Chemical composition questions involve amounts of substances…

How many grams Na are in 10 g NaCl? (It's not 5 g Na!)

The mole: convenient way of counting very large numbers of atoms or molecules

1 pair = 2 objects
1 dozen = 12 objects
1 mole = 6.022×10^{23} objects
↳ Avogadro's number

How many dozen candy bars are 173 candy bars?

$$173 \text{ cb} \times \frac{1 \text{ doz cb}}{12 \text{ cb}} = 14.4 \text{ doz c.b.}$$

How many moles of Al are in 1.24×10^{15} Al atoms? sci

$$1.24 \times 10^{15} \text{ Al atoms} \times \frac{1 \text{ mol Al}}{6.022 \times 10^{23} \text{ Al atoms}} = 2.06 \times 10^{-9} \text{ mol Al}$$

1.24E15 ÷ 6.022E23

How many H_2O molecules are in 4.8 mol H_2O?

$$4.8 \text{ mol } H_2O \times \frac{6.022 \times 10^{23} H_2O \text{ molecules}}{1 \text{ mol } H_2O} = 2.9 \times 10^{24} H_2O \text{ molecules}$$

Counting by mass is a way to count a large number of objects by measuring their mass.

If there are 80 nails per pound, how many nails are in 4.5 lb nails?

$$4.5 \text{ lb nails} \times \frac{80 \text{ nails}}{1 \text{ lb nails}} = 360 \text{ nails}$$

Relationship of mass and moles:

By definition, 1 mol of carbon-12 atoms has a mass of exactly 12 g

1 carbon-12 atom has a mass of 12 amu
1 mol carbon-12 atoms has a mass of 12 g

12
Mg
24.31

Atomic number = 12
Atomic mass = 24.31 amu
Molar mass = 24.31 g/mol

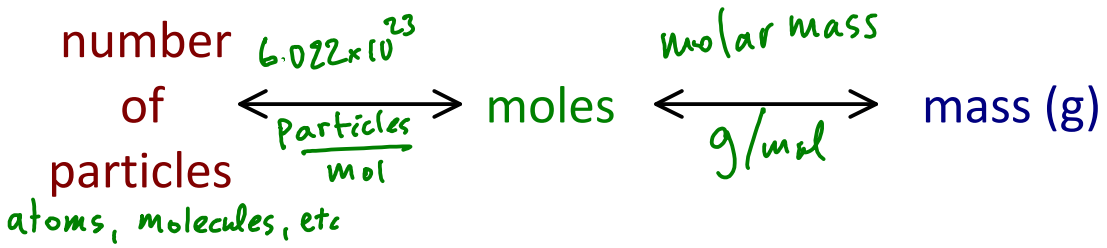
What is the mass of 17.0 mol Al?

$$17.0 \text{ mol Al} \times \frac{26.98 \text{ g Al}}{1 \text{ mol Al}} = 459 \text{ g Al}$$

How many moles Si are in 248.36 g Si?

$$248.36 \text{ g Si} \times \frac{1 \text{ mol Si}}{28.09 \text{ g Si}} = 8.842 \text{ mol Si}$$

Mole calculations



How many S atoms are in 8.32 g S?

$$8.32\text{ g S} \times \frac{1\text{ mol S}}{32.07\text{ g S}} \times \frac{6.022\times10^{23}\text{ S atoms}}{1\text{ mol S}} =$$

What is the average mass (in g) of 1 iron atom?

$$1\text{ Fe atom} \times \frac{1\text{ mol Fe}}{6.022\times10^{23}\text{ Fe atoms}} \times \frac{55.85\text{ g Fe}}{1\text{ mol Fe}} = 9.274\times10^{-23}\text{ g}$$

Molar mass of compounds

What is the mass in g of 12.0 mol H_2O?

You must first calculate the molar mass of H_2O:

2 H = 2 (1.008 g/mol)

1 O = 1 (16.00 g/mol)

$2\times1.008 + 16.00$

18.016 g/mol

$$12.0\text{ mol } H_2O \times \frac{18.016\text{ g } H_2O}{1\text{ mol } H_2O}$$

How many mol O_2 are in 82.3 g oxygen?

$$82.3\text{ g } O_2 \times \frac{1\text{ mol } O_2}{32.00\text{ g } O_2} = 2.57\text{ mol } O_2$$

$2(16.00\text{ g})$