Scientific Notation

- Convenient way to express very large or very small numbers.
- To express final answers with the correct number of significant digits.

↑ more about this later

1.2×10^3 ✓

14×10^{-1} X not in proper sci. notat.

$n \times 10^{?}$ any integer examples $-10, 0, 1, 15$

$1 \leq n < 10$

Examples:

$1525\ g = 1.525 \times 10^3\ g$

$0.00471\ m = 4.71 \times 10^{-3}\ m$

$7.81 \times 10^{-2}\ m = 0.0781\ m$

$6.02 \times 10^{23} = 602$ + 21 zeroes.

(Avogadro's #)

$565 \times 10^{-9}\ m = 5.65 \times 10^{-7}$

Calculations involving Scientific Notation

Multiplication + Division

$$\left(\frac{6.6 \times 10^{-8}}{3.3 \times 10^{-4}}\right) = 2.0 \times 10^{-4}$$

$-8-(-4) = -4$

↑ subtract exponents when dividing

$\left(\frac{x^5}{x^2} = x^3\right)$

$(2.5 \times 10^{-6}) \times (3.0 \times 10^{-7})$

$-6+(-7) = -13$

Add exponents.

$(x^4 \cdot x^3 = x^7)$

$= 7.5 \times 10^{-13}$

Addition + Subtraction

$(2.67 \times 10^{-3}) - (9.5 \times 10^{-4})$

The place values do not match

=> you need to make them match.

Think about

$$\begin{array}{r} 1250 \\ 4.25 \\ 0.019 \\ 416 \\ +\quad 22 \\ \hline \end{array}$$

$= 26.7 \times 10^{-4} - 9.5 \times 10^{-4}$

$= 17.2 \times 10^{-4}$ ← not in proper scientific notation

$= 1.72 \times 10^{-3}$

Homework:

1. a) $4.5 \times 10^7 + 6.45 \times 10^7$

   b) $5.4 \times 10^7 + 7.8 \times 10^6$

   c) $7.8 \times 10^{-6} - 8.4 \times 10^{-7}$

   d) $2.3 \times 10^4 - 4.2 \times 10^3$

   e) $6.7 \times 10^{-8} + 8.2 \times 10^{-7}$

2. a) $(4.5 \times 10^2)(2.3 \times 10^{-4})$

   b) $(2.0 \times 10^6)(3.5 \times 10^{-9})$

   c) $(1.2 \times 10^7)(1.2 \times 10^4)$

   d) $\dfrac{6.0 \times 10^7}{1.5 \times 10^2}$

   e) $\dfrac{7.2 \times 10^{-4}}{1.2 \times 10^{-4}}$

   f) $\dfrac{(5.5 \times 10^{-5})(6.0 \times 10^4)}{(2.1 \times 10^4)}$