

1.5 Introduction to Dimensional Analysis

The SI system has seven base units that are based on an object or event in the physical world. SI units are standards so comparisons can be made.

For this test, you are responsible for knowing SI units for **Time, Length, Mass and Temperature.**

<i>SI Base Units</i>		
Quantity	SI Base Unit	Symbol
Time	second	s
Length	meter	m
Mass	kilogram	kg
Temperature	Kelvin	K

Some units are not BASE units but are _____ units.

-Derived units are made by multiplying and dividing base units.

For example: Density:

Volume:

Dimensional Analysis

A "conversion factor" is a relationship between different units of measure.

For example: 1 foot = 12 inches. This relationship may be written as two conversion factors:

$\frac{1 \text{ foot}}{12 \text{ inches}}$ Which is used to convert inches to feet or $\frac{12 \text{ inches}}{1 \text{ foot}}$ which is used to convert feet to inches.

Conversion factors do NOT change the value of a quantity only the units, it is the same as multiplying by 1.

Conversion factors are considered exact numbers. Exact numbers are either defined numbers or result from a count. They have an infinite number of significant figures.

Metric prefixes to know:

$$\text{_____ mL} = \text{_____ cm}^3 = \text{_____ cc}$$

Dimensional Analysis Steps:

1. Start with GIVEN (If you have more than one given, use the number with a base unit, not a derived unit)
2. Determine what unit you are trying to convert to
3. Make a pathway using conversion factors that leads to desired unit
4. Make sure all undesired units cancel
5. MATH!!
6. Check sig figs

Example 1: 57.98 mL = _____ L

Example 2: 5005 mm = _____ mi

Example 3: 55 miles/ hour = _____ km/min

Example 4: Pistachio nuts cost \$6.00 per pound. How many pounds of nuts can be bought for \$20.00?

HOMEWORK: Introduction to Dimensional Analysis

The following information will be helpful in choosing conversion factors for the following homework

Prefix

Mega	1 M_	=	1000000 _
kilo	1 k_	=	1000 _
hecto	1 h_	=	100 _
deca	1 da_	=	10 _
deci	10 d_	=	1 _
centi	100 c_	=	1 _
milli	1000 m_	=	1 _
micro	1000000 μ _	=	1 _

$$1 \text{ ml} = 1 \text{ cm}^3 = 1 \text{ cc}$$

Other useful relationships:

$$1 \text{ yr} = 365 \text{ days}$$

$$1 \text{ lb} = 454 \text{ g}$$

$$1 \text{ mole} = 6.02 \times 10^{23} \text{ molecules}$$

$$1 \text{ mole} = 22.4 \text{ L}$$

$$1 \text{ km} = 0.621 \text{ mi}$$

$$1 \text{ gallon} = 3.7854 \text{ L}$$

Perform the following conversions using dimensional analysis. **YOU MUST SHOW ALL WORK (WITH UNITS!) IN ORDER TO RECEIVE CREDIT.** Any work not in dimensional analysis format will not be given credit!

1. 950 g = _____ kg

2. 275 mm = _____ cm

3. 1000. L = _____ kL

4. 1000.0 mL = _____ L

5. 1.3 yrs = _____ hr

6. 3.00 hrs = _____ sec

7. 1.5 g/L = _____ g/cm³

8. 3.0×10^{10} cm/s = _____ mi/hr