

## Section 3.4 (p95 – 100)

## Objectives:

1. Explain the relationship between moles of a substance and Avogadro's constant.
2. Find the molar mass of an element by using the periodic table.
3. Solve problems converting the amount of an element in moles to its mass in grams and vice versa.

Warm-up: How many seconds in 3 hours? Use factor-table method.

- Conversion relationships? Units must cross-cancel out
- 60 s = 1 min, 60 min = 1 hr

*Start:*

$$\frac{3hr}{1} \times \frac{(\quad)}{(\quad)} \times \frac{(\quad)}{(\quad)} =$$

How many hours in a day?

*Start:*

$$\frac{1day}{1} \times \frac{(\quad)}{(\quad)} \times \frac{(\quad)}{(\quad)} =$$

Conversions: 24 hrs – 1 day 3600 s = 1 hr
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How many seconds in 1 year, use 365.25 days = 1 year

1 dozens means \_\_\_\_\_ of something. 1 dozen cats equals \_\_\_ cats. Two dozen cats equals \_\_\_\_\_ cats.

Mole is the SI base unit that describes the amount of something. In chemistry, we have to count a large number of small objects. 1 mole (mol) is equal to:

$$602, 213, 670, 000, 000, 000, 000 = 6.022 \times 10^{23}$$

The number  $6.022 \times 10^{23}$ , is known as Avogadro's number,  $N_A$ .

So, dozen is to 12 as mol is to \_\_\_\_\_.

Revisit: the mass of an atom (p84)

- The mass of an atom is very small. For example, the mass of a Fluorine (F) atom is about  $3.1 \times 10^{-22}$  g = 0.000000000000000000000031 g (small..Huh?)
- Atomic masses are expressed as atomic mass units or amu.
- 1 amu is equal to the atomic mass of Carbon divided by 12.
- 1 amu =  $12.011/12 = 1.0009$ ...round to nearest whole number = 1

### Moles and grams are related

- The mass in 1-gram of a substance (element) is called its molar mass
- Units are grams/mol (g/mol)
- Just look up the atomic mass # and add the units g/mol.
- Practice: find the molar mass of
  - Mn \_\_\_\_\_g/mol
  - H \_\_\_\_\_
  - C \_\_\_\_\_
  - Cd \_\_\_\_\_
  - As \_\_\_\_\_
  - Sr \_\_\_\_\_

### Mole to grams and grams to mole conversions

Given \_\_\_\_\_ Want \_\_\_\_\_  
 [Mass in Grams] divide by [Molar Mass] = [Moles]

Given \_\_\_\_\_ Want \_\_\_\_\_  
 [Moles] x [Molar Mass] = [Mass in Grams]

Practice:

1. What is the mass in grams of 0.48 mol of Pt?
2. How many moles are present in 620 g of Hg?
3. How many grams are in 2 mols of Au?
4. How many grams are in 2.5 mols of Au?
5. Which has more atoms, 5 g of K or 3 g of F? (hint: compare moles)