Name: _____ Section: _____

# Workshop #1: Measurements & Conversions

1. Round the following numbers to THREE significant figures, and express your final responses using scientific notation.

   A. 239,720 _____ C. 0.000238505 _____

   B. 0.09763400 _____ D. 7,689,994,656 _____

2. Round the following numbers to FOUR significant figures, and express your final responses using scientific notation.

   A. 0.00765796 _____ C. 423.56 _____

   B. 56,928.31 _____ D. 0.0000555226 _____

3. Solve each of the following problems. Express your final answer to the correct number of significant figures in scientific notation. Make certain to include the appropriate units where appropriate.

   A. $382.5\ \text{mL} + 96.31\ \text{mL} - 5.9\ \text{mL}$ _____

   B. $\dfrac{3.496\ \text{ft} + 27.22\ \text{ft}}{5.006\ \text{lb}}$ _____

   C. $\dfrac{(2.661 \times 10^{-3}\ \text{cm})(5.11 \times 10^{9}\ \text{cm})}{7.3 \times 10^{7}\ \text{cm}}$ _____

   D. $\dfrac{28.62\ \text{s} - 3.5\ \text{s}}{(32.9 \times 10^{2}\ \text{s})(99.55 \times 10^{6}\ \text{s})}$ _____

   E. $\dfrac{(6.345 \times 10^{-17})(2.6447 \times 10^{-45})}{4.567 \times 10^{5} + 7.89887 \times 10^{6}}$ _____

4. Solve the following problems, conforming to the appropriate number of significant figures. You may need your textbook for certain unit conversions:

   A. _____ How many centimeters are there in 3.0 miles?

   B. _____ Convert $9.06 \times 10^{6}\ \mu\text{m}^2$ to $\text{mm}^2$.

C. _____ Convert 45 meters per second to kilometers per hour.

D. _____ Determine the density (in g/mL) of a substance that weighs 0.695 lb and occupies a volume of 3.4 qt.

E. _____ The concentration of carbon monoxide (CO), a common air pollutant, is found in a room to be $5.7 \times 10^{-3}$ mg / $cm^3$. How many grams of CO are present in the room if the room's dimensions measure 3.5 m × 3.0 m × 3.2 m?

F. _____ A cylindrical piece of metal is 2.03 inches high, has a diameter of 17.0 mm wide, and weighs 31.599 g. Determine its density. Will this object sink or float in water? Volume (cylinder) = $\pi r^2 h$

G. _____ Zinc sulfide is treated with sulfuric acid, resulting in a solution with some undissolved bits of zinc sulfide and releasing hydrogen sulfide gas. If 10.85 g of zinc sulfide is treated with 50.00 mL of sulfuric acid (density = 1.153 g / mL), 65.15 g of solution plus undissolved solid remain. What is the volume (in L) of hydrogen sulfide gas evolved from this reaction? The density of hydrogen sulfide gas is 1.393 g / L.

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5. *APPLICATION!* Nanotechnology, the field of building microscale structures one atom at a time, has progressed in recent years. One potential application of nanotechnology is the construction of artificial cells. The simplest cells could mimic red blood cells, the body's oxygen transporters. For example, nanocontainers, perhaps constructed of carbon, could be pumped full of oxygen and injected into a person's bloodstream. If the person needed additional oxygen, these containers could slowly release oxygen into the blood, allowing tissues that would otherwise die to remain alive. Suppose that nanocontainers were cubic and had an edge length of 25 nanometers.

   A. _____What is the volume (in L) of one nanocontainer?

   B. _____ Suppose that each nanocontainer could contain pure oxygen pressurized to a density of 85 g / L. How many grams of oxygen could be contained by each nanocontainer?

   C. _____ Normal air contains about 0.28 g of oxygen per liter. An average human inhales about 0.50 L of air per breath and takes about 20 breaths per minute. How many grams of oxygen does a human inhale per hour?

   D. _____What is the minimum number of nanocontainers that a person would need in their bloodstream to provide 1.0 hour's worth of oxygen?