##### What is a Mole

**Background:**

A unit was created to express the amount of a substance just like a dozen is 12 and a gross is 144. This unit, the **mole**, is defined **as the number of atoms in exactly 12 g of carbon-12**. To understand why, we must revisit atomic structure unit where the mass of protons and neutrons are both equal to 1 amu (atomic mass units).

**Your turn….**

1. A. What is the mass of **Carbon-12**? # protons \_\_\_\_\_\_\_ + # neutrons \_\_\_\_\_\_\_ = \_\_\_\_\_\_\_ amu or ­­­­­­­\_\_\_\_\_\_\_\_ g

1. What is the mass of **Carbon-13**? # protons \_\_\_\_\_\_\_ + # neutrons \_\_\_\_\_\_\_ = \_\_\_\_\_\_\_ amu or ­­­­­­­\_\_\_\_\_\_\_\_ g
2. What is the mass of **Carbon-14**? # protons \_\_\_\_\_\_\_ + # neutrons \_\_\_\_\_\_\_ = \_\_\_\_\_\_\_ amu or ­­­­­­­\_\_\_\_\_\_\_\_ g

2. Why are electrons NOT represented in determine the mass of the atom in the above question?

**More Background:**

As you learned last class, the number of particles in a mole is called Avogadro’s constant or **Avogadro’s Number**. One mole represents 6.02 x 1023 particles, which can be atoms, molecules or just about ANYTHING. You could have a mole of M&Ms for people quarantining in their homes. Do you think that is possible?   
Think of the mole movie. If you are actually reading this, then you can send me a quick email to tell me if it is possible or not and why for a second coupon. **Therefore, if you have exactly 12 g of carbon (atomic mass is 12) you have 1 mole or 6.02 x 1023 individual atoms of C.**



**Do I just add the label “grams” to the ave atomic mass?**

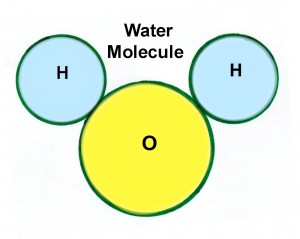
**Yep! Measurement in chemistry is that easy! The MOLAR MASS is simply adding the label of grams to the average atomic mass.**

**Molar mass of sodium is 22.99g and hydrogen is 1.01g**



**Your Turn…**

|  |
| --- |
| Find the molar mass of the following **elements**:  For example, the molar mass of Magnesium is 24.31g.   1. Calcium \_\_\_\_\_\_\_\_\_\_\_ C. Lithium \_\_\_\_\_\_\_\_\_\_\_\_ E. Barium \_\_\_\_\_\_\_\_\_\_\_ 2. Chlorine \_\_\_\_\_\_\_\_\_\_\_ D. Oxygen \_\_\_\_\_\_\_\_\_\_\_\_ F. Fluorine \_\_\_\_\_\_\_\_\_\_\_   *\*If I had 24.31g of Mg then I would have exactly 6.02 X 1023* ***atoms*** *of magnesium or a mole!* |

***What about a compound made up of atoms bonded together?***

***Well if you know the mass of the parts, then just add them up!***

H2O is **two** hydrogen and **one** oxygen….

2(1.01g) + 1(16.00g) =

2.02g + 16.00g = 18.02g is a mole of water molecules.

**Your Turn…**

|  |
| --- |
| Find the molar mass of the following **compounds**:  For example, the molar mass of Magnesium Oxide, or MgO, would be 24.31 + 16.00 = 40.31g  & Sodium Oxide Na2O is (2 X 22.99) + 16.00 = 61.98g   1. CaCl2 \_\_\_\_\_\_\_\_\_\_\_ C. Li2O \_\_\_\_\_\_\_\_\_\_\_\_ E. BaF2 \_\_\_\_\_\_\_\_\_\_\_\_ 2. LiCl \_\_\_\_\_\_\_\_\_\_\_ D. CaO \_\_\_\_\_\_\_\_\_\_\_\_ F. Ba(ClO3)2 \_\_\_\_\_\_\_\_\_\_\_   *\*If I had 40.31g of Mg0 then I would have exactly 6.02 X 1023* ***molecules*** *or a mole!* |

**Atoms** label is used foran **element**

**Molecules** label is used for **compounds**

**Particles can mean BOTH!**

**Summary of the MOLE:**

* There are 6.02 X 1023 individual **atoms** of magnesium in 24.31g of Mg or **24.31 g/mole**
* There are 6.02 X 1023 individual **atoms** of sodium in 22.99 g of Na, or **22.99 g/mole**
* There are 6.02 X 1023 individual **molecules** of MgO in 40.31g of MgO, or **40.31 g/mole**
* There are 6.02 X 1023 individual molecules of Na2O in 61.98 g of Na2O or **61.98 g/mole**