CONCEPT: MOLE CONCEPT

The Mole

- The mass of substance "containing the same number of units as atoms in 12.00 g of Carbon-12" and connects together:
  - □ **Atom**: A single element with no charge.
  - □ **Ion**: A single element with _____ or _____ charge.
  - □ **Molecule**: A compound with 2 or more _____ together.
  - □ **Formula Unit**: General term for a compound composed of a(n) _____ and _____.

EXAMPLE: Which of the following compounds would not be associated with the term "formula unit"?

a) Na_2CO_3 b) CH_3COONa c) BF_3 d) $MnCl_4$

Converting between Moles and Particles

- **Avogadro's Number**: One mole of a substance is equal to _____ ***particles***.
  - □ **Particles:** A general term that is used for ions, atoms, molecules or formula units.
  - □ 1 mole of chlorine, Cl_2, equals 6.022×10^{23} molecules Cl_2.

EXAMPLE: How many moles of chlorine gas are there in 8.33×10^{37} molecules?

a) 7.23×10^{-15} mol b) 5.02×10^{61} mol c) 1.38×10^{14} mol d) 6.65×10^{7} mol

Converting between Mass and Moles

- One mole of a substance is equal to the molar mass of that substance.
  - □ 1 mole of chlorine, Cl_2, weighs 70.90 grams.

EXAMPLE: How many grams of chlorine gas are there in 2.34 moles?

a) 82.85 g b) 165.91 g c) 0.066 g d) 0.033 g

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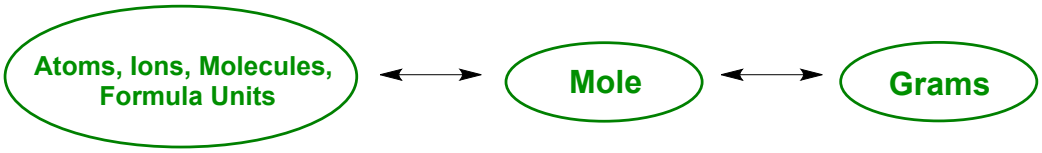
Converting between Mass and Particles

- As we've stated earlier, the unit of mole serves as a bridge that connects together the other units.



EXAMPLE: How many grams of Cl_2 contain 9.25×10^{24} molecules of Cl_2?

PRACTICE: If a sample of sodium chloride, NaCl, contains 73.1 kg, what is its number of formula units?

PRACTICE: Calculate the number of oxygen atoms found in 783.9 g $NiCl_2 \cdot 6\ H_2O$.

CONCEPT: MOLE CONCEPT

PRACTICE: If the density of water is 1.00 g/mL at 25^{o}C, calculate the number of water molecules found in 1.50 x 10^{3} µL of water.

PRACTICE: A cylindrical copper wire is used for the fences around a house. The copper wire has a diameter of 0.0750 in. How many copper atoms are found in 5.160 cm piece? The density of copper is 8.96 g/cm^{3}. ($V = \pi \cdot r^{2} \cdot h$)

PRACTICE: The density of the sun is 1.41 g/cm^{3} and its volume is 1.41 x 10^{27} m^{3}. How many hydrogen molecules are in the sun if we assume all the mass is hydrogen gas?