Scientific Notation:

Express the following numbers in scientific notation:

a) 543

b) 20,000,000

c) 12,000.0

d) 0.0000230

e) 0.0012

Significant Figures:

Determine the number of significant figures for each of the following measurements:

a) 2.303 meters

b) 5.50 seconds

c) 0.024 liters

d) 24.3 kilograms

e) 115.20 centimeters

f) 100 miles/hour

Significant Figures (Part 2): Doing math with measured quantities

Perform the following and express your answers using the appropriate number of significant figures:

a) 22.5 liters + 0.023 liters =

b) 110 apples – 25 apples =

c) 110 meters – 25 meters =

d) $\left(\frac{12.003\ grams}{mole}\right) \times 2.5\ \text{moles} =$

e) 50.45 cm^3/ 0.02 cm^2 =

f) $2.5\ \text{moles} \times \left(\frac{6.022x10^{23}\ \text{atoms}}{mole}\right) =$

Unit Conversion:

Convert the following quantities and express your answers using the appropriate number of significant figures:

a) 2.3 kilograms = _____ grams

b) 5.50 liters = _____ milliliters (mL)

c) 2.4 mL = _____ L

d) 24.3 calories = _____ joules (1 cal = 4.184 J)

e) 115.2 quarts = _____ liters (1 L = 1.057 qt)

f) 1013. kg/m^3 = _____ g/mL (1 mL = 1 cm^3)

g) 100.0 mL/hr = _____ cm^3/s (1 hr = 60 min = 3600 s)

Unit Conversion within the Metric System:

Mass: The most common form of hydrogen atom has a mass of 1.67×10^{-27} kg. Express the mass of this hydrogen atom in the following units (use scientific notation):

a) grams (g)

b) micrograms (μg)

c) milligrams (mg)

d) nanograms (ng)

Length: A single carbon atom has a diameter of approximately 2.0 angstroms. The angstrom unit is related to the meter by the following: 1 angstrom = 10^{-10} m. Express the diameter of a carbon atom in the following units (use scientific notation):

a) nanometers (nm)

b) micrometers (μm)

c) millimeters (mm)

d) kilometers (km)

e) How many carbons would you need to stack side-by-side to make a 1.0 inch long carbon atom chain?

Temperature:

1) Convert the following temperature readings from ^{o}F to ^{o}C:

i) 15 ^{o}F =

ii) 70.0 ^{o}F =

iii) 425 ^{o}F =

2) Convert the following temperature readings from ^{o}C to ^{o}F:

i) 4. ^{o}C =

ii) 37.0 ^{o}C =

iii) –100. ^{o}C =

3) Convert the temperatures in (2) to K

i) 4. ^{o}C =

ii) 37. ^{o}C =

iii) –100. ^{o}C =

Density:

1) Determine the density for the following substances:

i) 10.0 g of water (at 4 ^{o}C) with a volume of 10.0 cm^3:

ii) 10.0 g of ice with a volume of 10.9 cm^3:

iii) 10.0 g of aluminum with a volume of 3.7 cm^3:

iv) 10.0 g of gold with a volume of 0.52 cm^3:

2) Using the density values above, determine the amount of mass (grams) in 30.0 cm^3 of the following substances:

i) Water (at 4 ^{o}C):

ii) Ice:

iii) Aluminum:

iv) Gold:

3) How much space do 50.0 grams of the following substances occupy?

v) Water (at 4 ^{o}C):

vi) Ice:

vii) Aluminum:

viii) Gold:

A Practical Application:

An ailing patient in a hospital requires a certain drug to be administered at a rate of 40.0 cm^3 per hour. The intravenous (IV) drug delivery system that will deliver the medication controls the drug delivery by measuring drip rate. Using this system, 30 drops are equal to 1.0 cm^3 of medication.

a) What drip rate (drops per hour) is required to maintain a drug delivery of 40.0 cm^3 per hour?

b) What is the drip rate in drops per second?

c) How many drops would you expect to count in 10.0 seconds?