The Mole

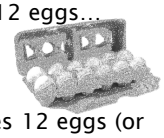
Mr. Sudbury

Counting Atoms

- Atoms are too small to see or determine the mass of individually, so scientists created a way to talk about quantities of atoms.
- Scientists talk about quantity in units of **moles** (abbreviated **mol**).
- A mole is simply an amount, a quantity used in chemistry.

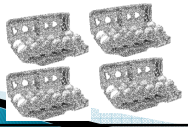
Analogy of a mole.

- If you went to the store to buy 12 eggs…
- You would be buying a dozen.



- A dozen is a value that describes 12 eggs (or anything else for that matter)
- Can you buy 2 dozen eggs?

- 4 dozen?



Analogy of a mole.

- Lots of things can be in dozens!

How many are in a mole?

- A mole is an amount.
- How much?
- Avogadro's number is how many ___ are in a mole.
- Avogadro's number is 6.0221367×10^{23}.
- So there are 6.0221367×10^{23} atoms in a mole.

How much in a mole?

- 602,213,670,000,000,000,000,000
- That's a lot of _____ in a mol.
- Atoms are small!!!

Molar Mass

- So if you had 1.0 mol of any element, you could easily know how many atoms are in that quantity.
- Besides knowing how many atoms there are, you could know how much mass that mol of atoms has.
- If you have 1.0 moles of Al, you have 6.02x 10^{23} Al atoms and it would have a mass of….

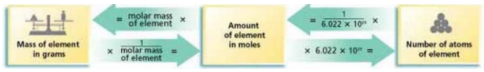
13
Al
26.982
Aluminum

Molar Mass

- The Molar Mass of an element or compound is the mass of one mole of a pure substance.
- Molar mass has units of g/mol.
- Not to be confused with amu….

16 6A	17 7A	18 8A
		2 **He** 4.003 Helium
8 **O** 15.999 Oxygen	9 **F** 18.998 Fluorine	10 **Ne** 20.180 Neon
16 **S** 32.066 Sulfur	17 **Cl** 35.453 Chlorine	18 **Ar** 39.948 Argon
34 **Se** 78.96 Selenium	35 **Br** 79.904 Bromine	36 **Kr** 83.798 Krypton

Gram–Mol Conversion



- What is the mass of 3.50 moles of Cl?
- How many Cl atoms is that?

16 6A	17 7A	18 8A
		2 **He** 4.003 Helium
8 **O** 15.999 Oxygen	9 **F** 18.998 Fluorine	10 **Ne** 20.180 Neon
16 **S** 32.066 Sulfur	17 **Cl** 35.453 Chlorine	18 **Ar** 39.948 Argon
34 **Se** 78.96 Selenium	35 **Br** 79.904 Bromine	36 **Kr** 83.798 Krypton

Gram to Mole Conversions

- If you have 81.5 grams of S, how many moles is that?
- How many S atoms is that?

16 6A	17 7A	18 8A
		2 **He** 4.003 Helium
8 **O** 15.999 Oxygen	9 **F** 18.998 Fluorine	10 **Ne** 20.180 Neon
16 **S** 32.066 Sulfur	17 **Cl** 35.453 Chlorine	18 **Ar** 39.948 Argon
34 **Se** 78.96 Selenium	35 **Br** 79.904 Bromine	36 **Kr** 83.798 Krypton

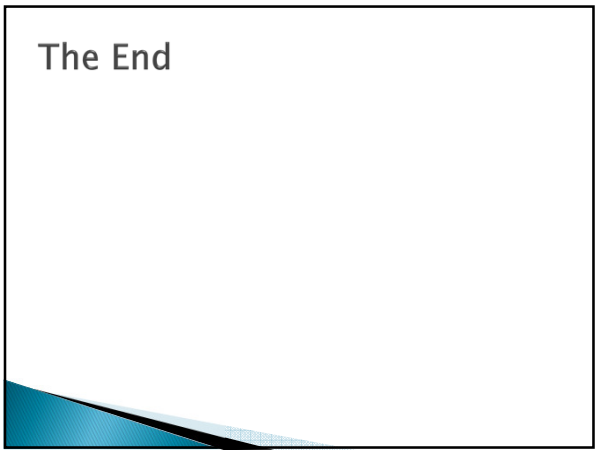
Grams to Moles Conversions

- If I have 142.6 g of F, hot many atoms of F do I have?

16 6A	17 7A	18 8A
		2 **He** 4.003 Helium
8 **O** 15.999 Oxygen	9 **F** 18.998 Fluorine	10 **Ne** 20.180 Neon
16 **S** 32.066 Sulfur	17 **Cl** 35.453 Chlorine	18 **Ar** 39.948 Argon
34 **Se** 78.96 Selenium	35 **Br** 79.904 Bromine	36 **Kr** 83.798 Krypton

Moles Review

- A mole is an amount used in chemistry.
- It is rounded to 6.022 x 10^{23}.
- You know how much mass a mole of any atom has (according to the PT).
  - Round to 2 decimal places.
- This is a fundamental skill you WILL NEED many times throughout the year. Go to tutoring if you need help.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