

SPH3U: Physics Math Part A – Scientific Notation

Scientific Notation

Numbers that are **very large** or **very small** are often **expressed** in this **form** for convenience. A **number written in scientific notation** has **two** parts which are **multiplied**.

One part is between **1 and 10** (it can be 1 or bigger but must be less than 10). The **other part** is a **power of ten**.

To **change** a number into **scientific notation**:

1. **place a decimal** after the **first non-zero digit** looking from the **left**;
2. **multiply** by the appropriate **power of ten**.

Examples

Change to scientific notation

(a) 465

First 4.65 and then 4.65×10^2 or $465 = 4.65 \times 10^2$

(b) 0.0032

First 3.2 and then 3.2×10^{-2} or $0.0032 = 3.2 \times 10^{-3}$

1. Write the following in scientific notation. Check to see that you can get the same answers using the "EE" or "EXP" button on your calculator.

a) $604 \rightarrow 6.04 \times 10^2$

b) $403 \rightarrow 4.03 \times 10^2$

c) $710,000 \rightarrow 7.1 \times 10^5$

d) $0.0504 \rightarrow 5.04 \times 10^{-2}$

e) $0.0038 \rightarrow 3.8 \times 10^{-3}$

f) $0.043 \rightarrow 4.3 \times 10^{-2}$

g) $0.000031 \rightarrow 3.1 \times 10^{-5}$

h) $4.3 \rightarrow 4.3 \times 10^0$

2. Write the following in standard notation. Again, check to see that you can get the same answers on your calculator.

a) $8.1 \times 10^3 = 8,100$

b) $6.1 \times 10^7 = 61,000,000$

c) $7.6 \times 10^5 = 760,000$

d) $9.3 \times 10^1 = 93$

e) $4.7 \times 10^{-4} = 0.00047$

f) $2.3 \times 10^{-2} = 0.023$

g) $4.7 \times 10^{-7} = 0.00000047$

h) $4.03 \times 10^3 = 4,030$

Using Metric Prefixes with Units:

giga (G)	mega (M)	kilo (k)	hecto (h)	deca (da)	deci (d)	centi (c)	milli (m)	micro (μ)	nano (n)	pico (p)
10^9	10^6	10^3	10^2	10^1	10^{-1}	10^{-2}	10^{-3}	10^{-6}	10^{-9}	10^{-12}

Example #1: 7 km (kilometers) = 7×10^3 meters (Note that kilo is the prefix, and meters is the base unit)

Example #2: 367 pg (picograms) = 367×10^{-12} grams = $3.67 \times 10^2 \times 10^{-12}$ grams = 3.67×10^{-10} g (grams)

3. Complete the following:

a) $72.3 \text{ km} = 72.3 \times 10^3 = 7.23 \times 10^4 \text{ m}$

d) $2533.6 \text{ } \mu\text{m} = 2533.6 \times 10^{-6} \text{ m} = 2.5336 \times 10^{-3} \text{ m}$

b) $4820 \text{ mg} = 4820 \times 10^{-3} \text{ g} = 4.820 \text{ g}$

e) $0.345 \text{ dg} = 0.345 \times 10^{-1} \text{ g} = 3.45 \times 10^{-2} \text{ g}$

d) $2533.6 \text{ } \mu\text{m} \times \frac{10^{-6} \text{ m}}{1 \text{ } \mu\text{m}} = 2.5336 \times 10^{-3} \text{ m}$

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