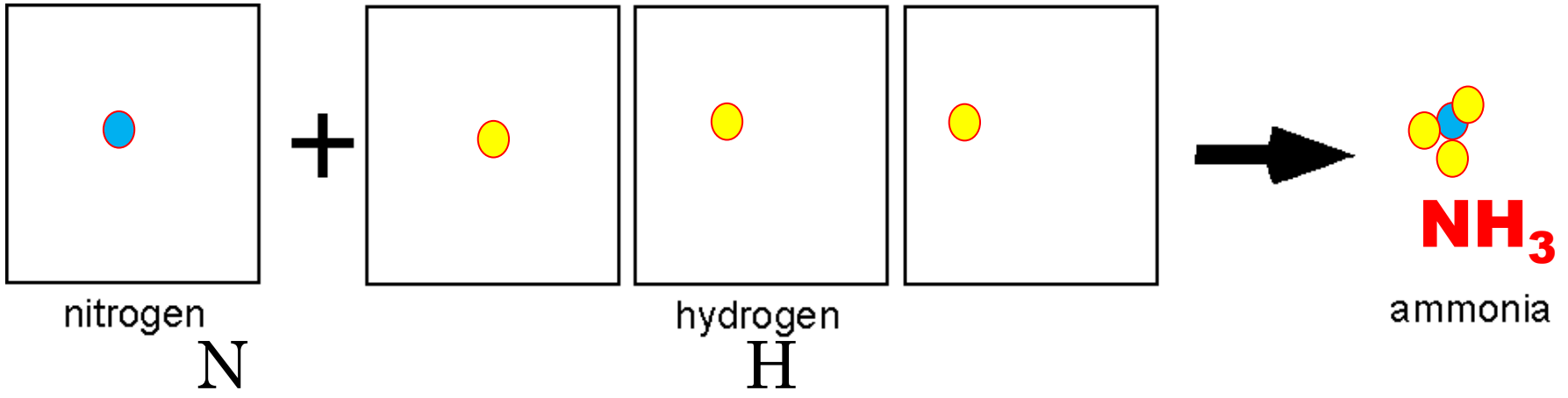
Homework Quiz – get out a sheet of paper and copy the following.

Copy your answer for questions for # 3 & 4 from Unit 4 Worksheet 2.

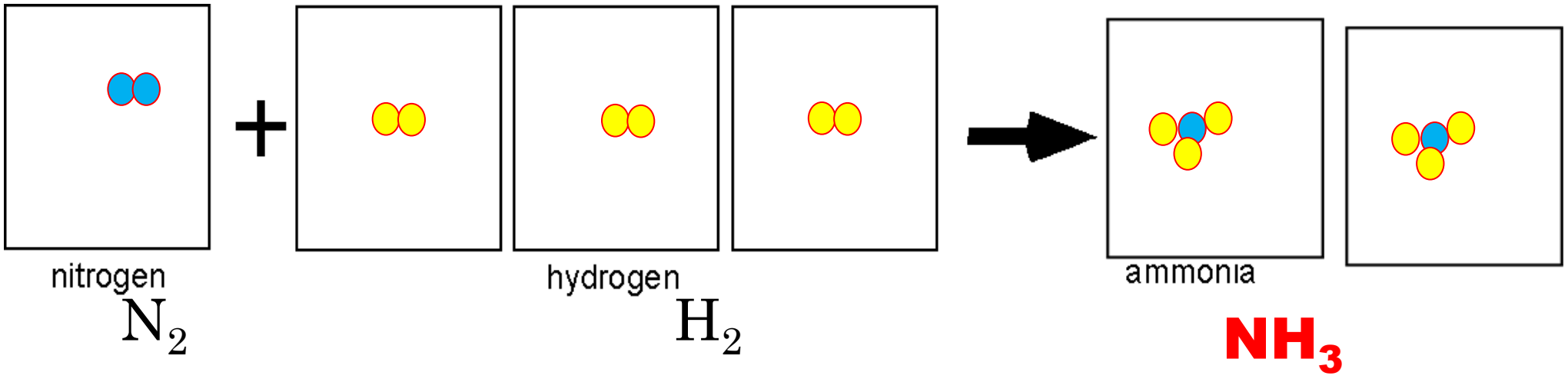




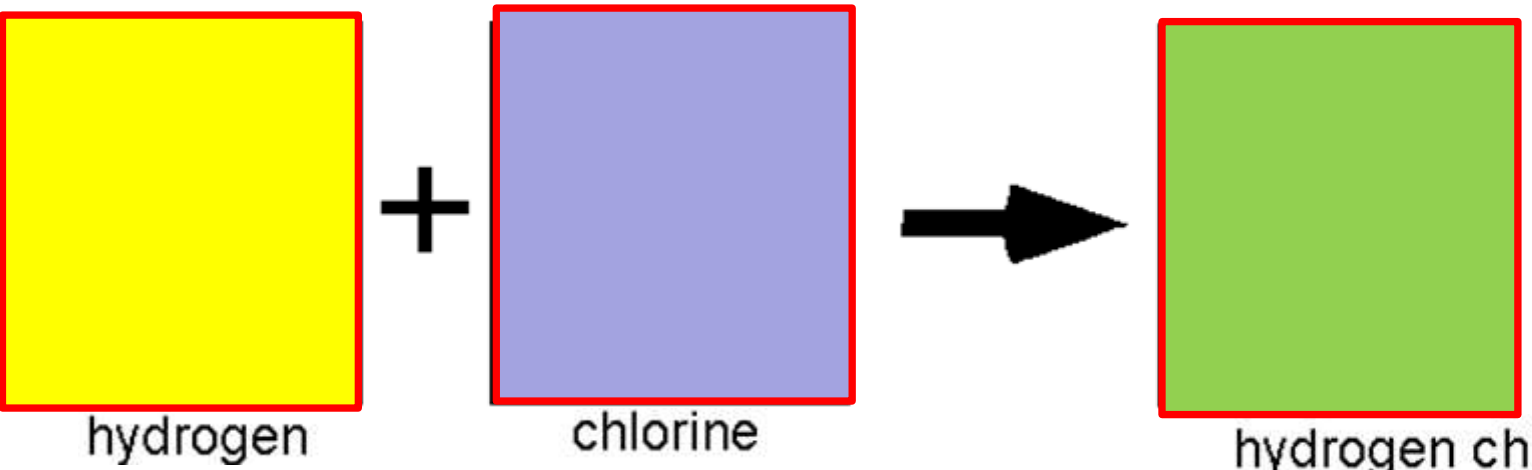
On the Unit 4 Worksheet 2 homework you found the formula that 1 volume of nitrogen mixed with three volumes of hydrogen produce one volume of ammonia:



Experiments showed that two volumes of ammonia were produced. Correct your homework to show to this.



When 1 volume of hydrogen and 1 volume of chlorine were mixed, it was assumed that one volume of hydrogen chloride was produced:



hydrogen

chlorine

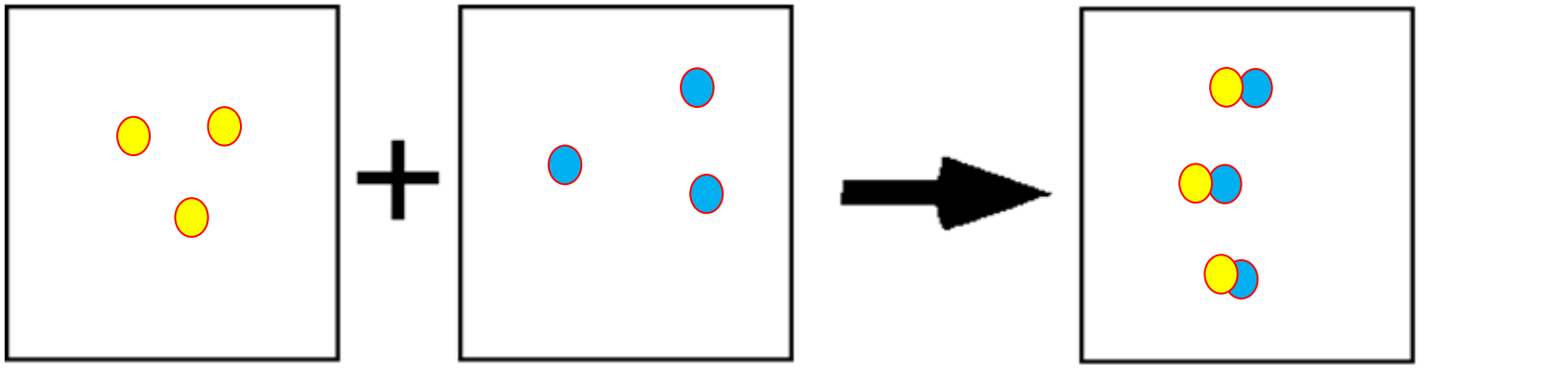
hydrogen chloride

1 vol H_1

1 vol Cl_1

1 volume HCl

Equal volumes of gasses have equal numbers of molecules



hydrogen

chlorine

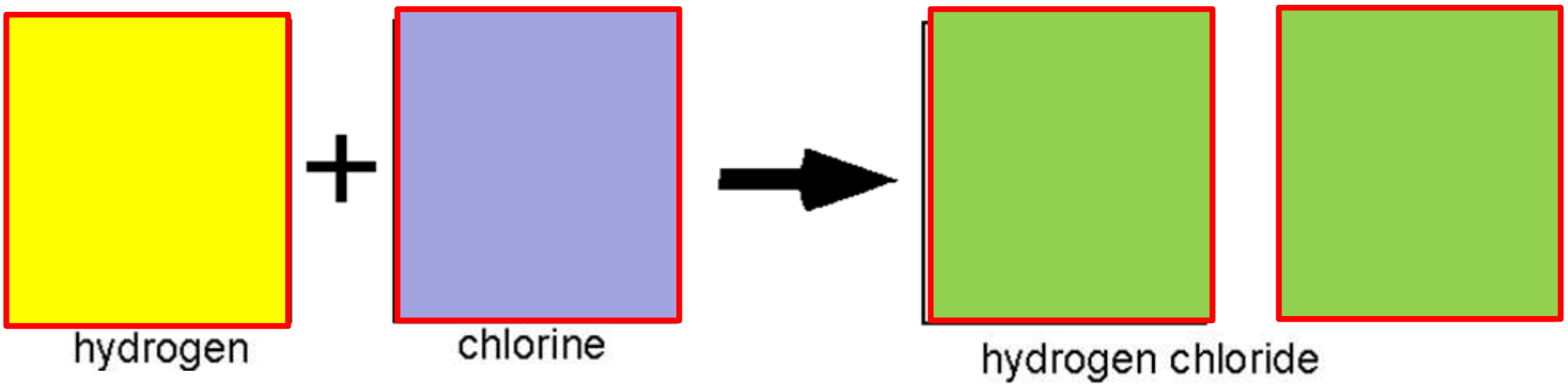
hydrogen chloride

1 vol H_1

1 vol Cl_1

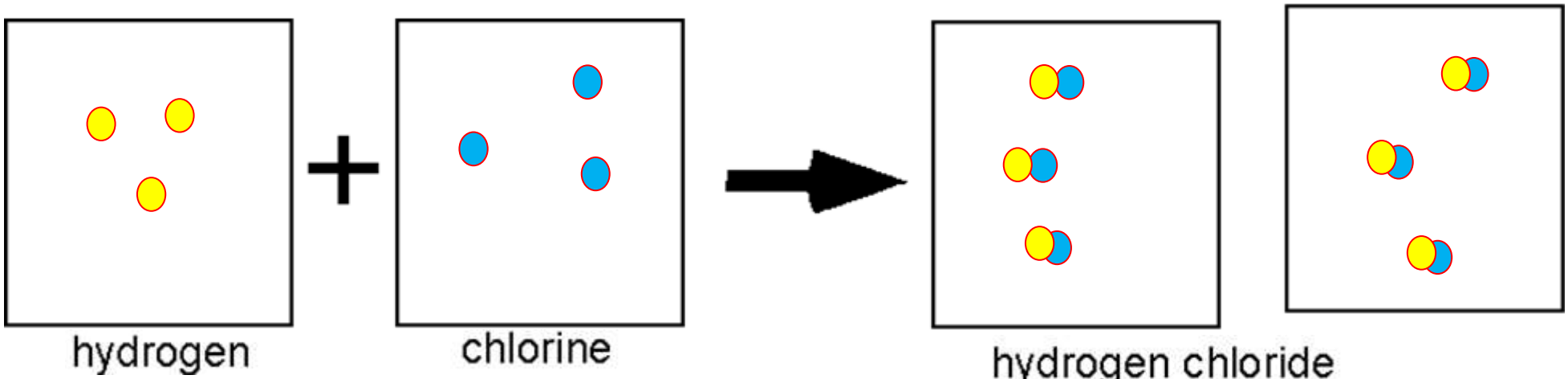
1 volume

Experiments showed that when 1 volume of hydrogen and 1 volume of chlorine were mixed, two volumes of hydrogen chloride were produced:

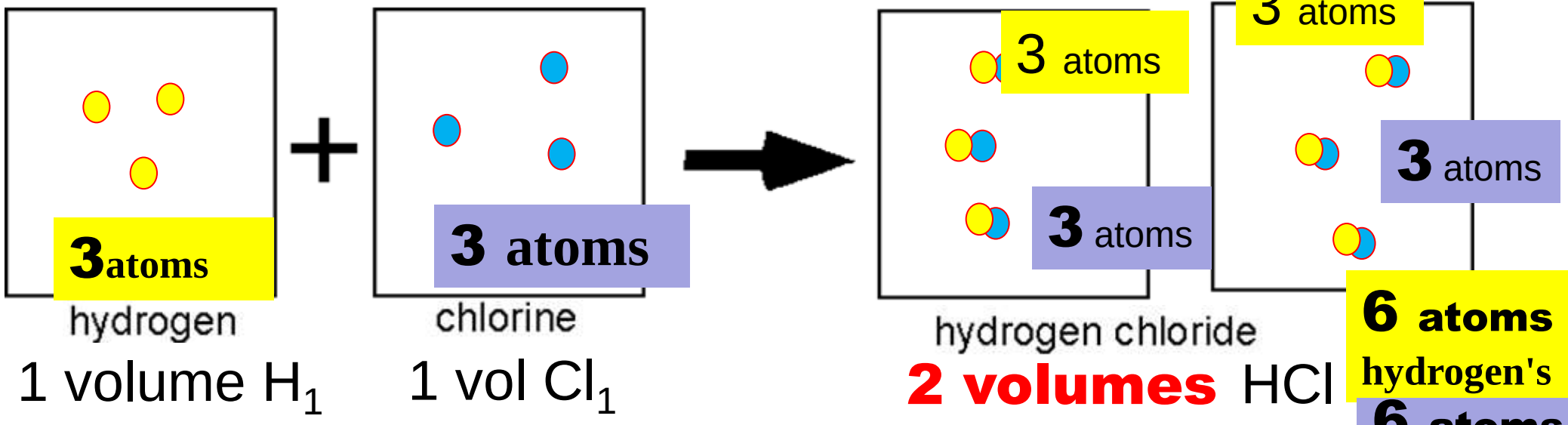


1 vol H_1 1 vol Cl_1 **2 volumes** HCl

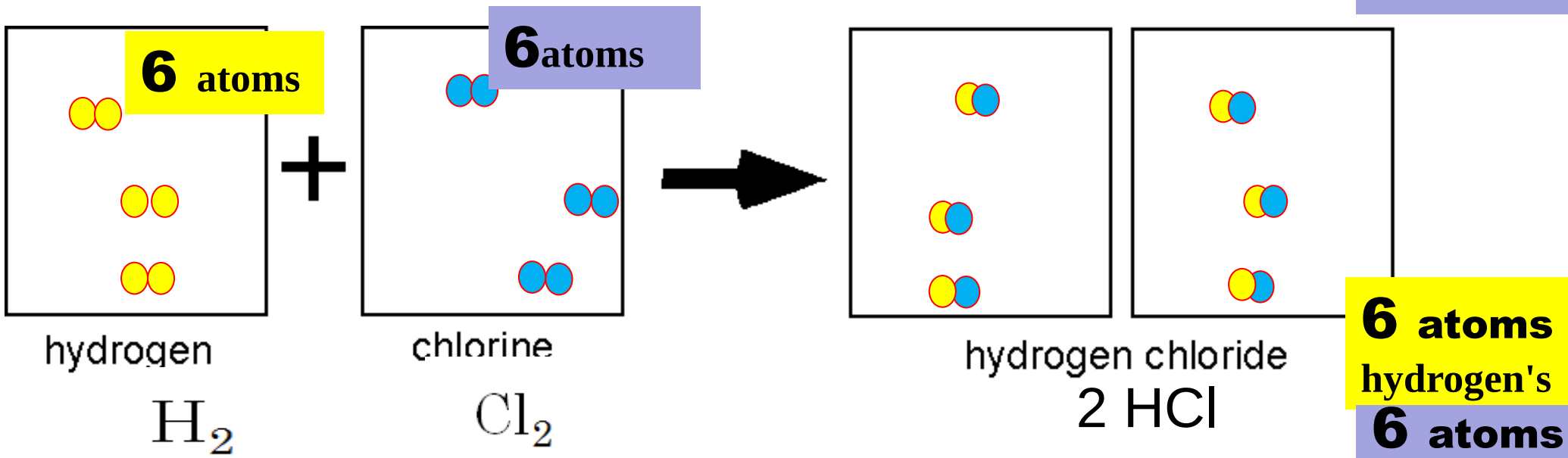
Equal volumes of gasses are supposed to have equal numbers of molecules:



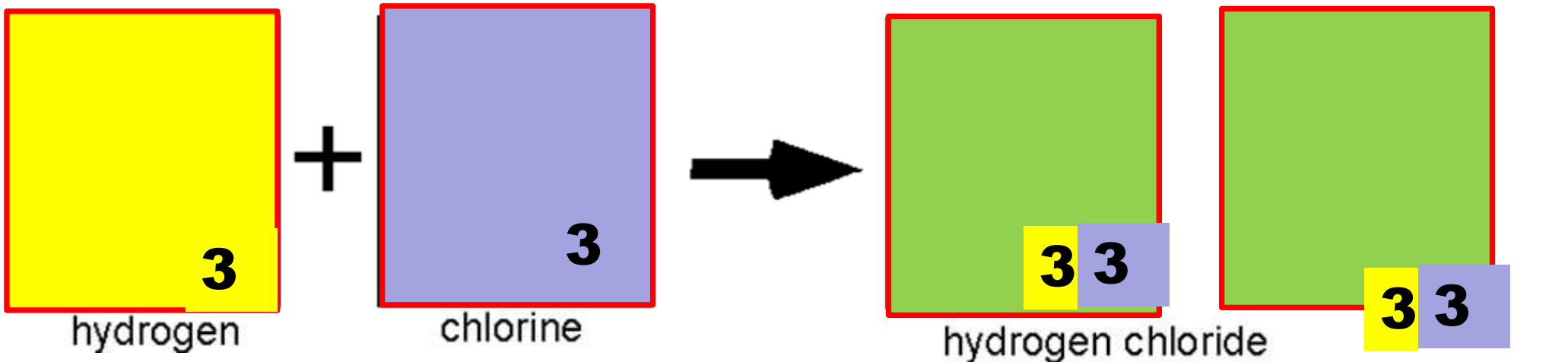
This is not equal numbers of molecules on both sides of the arrow.



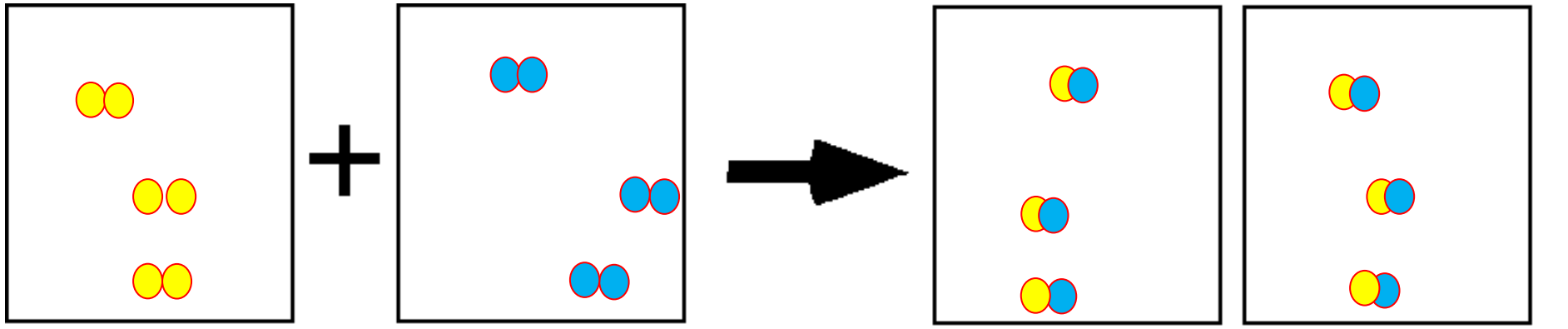
Equal volumes of gasses have equal numbers of molecules



Diatomic molecule:

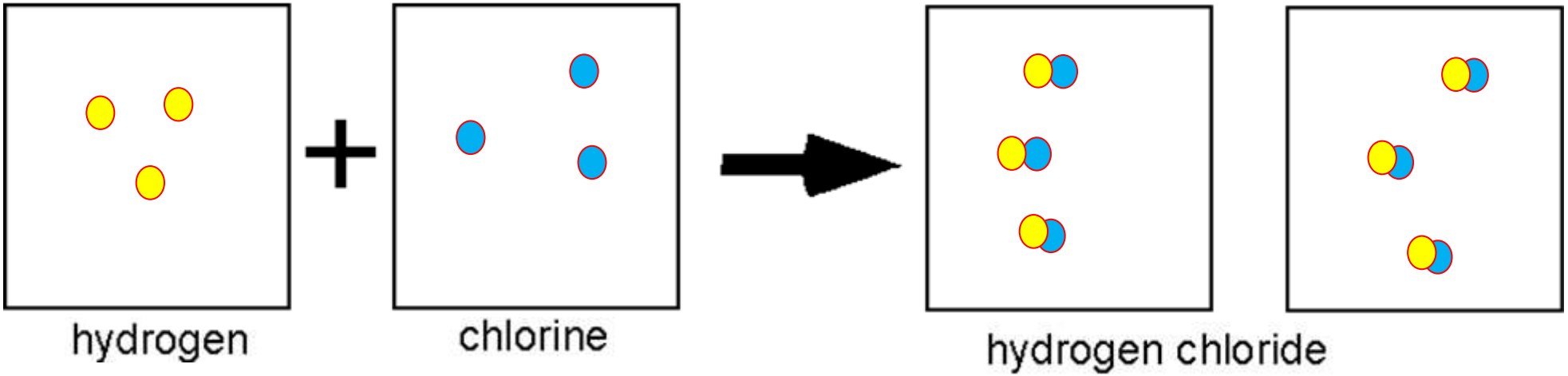


Equal volumes of gasses have equal numbers of molecules



Diatomic molecule

Which is correct? The top or bottom?



hydrogen

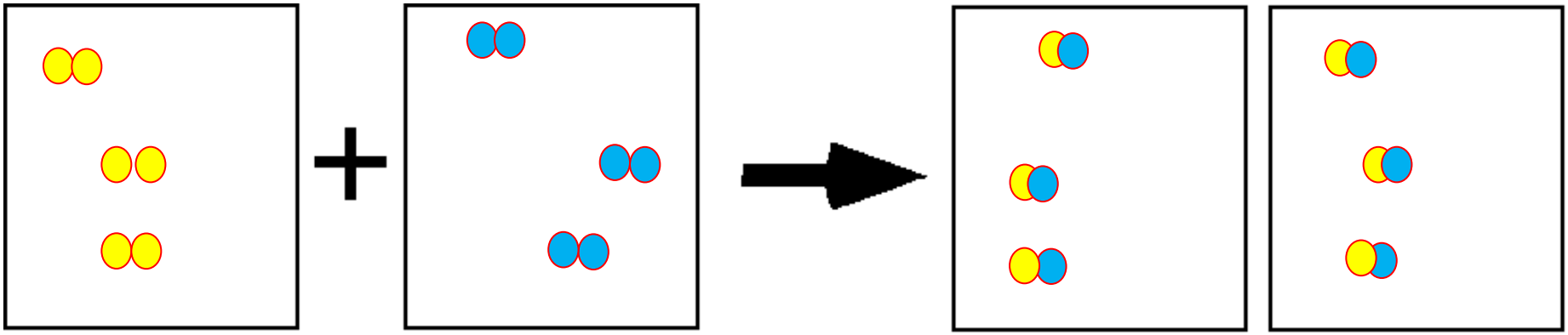
chlorine

hydrogen chloride

H

Cl

2 HCl



hydrogen

chlorine

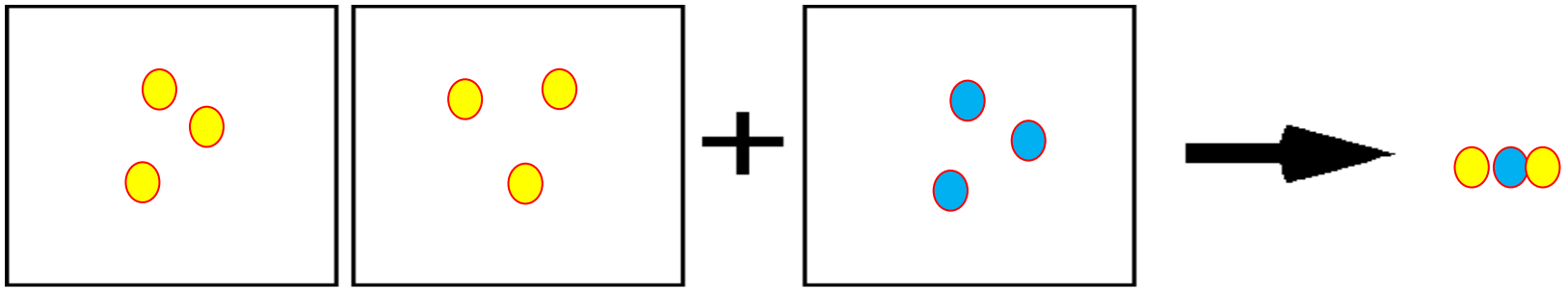
hydrogen chloride

H_2

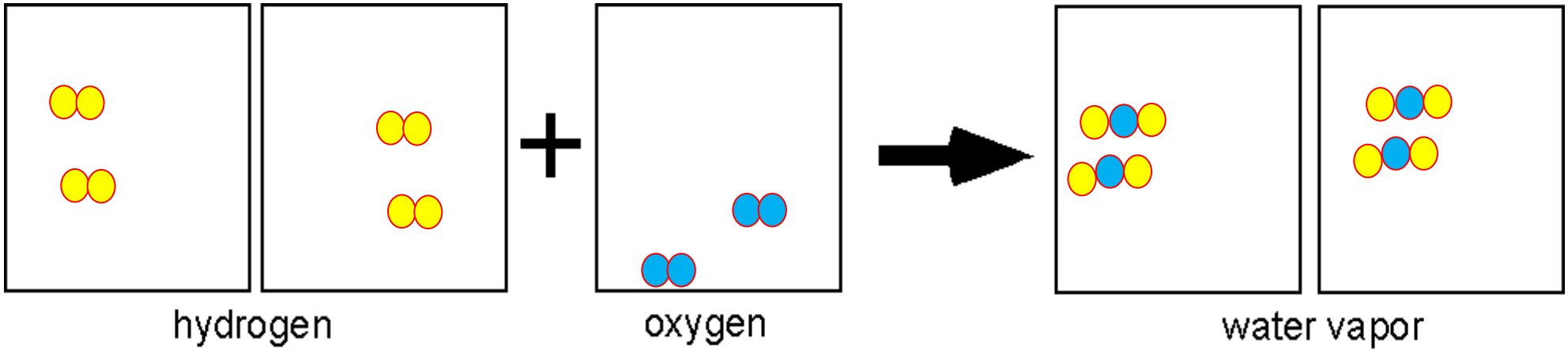
Cl_2

2 HCl

When 1 volume of hydrogen and 1 volume of oxygen were mixed, it was assumed that one volume of water vapor was produced. Experiments showed two parts water vapor was produced



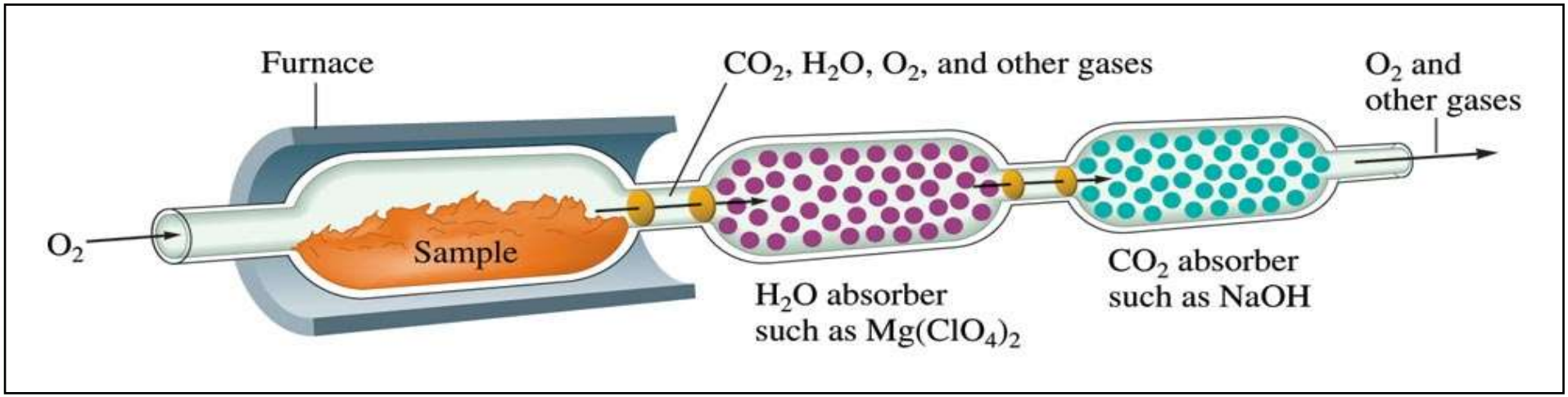
2 volumes H_1 + 1 vol O_1 → 1 volume H_2O



2 volumes H_2 + 1 vol O_2 → 2 volumes H_2O

$C_?H_? + O_2 \rightarrow CO_2 + H_2O$

- **The products can be trapped in the device shown below.**



- The increase in the mass of the H_2O absorber and the CO_2 absorber are a direct result of the mass of the C and the H from $C_?H_?$ ending up in the absorber.

- **The result of such analysis provides the masses of each type of element in the compound.**

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Compounds of carbon and oxygen from 100 grams of an unknown compound:

Compound A: 57.1 g O / 42.9 g C

Compound B: 72.7 g O and 27.3 C

a. Determine the value of the ratio in each compound.
A: **1.33** B: **2.66**

b. How does the mass ratio for compound B compare to that in compound A? **double**

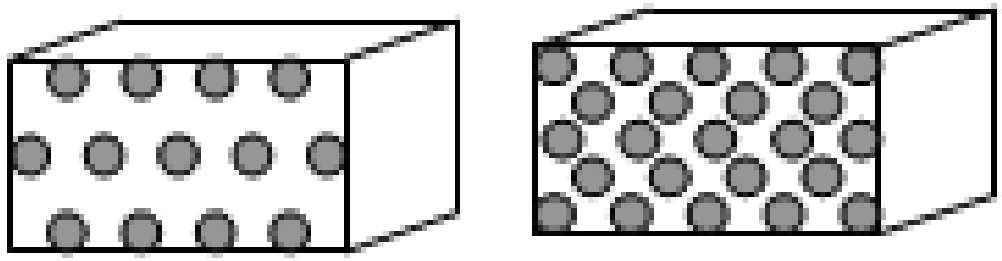
c. Express these ratios as improper fractions.
A: **4/3, B: 8/3**

d. For each hypothesis, sketch particle diagrams for the compounds of A and B that account for these mass ratios. Write the formula for the compound in each diagram.

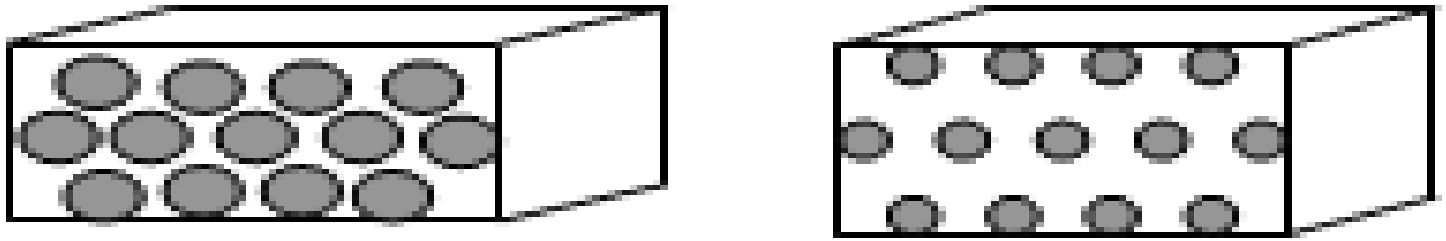
Notes

Back in Unit 1 we found that copper was more dense than aluminum. Two possible models arose to account for this difference.

A. The masses of Al and Cu atoms are about the same, but there are more atoms of Cu than atoms of Al in each cm^3 sample.



B. One cm^3 samples of Cu and Al contain about the same number of atoms, but the Cu atoms are more massive.



Notes

- A third possibility – that both the size and the mass of the atoms of these two elements were different – also came up. At the time, we did not have enough evidence to make a decision about these possible models.
- While the reason for density variation between particle types is difficult to determine for liquids and solids, a conclusion *can* be reached more easily for gases due to the fact that particles in a gas are widely spaced.
- **This means that particle size does not have an effect on the volume that a given number of gaseous particles occupy.**
- This hypothesis not only allows us to deduce the numbers of molecules that react with one another based on volumes, but also enables us to determine the relative masses of elements and compounds.

What is the best way to figure out how many “peanuts” are in the bag?

Count by weighing

Weigh some of the peanuts to get an average mass for a peanut.

Then weigh the big bag of peanuts. Divide the mass of bag by the mass the average peanut to determine the number of peanuts in the bag.

Bell Quiz, Thursday, Nov 14, 2013

Copy this data

Hardware	Mass (g)
Empty bag & tape	5.8
Bag/ tape + Washers	73.5
Bag/ tape + Hex Nuts	133.2
Bag/ tape + Bolts	215.5

Go to the Relative Mass Activity sheet, problem #1, and calculate the mass of a box of washers and the mass of a box of hex nuts using the data above.

****Be careful. The masses above include the bag & tape.****

1. A box of hardware contains 100 pieces. Assuming there are 25 pieces in each vial, calculate the mass of a box of each kind of hardware. Express these values in units of g/box. X

2. If you had 1.00 kg of each kind of hardware, how many boxes of each would you have?

3. You learned that a barrel of the 1" bolts had a mass of 65.2 kg. The mass of the barrel was 9.6 kg. How many boxes of bolts are in the barrel?

Bell Quiz, Thursday, Nov 14, 2013

1. (#4 on the activity sheet) Someone at the Home Depot tells you that a 2" bolt is 6.75 times as heavy as a washer. What would be the mass of a box of such bolts? Show your work!

2. (#5 on the sheet) Suppose that you were given the job of shipping 25,000 hex nuts to a customer.

a) How many boxes of hex nuts would be equal to 25000 hex nuts? Use the information from question one on the Relative Mass sheet to answer this question . Show your work!

All you have is a hanging scale and a barrel of hex nuts.

b) Describe how you could determine the proper number of pieces without physically counting them out.

White Boards & Post Lab Tasks For Relative Mass Lab

All groups:

- Do the “Extension” on the lab paper and show all work on the white board.
  - Please double the mass of the bolts & hex nuts before you calculate your ratios.
  - Circle the “correct number” with the correct element on your periodic tables.
- Determine the number of hex nuts, bolts, and washers in each bag. Show all your work on the white board.