The Mole

Formula Mass Revisited

NaCl

1 Na x 23.0 amu = 23.0u

1 Cl x 35.5 amu = 35.5u

58.5 u

1 amu = 1.67×10^{-24}g

0.00000000000000000000000977g

The Mole

The Mole

# of particles	Group Name	Mass
1 NaCl	One	58.5u = 0.[illegible]g
12 NaCl	Dozen	702u = 0.[illegible]g
144 NaCl	Gross	8424u = 0.[illegible]g
6.02×10^{23} NaCl	Mole	58.5g

Not Enough

Not Enough

Not Enough

- Mole
  - A counting group, like a dozen or a gross
  - Allows mass conversions directly from amu's to grams
- Avogadro's Number
  - The number of "things" in a mole
  - 602,000,000,000,000,000,000,000
  - 6.02×10^{23}

The Mole

Just how big a group is a mole, anyway.....

- Faster computers perform 8 billion operations a second
  - How long to count everyone on the planet?
    - About one second
  - How long to count to Avogadro's number?
    - 2.4 million years
- A mole of raindrops
  - Fill a cylindrical tank with a diameter of 100ft
    - 280 times the distance between the earth and the sun
- A mole of BB's
  - If you could turn Utah into a giant container, filling the valley and leveling the mountains
    - A mole of BB's would bury the state 253 feet

The Mole

Just how big a group is a mole, anyway.....

- A mole of carbon atoms

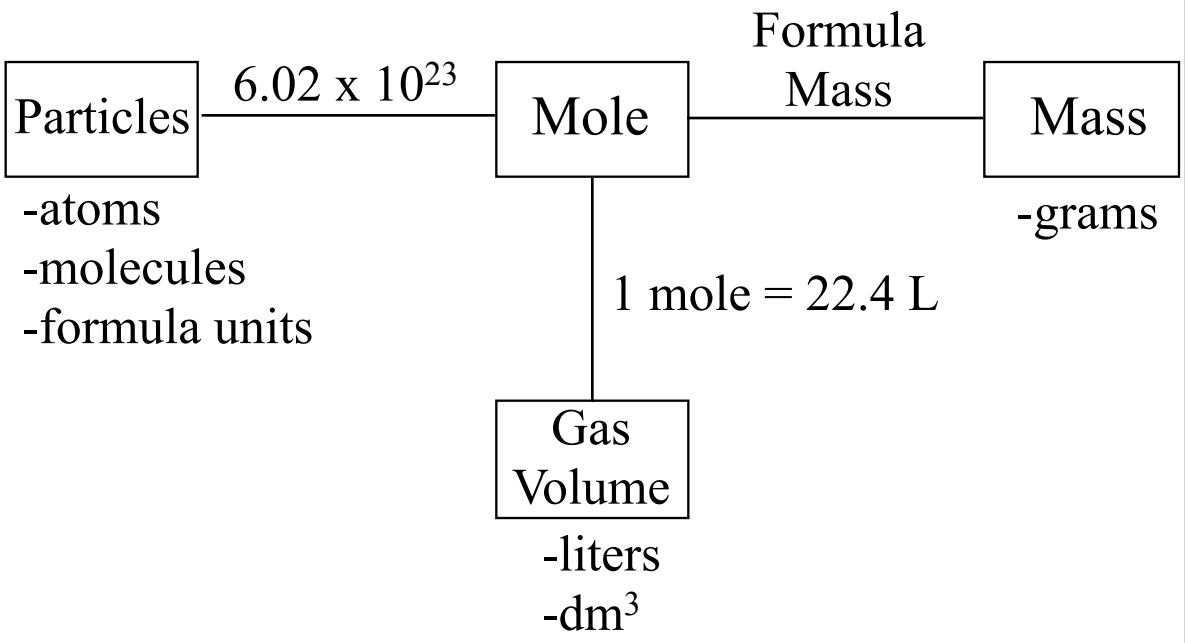
$$1 \text{ C atom} = 12.0 \text{ amu}$$

$$6.02 \times 10^{23} \text{ C atom} = 1 \text{ mole C} = 12.0 \text{ g C}$$

$6.02 \times 10^{23} \times 2 = 12.04 \times 10^{23}$ C Atoms ← 2 moles Carbon → 24.0 g

The Mole

Conversion Chart



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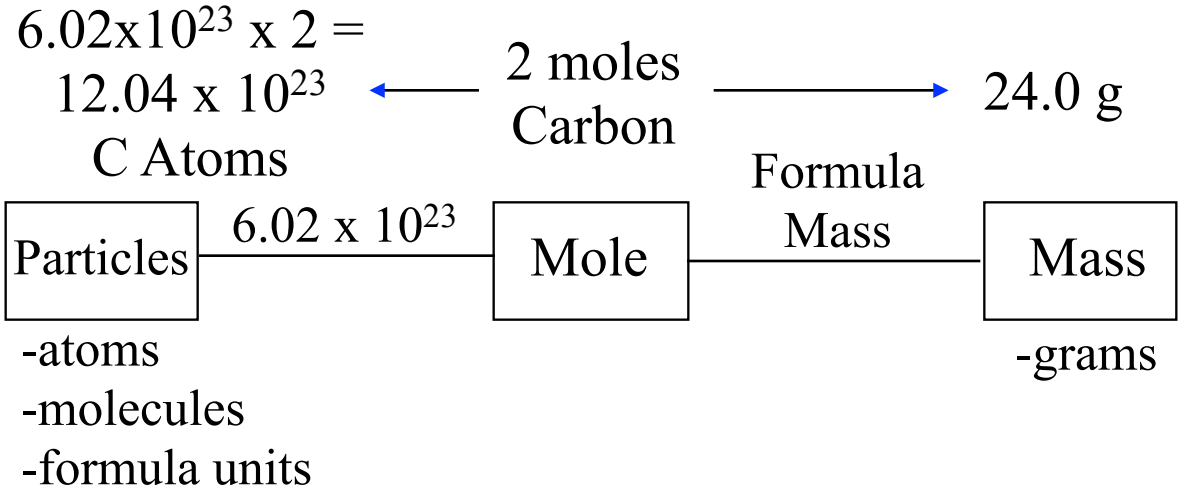

-atoms
-molecules
-formula units

-grams

The Mole

Let's Practice

- What is the mass of 2.3 moles of NO_2?

The Mole

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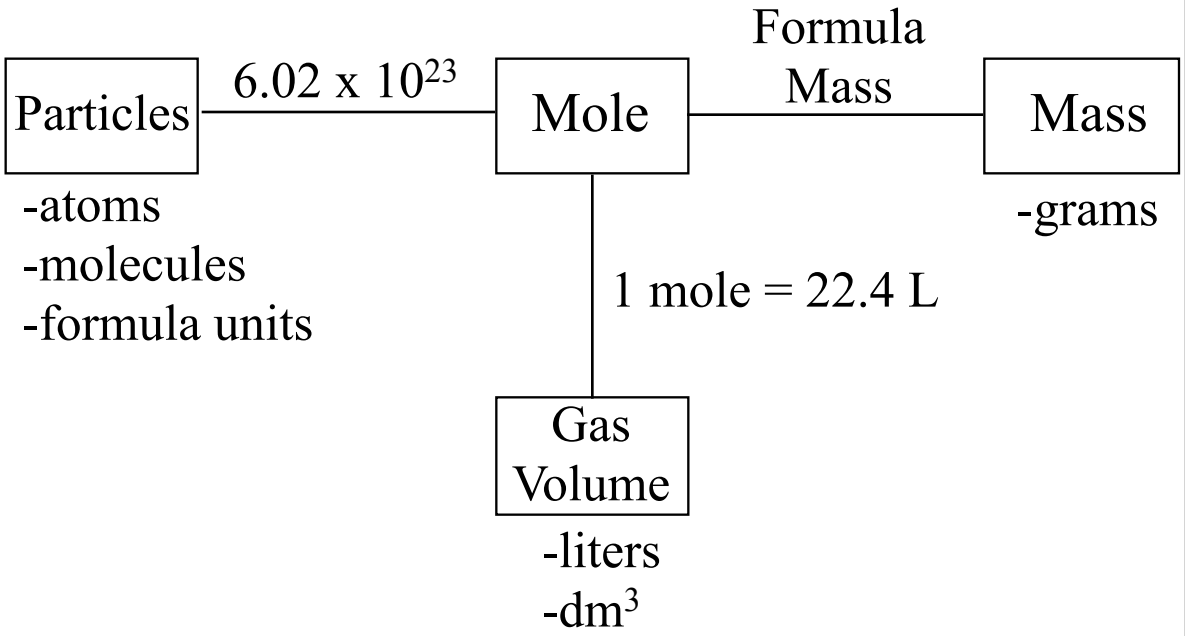

The Mole

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The Mole

Let's Practice

- How many molecules of H_2O are contained in 25.0g of H_2O?

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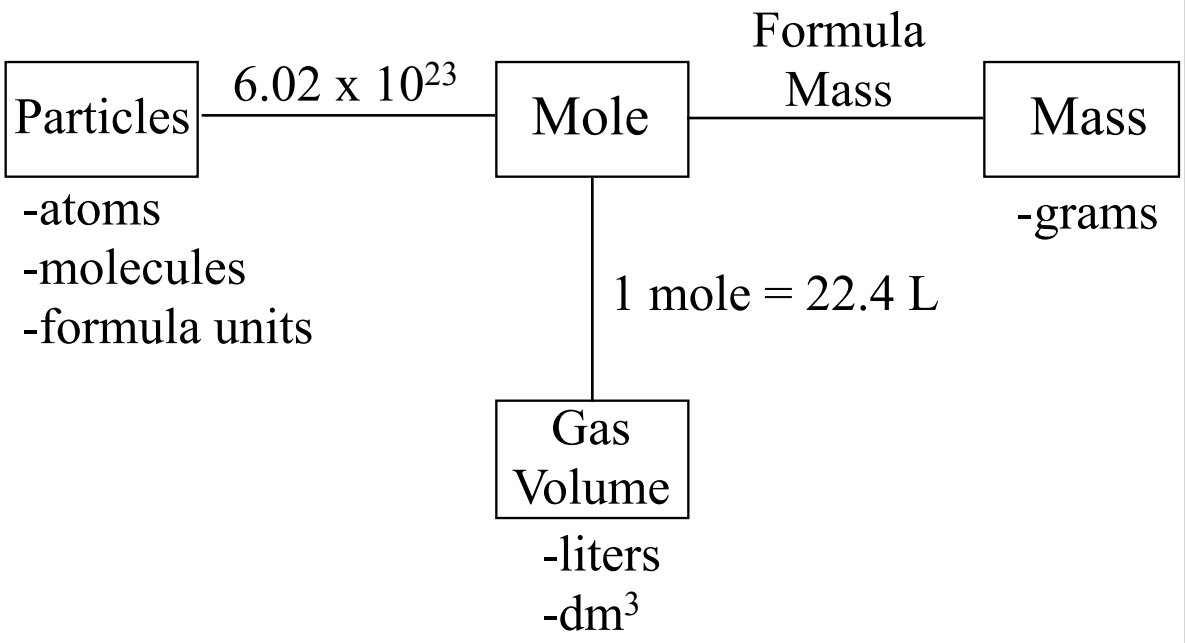

The Mole

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The Mole

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The Mole

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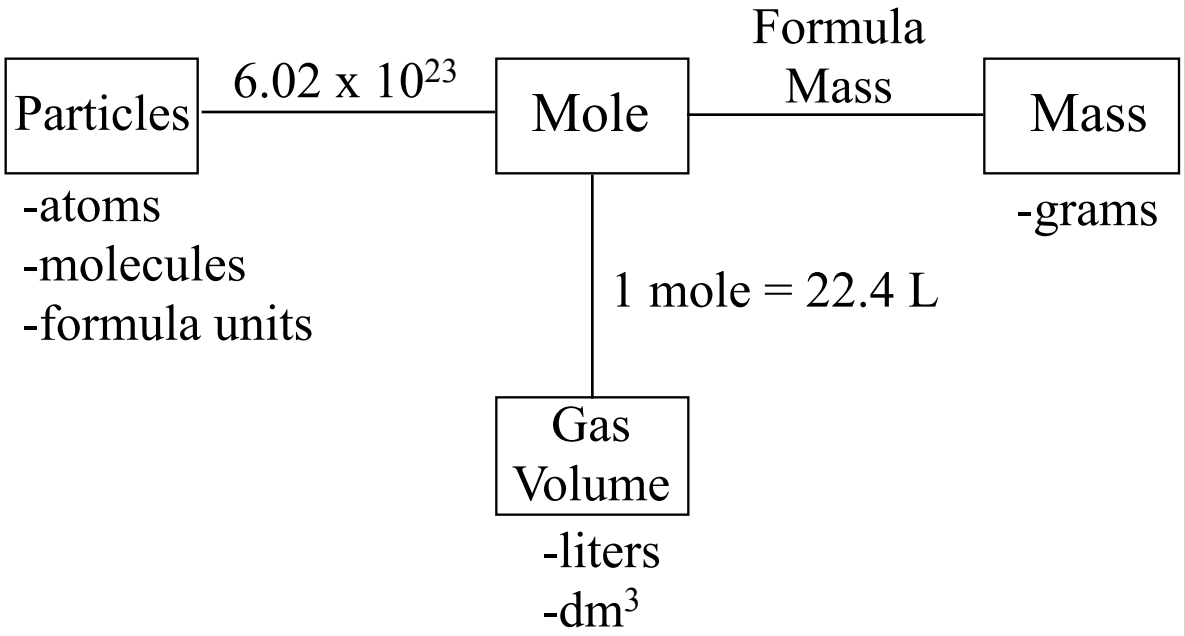

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