

Unit 3 Activity Sheet

Dr. Scharberg

The best problem-solving method is using a piece of scratch paper and working these problems. DON'T WRITE DOWN JUST THE ANSWERS--THIS DOES NOT HELP YOU LEARN THE MATERIAL!!! YOU WILL NEED YOUR CALCULATOR!!

1. How many significant figures are contained in each of the following numbers?

- | | |
|--------------------------|---------------|
| a. 915 | <u>3</u> |
| b. 2.0040 | <u>5</u> |
| c. 0.0049 | <u>2</u> |
| d. 5.42×10^{-3} | <u>3</u> |
| e. 60.02 | <u>4</u> |
| f. 1000 | <u>1 or 4</u> |
| g. 0.00200 | <u>3</u> |
| h. 22.0150 | <u>6</u> |

2. Unit Conversions:

SOLVE THESE PROBLEMS ON SCRATCH PAPER!!

(solutions on following pages)

- A collection of one thousand household flies weighs 5.00 grams. How many mg does the average fly weigh?
- What is the volume of a rectangular metal block that measures 4.0 cm X 3.2 cm X 30 mm?
- If your height is 5 ft. 4 in., what is this height in meters?
- What is the boiling point of water in degrees Kelvin?
- If a gas tank has a capacity of 15.0 gallons, what is its capacity in liters?
- When the price of gasoline is \$1.25 a gallon, what is the price in liters?
- In Mexico City, the posted speed limit is 40 km/hr. What is the speed limit in miles/hr?

(solutions on following pages)

3. Density Calculations:

SOLVE THESE PROBLEMS ON SCRATCH PAPER!!

- Calculate the density of a 156 gram piece of iron that displaces 20 ml of water in a 100 ml graduated cylinder.
- The density of gasoline is 0.66 g/ml. How much does one liter weigh? How much does one gallon weigh in lbs?
- What is the mass of 2.5 liters of ethanol? (Density = 0.789 g/ml)
- What is the mass of 1.00 liter of benzene? (Density = 0.88 g/ml)
- A cube of gold measures 5.0 cm along each edge and weighs 2.413 kg. Calculate the density of gold.
- A metal cylinder weighing 43.2 g is placed in a graduated cylinder containing 50.0 ml of water. The water level rises to the 66.0 ml graduation line. Calculate the density of the metal.
- A copper cylinder has a radius of 0.70 cm, a height of 5.2 cm, and weighs 71.2 g. Calculate the density of copper.

⇒ 2. Unit Conversions: Worked out solutions

$$a. \frac{5.00g}{1000 \text{ flies}} = \frac{5.00 \times 10^{-3}g}{\text{fly}} = \frac{5.00mg}{\text{fly}} \quad 5.00mg \text{ per fly}$$

$$b. 4.0cm \times 3.2cm \times 3.0cm = 38cm^3$$

↙ (convert from 30mm)

$$c. 5ft. 4in. \Rightarrow 64 \text{ inches}$$

$$64 \text{ inches} \times \frac{1 \text{ yard}}{36 \text{ inches}} \times \frac{1.0 \text{ meter}}{1.1 \text{ yard}} = 1.6 \text{ meters}$$

$$d. 100^\circ C + 273 = 373 \text{ K}$$

$$e. 15.0 \text{ gallons} \times \frac{4 \text{ quarts}}{1 \text{ gallon}} \times \frac{1.0 \text{ liter}}{1.06 \text{ quarts}} = 56.6 \text{ liters}$$

$$f. \frac{\$1.25}{\text{gallon}} \times \frac{1 \text{ gallon}}{4 \text{ quarts}} \times \frac{1.06 \text{ quarts}}{1.0 \text{ liter}} = \frac{0.33}{\text{liter}}$$

$$g. \frac{40 \text{ km}}{\text{hr}} \times \frac{1 \text{ mile}}{1.61 \text{ km}} = \frac{25 \text{ miles}}{\text{hr}} \quad \left(\begin{array}{l} \text{round off} \\ 24.8 \end{array} \right)$$

⇒ 3. Density Calculations: worked out solutions

$$a. \frac{156g}{20mL} = \frac{7.8g}{mL}$$

$$b. \frac{0.66g}{mL} \times \frac{1000mL}{1 \text{ liter}} = \frac{660g}{\text{liter}} ;$$

Unit 3 Activity sheet (continued)

(2)

Worked out solutions

$$b. \quad \frac{660 \text{ g}}{\text{liter}} \times \frac{1 \text{ liter}}{1.06 \text{ quarts}} \times \frac{4 \text{ quarts}}{1 \text{ gallon}} = \frac{1 \text{ pound}}{453.59 \text{ g}}$$

$$= \frac{5.49 \text{ lb (pound)}}{1 \text{ gallon}} ; 5.49 \text{ lb/gal}$$

$$c. \quad \frac{0.789 \text{ g}}{1 \text{ mL}} \times \frac{1000 \text{ mL}}{1 \text{ liter}} \times 2.5 \text{ liters} = 1972 \text{ g or } 1.97 \text{ kg}$$

$$d. \quad 1.00 \text{ liter} \times \frac{1000 \text{ mL}}{1 \text{ liter}} \times \frac{0.88 \text{ g}}{\text{mL}} = 880 \text{ g or } (0.88 \text{ kg})$$

$$e. \quad \text{Volume} = (5.0 \text{ cm})^3 = 125 \text{ cm}^3$$

$$\text{mass} = 2.413 \text{ kg} = 2,413 \text{ g}$$

$$\text{density} = \frac{\text{mass}}{\text{Volume}} = \frac{2,413 \text{ g}}{125 \text{ cm}^3} = 19.3 \frac{\text{g}}{\text{cm}^3}$$

$$f. \quad \text{Volume of cylinder} = 66.0 \text{ mL} - 50.0 \text{ mL} = 16 \text{ mL}$$

$$\text{mass} = 43.2 \text{ g}$$

$$\text{density} = \frac{43.2 \text{ g}}{16 \text{ mL}} = 2.7 \frac{\text{g}}{\text{mL}}$$

$$g. \quad \text{Volume of cylinder} = (\pi r^2 h) = \pi (0.70 \text{ cm})^2 (5.2 \text{ cm})$$

$$= 8.0 \text{ cm}^3$$

$$\text{density} = \frac{71.2 \text{ g}}{8.0 \text{ cm}^3} = 8.9 \frac{\text{g}}{\text{cm}^3}$$

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4. Practice Multiple Choice Problems.

1. 100 kg equals A pounds. $100\text{kg} \times \frac{2.20\text{pounds}}{1\text{kg}}$
 a. 220 d. 45.45
 b. 22 e. no correct response
 c. 454
2. A volume of 0.0670 liter equals:
 a. 0.670 ml d. 670 ml
 b. 6.70 ml e. none of these
 c. 67.0 ml $0.0670\text{liters} \times \frac{1000\text{ml}}{1\text{liter}}$
3. 25.4 mm equals A inches. $25.4\text{mm} \times \frac{1\text{cm}}{10\text{mm}} \times \frac{1\text{inch}}{2.54\text{cm}}$
 a. 1.00 b. 10.0 c. 6.45 d. 0.1 e. none of these
4. 35 mm (as in 35 mm film) is equivalent to:
 a. 8.9 inches d. 0.14 inches $35\text{mm} \times \frac{1\text{cm}}{10\text{mm}} \times \frac{1\text{inch}}{2.54\text{cm}}$
 b. 88.9 inches e. 13.8 inches
 c. 1.38 inches
5. 50 mg equals B grams. $50\text{mg} \times \frac{1\text{g}}{1000\text{mg}}$
 a. 50,000 d. 5.0
 b. 0.050 e. none of these
 c. 0.50
6. The number 6.02×10^4 expressed in decimal form is:
 a. 602 d. 0.000602
 b. 6020 e. 0.0602
 c. 60200
7. The number of significant figures in the number 0.001023 is
 a. 2 b. 3 c. 4 d. 5 e. 6
8. The number 0.0075 expressed in scientific notation is:
 a. 75 d. 7.5×10^3
 b. 75×10^3 e. none of these
 c. 7.5×10^{-3}
9. 50 miles/hour equals 80.5 km/hr km/hour. $\frac{50\text{miles}}{\text{hour}} \times \frac{1.61\text{km}}{1\text{mile}}$
 a. 80 km/hr d. 3.13 km/hr
 b. 8 km/hr e. none of these
 c. 31.25 km/hr
10. The melting point of tungsten, W, is 3410°C . What is this temperature on the Kelvin scale?
 a. 3137 K b. 3310 K c. 3510 K d. 3683 K

$$3410^\circ\text{C} + 273 =$$