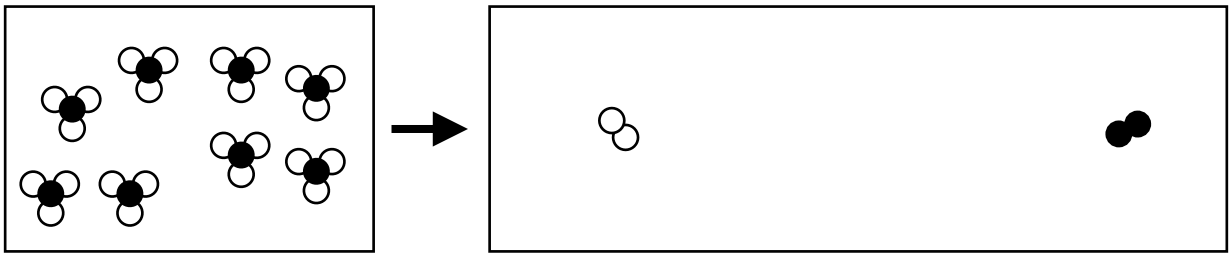
P D1 (pg 1 of 2) **Particulate Diagrams** Name_____Per____

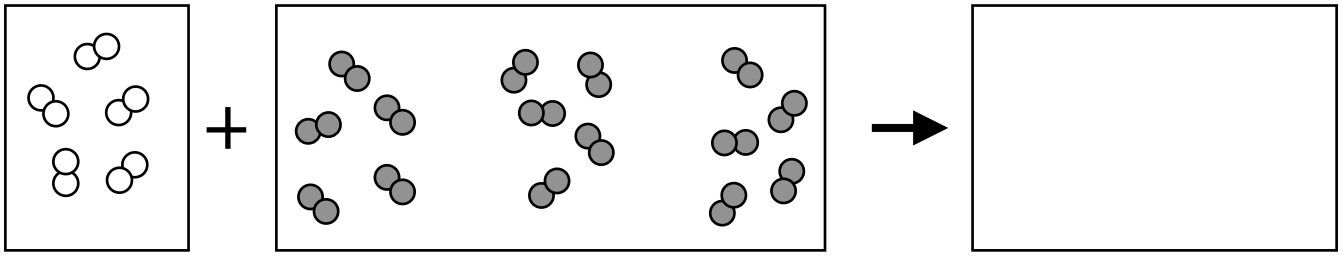
1. Consider the reaction of 2 L of chlorine trifluoride gas to decompose into chlorine gas and fluorine gas. Assume that the product container is 4 L, but is at the same temperature, and same pressure as the reactant gases. Complete the remainder of the particulate diagram as appropriate.



ClF_3

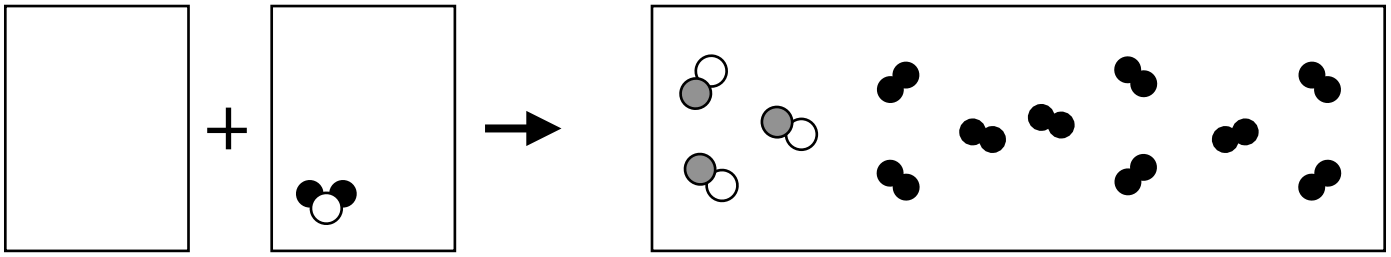
2. Write the balanced equation for the reaction (#1) on the line above with the lowest whole number ratios.

3. 1 L of nitrogen gas reacts with 3 L of hydrogen gas at the same temperature and pressure in a synthesis reaction producing only one compound. Complete the particulate diagram as appropriate by observing that that the products fill a 2 L container at the same temperature and pressure as the reactants.



4. Write the balanced equation for the reaction (#3) on the line above with the lowest whole number ratios.

5. 4 L of hydrogen gas and carbon monoxide form when 1 L of water vapor and 1 L of some other compound react. Complete the particulate diagram as appropriate, assuming that all the gases are at the same temperature and pressure.
Hint: Complete the water before deciding on the "mystery" molecule.

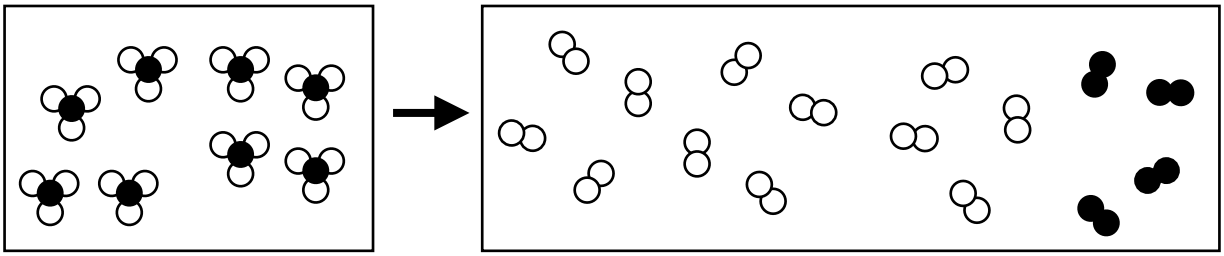


6. Write the balanced equation for the reaction (#5) on the line above with the lowest whole number ratios.

Particulate Diagrams

ANSWERS

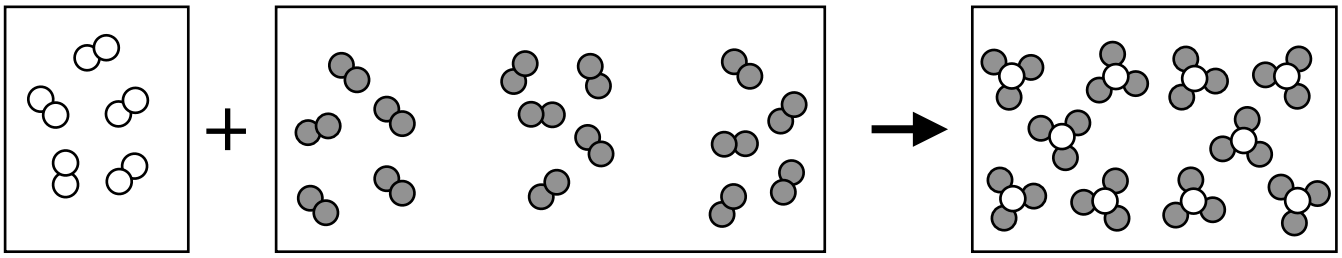
1. Since you can see the formula of the reactant is ClF_3, and there are four in each volume, all the other volumes must also have four molecules in the containers (since they are all at the same temperature and pressure − you learned this in unit D). You can see on the product side that the chlorine and fluorine will be diatomic. You can count atoms to determine how many of each will form. Notice the well placed + sign between the two types of product elements occurs in the balanced equation.



$2\ ClF_3 \rightarrow 3\ F_2 + Cl_2$

2. Write the balanced equation for the reaction (#1) on the line above.

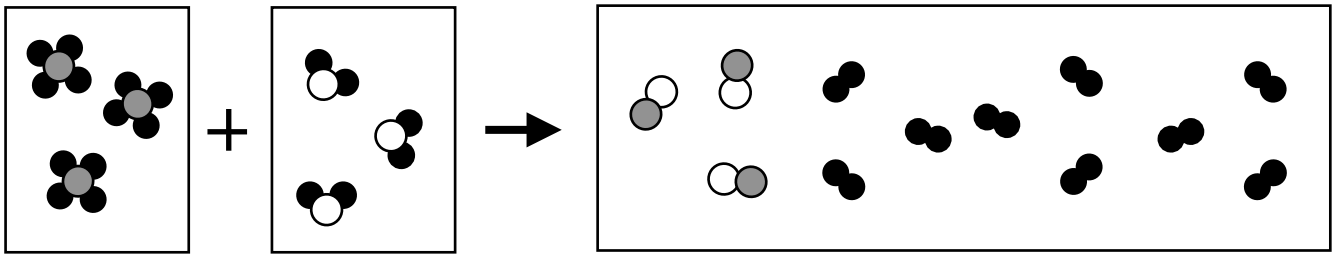
3. You know that the product volumes must have five molecules in them, since the volumes all have the same temperature and pressure telling you the molecules must be equal. Only one type of molecule is being formed so the product volumes must contain all the same molecules. There is only one way to configure all the atoms to meet this critera of five equal molecules in each box.



$N_2 + 3\ H_2 \rightarrow 2\ NH_3$

4. Write the balanced equation for the reaction (#3) on the line above.

5. You know the model for water, and there is only one water molecule in the volume, so you can see you need to sketch two more to create the same temperature and pressure: 3 molecules per liter since 12 molecules in 12 L are on the product side. You know that there must be three mystery molecules in the container to cause the same temperature and pressure, so by counting particles you can tell that the mystery molecule must be made with one carbon and four hydrogens.



$CH_4 + H_2O \rightarrow CO + 3\ H_2$

6. Write the balanced equation for the reaction (#5) on the line above.