Mass Relationships in Chemical Rxns

- atomic mass (amu/$\frac{g}{mol}$) = weighted average of all naturally occuring isotopes

Formula of Calculating Avg. Atomic Mass

$$\text{atomic mass} = \left(\begin{matrix}\text{fractional abundance of} \\ \text{isotope \#1}\end{matrix}\right)\left(\begin{matrix}\text{mass of} \\ \text{isotope} \\ \text{\#1}\end{matrix}\right) + \left(\begin{matrix}\text{fractional abundance of} \\ \text{isotope \#2}\end{matrix}\right)\left(\begin{matrix}\text{mass of} \\ \text{isotope} \\ \text{\#2}\end{matrix}\right)$$

To put this in a lot more simpler terms...

The atomic mass of an element is what we see on the periodic table (an average mass). There are multiple isotopes for every element that contribute to the avg. mass, but each isotope has a specific amount of abundance in our world

Think about it this way...

Carbon has two isotopes with different weights.

C-12 (12.0 amu) and C-13 (13.0 amu)

Now to find the avg. mass of a carbon atom we need to take an avg.

Most might think!

$$\text{avg. C mass} = \frac{12+13}{2} = \boxed{12.5 \text{ amu}}$$

BUT, we have to take into account that those isotopes are weighted VERY differently!

In our entire world, scientists discovered

that most atoms of carbon are C-12 carbon atoms. In fact... out of all the carbon in the world.

98.90% is C-12 (12.0 amu) and only 1.10% is C-13 (13.0 amu)

Those red numbers are what we call percent or fractional abundances.

Now, since we know that a very very small percent of carbon is 13.0 amu, we can probably guess that the avg. mass is going to be very close to 12.0 amu.

Essentially, we are taking a weighted avg. that depends on how present an isotope is in the world.

Now, we use the formula...

atomic mass = (12.0 amu)(0.9890) + (13.0)(0.0110)

(0.9890): taking 98.9% of the 12.0 amu

(13.0)(0.0110): and combining it with one percent of the 13.0 amu

atomic mass ≅ 12.01

Note: the fractional abundance you learned is just the given percent/100 so you can take 98.9% of the C-12 mass.

Also, when doing these problems,