SI Worksheet

2/3/22

Agenda:

Worksheet (see how long worksheet is)

1. Conversion Questions
   a. Convert 6,789 ft to miles. 1 mi=5280 ft

$$6{,}789\text{ft} \times \frac{1\text{ mi}}{5280\text{ft}} = 1.3\text{ mi}$$

   b. Convert 218.9 lbs to kilograms (kg). 1 kg=2.2 lbs

$$218.9\text{lbs} \times \frac{1\text{kg}}{2.2\text{lbs}} = 99.5\text{ kg}$$

   c. Convert 40 inches (in) to nanometers (nm). 2.54 cm= 1 in

$$40\text{in} \times \frac{2.54\text{cm}}{1\text{in}} \times \frac{1\times10^{-2}\text{m}}{1\text{ cm}} \times \frac{1\text{ nm}}{1\times10^{9}\text{ m}} = 1.016\times10^{9}\text{ nm}$$

   d. A child is prescribed a dosage of 12 mg of a certain drug per day and is allowed to refill his prescription twice. If there are 60 tablets in a prescription, and each tablet has 4 mg, how many doses are in the 3 prescriptions (original + 2 refills)?

$$3\text{ prescriptions} = 3\text{ pres} \times \frac{60\text{ tablets}}{1\text{ pres.}} \times \frac{1\text{ mg}}{1\text{ tablet}} \times \frac{1\text{ dosage}}{12\text{ mg}}$$ This cancels all unwanted units

$$= \frac{3\times60\times1\times1}{1\times1\times12} \text{ or } \frac{720}{12} \text{ dosages}$$ Which reduces to

$$= 60\text{ daily dosages}$$ Solution

$$3\text{prescription} \times \frac{60\text{ tablets}}{1\text{prescription}} \times \frac{4\text{mg}}{1\text{tablet}} \times \frac{1\text{dosage}}{12\text{ mg}} = \frac{720}{12} = 60 \text{ dosages}$$

$D = \frac{m}{V}$

2. Density

a. The solution in lab has a density of 11.3 g/mL. If the volume of the solution is 5.897 mL, what is the mass of the solution?

$d = 11.3\ g/mL$
$V = 5.897\ mL$
$m = ?$

$(V)\ d = \frac{m}{V}(V)$

$m = dV$
$= (11.3\ g/mL)(5.897\ mL)$
$= 66.6\ g$

b. A student found a rock. It was determined that the rock was coal. Since coal has a density of 1.4 g/cm^3, and was weighed to be 3.77 grams, what is the volume of the piece of coal?

$d = 1.4\ g/cm^3 = 1.4\ g/mL$
$m = 3.77\ g$
$V = ?$

$(V)\ d = \frac{m}{V}(V)$
$\frac{Vd}{d} = \frac{m}{d}$
$V = \frac{m}{d}$

$V = \frac{3.77\ g}{1.49\ g/mL}$
$= 2.7\ mL$

c. A piece of wood that measures 3.1 cm by 6.98cm by 4.7 cm has a mass of 82.30 grams. What is the density of the wood? Would the piece of wood float in water (d=1.00 g/mL)? V= LxWxH

$V = (3.1\ cm) \times (6.98) \times (4.7\ cm)$
$= 101.7\ cm^3 = 101.7\ mL$

$V = 101.7\ mL$
$m = 82.30\ g$
$d = ?$

$d = \frac{82.30\ g}{101.7\ mL}$
$d = 0.809\ g/mL$

Yes, the piece of wood would float in water because $0.809\ g/mL < 1.00\ g/mL$ (density of water)

d. A little aluminum boat (mass of 14.50 g) has a volume of 450.00 cm3. The boat is place in a small pool of water and carefully filled with pennies. If each penny has a mass of 2.50 g, how many pennies can be added to the boat before it sinks? (Tricky, let me know if you have questions)

$m_{boat} = 14.50\ g$
$V_{boat} = 450.00\ cm^3 = 450.00\ mL$

$m_{penny} = 2.50\ g$

$d_{boat} = \frac{14.50\ g}{450.00\ mL} = 0.032\ g/mL$ ← less dense than water

so what mass does boat need for $d = 1.00\ g/mL$?

$1.00\ g/mL = \frac{m}{450.00\ mL} = 450.00\ g$

*the boat will sink when density = 1.00 g/mL

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we know mass of boat needs to be 450.0g, so how much more grams for the boat to hold a mass of 450.0g?

450.0g − 14.50 = 435.5g

each penny ~~weighs~~ has a mass of 2.50g

$\frac{435.5g}{2.50g}$ = 174 pennies

3. Significant Figures
   a. How many significant figures is in 0.987? **3**

a. ~~b~~. How many significant figures is in 0.980000? **6 (trailing zeros are significant)**

a. ~~c~~. How many significant figures in 0.5908? **4 ("0" between non-zero numbers are significant)**

a. ~~d~~. How many significant figures in ~~149.670?6~~ 1490.670? 7

b. ~~e~~. 2.34 + 5.6 =? Write the answer with right amount of significant figures

7.94

Correct sig figs: 7.9 (When adding or subtracting look at the value with the fewest DECIMAL places)

C ~~f~~. 5.098/ 1.94 =? Write the answer with right among of significant figures

2.6278
Correct sig figs: 2.63 (When multiplying or dividing look at the value with the fewest SIG FIGS)

PEMDAS

d. ~~g~~. 20.657 ÷ 2.86 × 6.90 − 1.08 =? Write the answer with right number of significant figures.

$\frac{20.657}{2.86}$ = 7.22 (fewest sig figs)

7.22 × 6.90 = 49.8 (fewest sig figs)

49.8 − 1.08 = 48.7 (fewest decimal places

e. $(30.45 - 7.69 \times 3.40) / (5.349 + 9.857 \times 6.45)$ PEMDAS

First focus on numerator:
$(30.45 - 7.69 \times 3.40)$

$(30.45 - 26.1)$

4.4

Denominator
$(5.349 + 9.857 \times 6.45)$

$5.349 + 63.6$

68.9

$\frac{4.4}{68.9} = 0.064$ (fewest sig figs)

4. Precise or Accurate
   a. Susan conducts an experiment five times and gets a solution concentration of 1.9M, 2.1M, 1.8M, 1.9M, and 2.2M. The known concentration of the solution is 2.0M. Are Susan's results accurate, precise or both? **(Both accurate and precise)**

   b. Martin is conducting an experiment. His first test gives him a yield of 5.2 grams. His second test gives him a yield of 1.3 grams. His third test gives him a yield of 8.5 grams. On average, his yield is 5.0 grams, which is close to the known yield of 5.1 grams of substance. ~~Which of the following are true~~? **(accurate, but not precise)**

   c. Jared is practicing for a golf tournament. His normal driver distance is 250 yards. He hits three balls with his driver, and they travel a distance of 190 yards, 195 yards, and 187 yards. ~~Which of the following is true~~? **(precise, but not accurate)**