Dr. Mattson's Gen Chem Fall 2015
Friday, 8/28/15

For Lab: Read Sections 1.9 and 1.10 for lab 1
First quiz is over syllabus
Bring laptops to lab

Derived Units

Area = $length_1 \times length_2 = l_1 \times l_2$ (rectangle)
$= \pi r^2$ (circle)
cm^2, m^2 ...

Volume = $l_1 \times l_2 \times l_3$ (box)
$= 4/3\ \pi r^3$ (sphere)

$$\boxed{1\ cm^3 \equiv 1\ mL}$$

Ex

Copper has a radius of .157 nm. Calculate the volume of a copper atom in cm^3.

.157 nm → cm → cm^3

$$vol = \frac{4}{3}\pi r^3 = \frac{4}{3}\pi\ \cancel{.157\ nm}\ (1.57\times10^{-8})^3\ cm^3 = 1.62\times10^{-23}\ cm^3$$

$$radius = .157\ nm \left| \frac{10^{-9}\ m}{1\ nm} \right| \frac{1\ cm}{10^{-2}\ m} \Big| = 1.57\times10^{-8}\ cm$$

$.157\ nm \rightarrow nm^3 \rightarrow cm^3$

$$vol = \frac{4}{3}\pi r^3 = \frac{4}{3}\pi\ .157^3\ nm^3 \left| \frac{(10^{-9})^3 m^3}{1^3\ nm^3} \right| \frac{1^3\ cm^3}{(10^{-2})^3 m^3} \Bigg| = 1.62 \times 10^{-23}\ cm^3$$

$$\text{Force} = \frac{kg\ m}{s^2} = N$$

$$\text{Pascal} = \frac{kg}{m\ s^2} = Pa$$

$$\text{Energy} = \frac{kg\ m^2}{s^2} = J$$

Density $\boxed{\rho = \frac{m}{V}} = \frac{\text{mass}}{\text{volume}}$

$$\frac{g}{cm^3} \equiv g/mL$$

$$g/L \quad etc$$

$$\boxed{m = \rho V} \quad \boxed{V = \frac{m}{\rho}}$$

Ex

Aluminum has a density of 2.70 g/cm³. What is the ~~mass~~ volume of a block of aluminum with a mass of 410 g?

$$V = \frac{m}{\rho} = 410\,g \times \frac{1\,cm^3}{2.70\,g} = 152\,cm^3$$

Converting Units

1.71 Normal blood has a cholesterol level of about 200 mg chol / 100 mL blood. Express this in g/L.

mg chol → g chol

mL blood → L blood

$$\text{Concentration} = \frac{200\,mg\ chol}{100\,mL\ blood} \left| \frac{10^{-3}\,g\ chol}{1\,mg\ chol} \right| \frac{1\,mL\ blood}{10^{-3}\,L\ blood} \Bigg| = \boxed{2.00\,\frac{g\ chol}{L\ blood}}$$

Hint:

1.68 

$1\,mi^2 = 640$ acres

$$Vol = \frac{1\,acre\,ft}{} \left| \frac{1\,mi^2}{640\,acres} \right| \text{[redacted]} = \text{[redacted]}\ ft^3$$

Folder Activity Chapter 1 Number 2 **28 August 2015**

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1. ☐ Classify each of the following as a unit of density, volume, speed, area, or energy.

a. mg/L density b. kJ energy c. μ/cm³ density d. μm/s speed

e. pm³ volume f. Gm² area g. kg m²/s² energy h. Cal energy

2. ☐ A box has dimensions of 28 cm, 15 cm and 17 cm. What is the volume of the box, in L? Start by identifying the quantity you are looking for (V) and how you can get it from the information given ($V = l_1 \times l_2 \times l_3$). Also, don't forget that the answer will have units of L.

$Vol = 28\,cm \times 15\,cm \times 17\,cm = 7140\,cm^3 = 7140\,mL$

$7140\,ml \times \frac{10^{-3}\,L}{1\,ml} = 7.140\,L$

3. ☐ A coin suspected to be pure gold has a volume of 1.21 cm³ and a mass of 17.24 g. Given that gold has a density of 19.3 g/cm³, is it possible that the coin is pure gold? Show work.

$\rho = \frac{17.24\,g}{1.21\,cm^3} = 14.2\,g/cm^3$ This coin is NOT gold because the density is too low.

4. ☐ Air has a density of 1.21 g/L. What is the mass of air in a cube measuring 1.0 m on a side? Start by rearranging the formula ρ = m/V

$m = \rho V$

$Vol\ cube = (1.0\,m)^3 = 1\,m^3$

$= (100\,cm)^3 = 1{,}000{,}000\,cm^3 = 10^6\,cm^3 = 10^6\,mL$

$1.21\,g/L \times 10^3\,L = \boxed{1210\,g}$ $10^6\,mL \times \frac{10^{-3}\,L}{1\,mL} = 10^3\,L$

5. ☐ Convert 74 miles/hour to units of m/s. Start by identifying the quantity in question.

$speed = \frac{74\,miles}{1\,hr} \times \frac{1\,hr}{60\,min} \times \frac{1\,min}{60\,s} \times \frac{1609.344\,m}{1\,mile} = 33\ m/s$

Quantity) number + units

Check in the ☐ any problem that you found difficult (you wouldn't be able to solve it on your own on an exam).