Significant Figures

Rules for Counting Sig. Fig.

1. **All** non-zero digits are significant ✓✓✓ 597 (3)

2. Zeroes

a) zeroes between non-zero digits are significant
Ex. 507 ✓✓ (3) 5007 (4)

b) leading zeroes are not significant
Ex. 0.00004 ✓ (1)

c) Trailing zeroes to the right of a number are significan**t if the number has a decimal point** If the number ends in zero and has no decimal point, we assume that the trailing zeroes are not significant.
Ex. 480.0 (4 sig figs)
Ex. 4800 (2 sig figs)

How many significant figures in the following?

a) 38.4703 mL - 6 sig. figs
b) 0.0052 g - 2 sig. figs
c) 0.05700 s - 4 sig. figs
d) 6.19×10^8 years - 3 sig. figs

Significant Figures and Calculations

1. Multiplication and Division

The result of the operation is reported as having as many significant figures as the measurement with the fewest significant figures

Ex. (6.221 cm) x (5.2 cm) = $32 cm^2$ 32.3492

4 2

2. Addition and Subtraction

The result of the operation is reported to the same number of **decimal places** as that of the term with the least number of **decimal places**

Ex. 20.4
1.322
\+ 83

Measuring Matter

All forms of matter are normally measured by count, mass or volume.

Mole (mol) - SI unit for measuring the amount of a substance
A mole of any substance contains 6.02 x 10^{23} representative particles. (atoms, molecules)

6.02 x 10^{23} is referred to as **Avagadro's number**

Representative particles refers to the species present in a substance, usually atoms, molecules or formula units.

atom **Fe** molecule **O_2** molecule **NaCl**

Ex. one mole of atoms = 6.02 x 10^{23} atoms
one mole of molecules = 6.02 x 10^{23} molecules

Converting Number of Particles to Moles

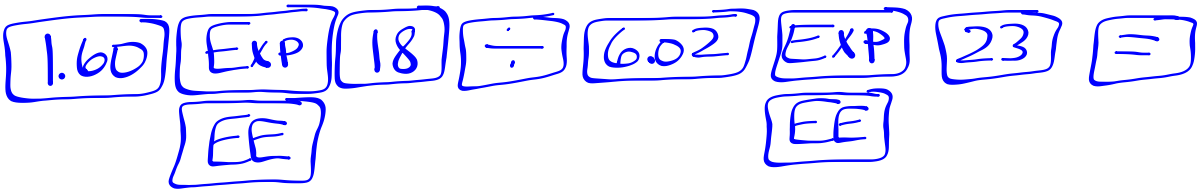
0.000002658

Ex. How many moles are found in 1.60 x 10^{18} atoms of silicon?

$$1.60 \times 10^{18} \text{ atoms Si} \times \frac{1 \text{ mol Si}}{6.02 \times 10^{23} \text{ atoms Si}} = 2.66 \times 10^{-6} \text{ mol Si}$$

0.00000266 mol Si

$$\text{moles} = \text{representative particles} \times \frac{1 \text{ mole}}{6.02 \times 10^{23} \text{ representative particles}}$$


1.60
EXP
EE
18
÷
6.02
EXP
EE
23
=

$$1\,hr = 60\,min$$

$$2\,hr \times \frac{60\,min}{1\,hr} = 120\,min$$

$$4.4\,hr \times \frac{60\,min}{1\,hr} =$$

Converting Moles to Number of Particles

Ex. How many molecules are found in 3.40 mol of sugar?

$$3.40\ \text{mol}\ C_6H_{12}O_6 \times \frac{6.02\times10^{23}\ \text{molecules}\ C_6H_{12}O_6}{1\ \text{mol}\ C_6H_{12}O_6} =$$

$$= 2.05\times10^{24}\ \text{molecules}\ C_6H_{12}O_6$$

Ex. How many atoms are found in 4.17 mol of propane (C_3H_8)?

$$4.17\ \text{mol}\ C_3H_8 \times \frac{6.02\times10^{23}\ \text{molecules}\ C_3H_8}{1\ \text{mol}\ C_3H_8} \times \frac{11\ \text{atoms}}{1\ \text{molecules}\ C_3H_8}$$

$$= 2.76\times10^{25}\ \text{atoms}$$

$$\text{representative particles} = \text{moles} \times \frac{6.02 \times 10^{23}\ \text{representative particles}}{1\ \text{mole}}$$

How many moles are in 2.14×10^{24} molecules of NO_2?

(3.55 mol)

How many atoms are in 8.08 moles of C_6H_{12}?

(8.76×10^{25} atoms)