Significant Figures

Rules for Counting Sig. Fig.

1. **All** non-zero digits are significant

2. Zeroes

a) zeroes between non-zero digits are significant

Ex. 507

b) leading zeroes are not significant

Ex. 0.00004

c) Trailing zeroes to the right of a number are significant **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

30.

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) = 32.3492 → 32 cm^2

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
14022
147

1.195
1320
41.263

150
1
0.182

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 6.02×10^{23} representative particles.

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

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

Fe **O_2** **NaCl**

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

Converting Number of Particles to Moles

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

$$1.60 \times 10^{18}\ \text{atoms Si} \times \frac{1\ \text{mol Si}}{6.02 \times 10^{23}\ \text{atoms Si}} = 0.00000266\ \text{mol Si}$$

$$= 2.66 \times 10^{-6}\ \text{mol Si}$$

3 sig

1.60 EXP 18 ÷ 6.02 EXP 23

EE EE

Note*** Exact quantities do not affect the process of rounding numbers to a certain number of significant digits.

Exact Quantity= Conversion factor

Converting Moles to Number of Particles

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

3.40 x 6.02 EXP 23

6.02×10^{23}

$3.40 \text{ mol} \times \frac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mol}} = 2.05 \times 10^{24}$

Ex. How many atoms are found in 4.17 mol of propane (C_3H_8)? 3+8

$4.17 \text{ mol} \times \frac{6.02 \times 10^{23} \text{ molecules}}{1 \text{ mol}} \times \frac{11 \text{ atoms}}{1 \text{ molecule}}$

$= 2.761374 \times 10^{25} \text{ atoms}$

$= 2.76 \times 10^{25} \text{ atoms}$

Note*** Exact quantities do not affect the process of rounding numbers to a cer

Exact Quantity= Conversion factor