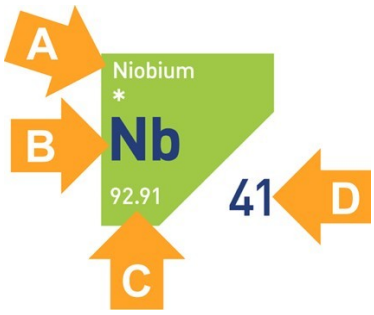
Week 3 Concepts: Chemical Reactions and

STOICHIOMETRY

Introduction: Just like in preparing your favorite foods, recipes exist for chemicals as well. We can use balanced chemical equations just like a recipe in your favorite cookbook. In chemistry, this process is called stoichiometry.

Which of the numbers represents the atomic mass of the atom below?



- A
- B
- C
- D

If the balanced chemical reaction for the formation of Li_2O is $4\ Li_{(s)} + O_{2(g)} \rightarrow 2\ Li_2O_{(s)}$, how many molecules of $Li_2O_{(s)}$ would you produce if you used up 6 atoms of $Li_{(s)}$?

- 3
- 12
- 2
- 6

AVOGADRO'S NUMBER AND THE MOLE

Before we can dive into stoichiometry, you must first understand **Avogadro's number: 6.022×10^{23}**. This is the number of atoms in 12 grams of the isotope carbon-12. As you will see, this number will allow you to make connections between chemical compounds and chemical masses.
To help understand this number, first consider a named number you have likely heard of: a dozen. If you have a dozen eggs, you have 12 eggs, if you have a dozen atoms, you have 12 atoms, etc. We know that a dozen means 12.

Just as 12 of a substance is a dozen, 6.022×10^{23} of a substance is a mole. For example:

- One mole of aluminum atoms is 6.022×10^{23} atoms of aluminum.
- If you have 1 mole of cookies, you have 6.022×10^{23} cookies
- 1 mole of H_2O is equal to 6.022×10^{23} molecules of H_2O

It is important to note that a mole of a substance does not have the same mass of a mole of another substance, just as a dozen eggs would have a much smaller mass than a dozen cars.
For example, the mole of cookies would have a greater mass than the mole of H_2O molecules as these molecules are much less massive than cookies.