Chemistry Lecture #3: Density Calculations

What is the density of a rock that has a mass of 2.4 g and a volume of 2.0 mL?

\[ d = \frac{m}{v} \]
\[ d = \frac{2.4 \text{ g}}{2.0 \text{ mL}} = 1.2 \text{ g/mL} \] or \[ 1.2 \text{ g/mL} \]

What is the mass of 19.9 mL of coal that has a density of 1.50 g/mL?

\[ m = \frac{d \cdot V}{1.50 \text{ g/mL}} \]
\[ m = \frac{(1.50 \text{ g/mL}) \cdot (19.9 \text{ mL})}{1} = 29.85 \text{ g} \] or \[ 29.85 \text{ g} \]

Ethanol has a density of 0.789 g/mL. What is the volume of 3.95 g of ethanol?

\[ d = \frac{m}{V} \]
\[ 0.789 = \frac{3.95 \text{ g}}{V} \]
\[ V = \frac{3.95 \text{ g}}{0.789} \]
\[ V = 5.006 \text{ mL} \]
A graduated cylinder has a mass of 5.00 g. When 8 mL of liquid is added, the mass of cylinder and liquid is 21.00 g. What is the density of the liquid?

\[
d = \frac{m}{V}
\]

\[
d = \frac{16}{8} = 2 \text{ g/mL}
\]

A block has dimensions of 4.00 cm x 3.00 cm x 2.00 cm. The block has a mass of 10.00 g. What is the density of the block?

\[
V = l \times w \times h
\]

\[
V = 4.00 \times 3.00 \times 2.00 \text{ cm}^3
\]

\[
V = 24.0 \text{ cm}^3 \quad \text{or} \quad 24.0 \text{ mL}
\]

\[
d = \frac{m}{V}
\]

\[
d = \frac{10.00}{24.0} = 0.41666 \
\]

\[
d = 0.4179 \text{ g/mL}
\]
A stack of coins has a diameter of 1.27 cm, and a height of 4.00 cm. The mass of the coins is 12.00 g. What is the density of the coins?

\[ r = \frac{1.27}{2} \text{ cm} \]
\[ r = 0.635 \text{ cm} \]

\[ V = \pi r^2 h \]
\[ V = \pi (0.635)^2 \times 4 \text{ cm}^3 \]
\[ V = 5.067 \text{ cm}^3 \]

\[ d = \frac{m}{V} \]
\[ d = \frac{12.00}{5.067} \]
\[ d = 2.3682 \text{ g/cm}^3 \]

A gold colored rock has a mass of 19.20 g. When it is placed in a graduated cylinder filled with 6.00 mL of water, the volume increases to 10.00 mL. What is the density of the rock? If the density of gold is 19.3 g/mL, is the rock really made of gold?

\[ d = \frac{m}{V} \]
\[ d = \frac{19.20}{4.00} \]
\[ d = 4.80 \text{ g/mL} \]

This is not the density of gold, but it is the density of iron pyrite [fool's gold].