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?

$d = ?$ $m = 2.4\ g$ $v = 2.0\ mL$

$$d = \frac{m}{V} \qquad d = \frac{2.4\ g}{2.0\ mL} = \frac{1.2\ g}{mL} \quad or \quad \boxed{1.2\ g/mL}$$

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

$m = ?$ $V = 19.9\ mL$

$d = 1.50\ g/mL$

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

$$\frac{(mL)}{(mL)}m = \frac{(1.50g)(19.9\ mL)}{mL}$$

$$\frac{1.50\ g}{mL} \diagup \frac{m}{19.9\ mL}$$

$m = (1.50)(19.9)\ g$

$m = 29.85\ g$

$or\ \boxed{29.9\ g}$

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

$\frac{1.50}{1} = \frac{m}{19.9}$

$(m)1 = (1.50)19.9$

$m = 29.85$

$\boxed{m = 29.9\ g}$

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

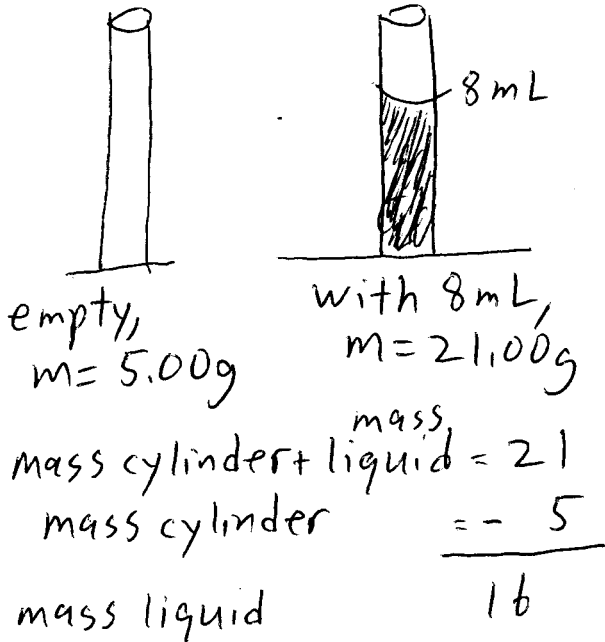$d = 0.789\ g/mL$ $V = ?$ $m = 3.95\ g$

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

$$\frac{0.789}{1} \diagup \frac{3.95\ g}{V}$$

$0.789(V) = 3.95(1)$

$$V = \frac{3.95}{0.789}$$

$V = 5.006$

$\boxed{5.01\ mL}$

A graduated cylinder has a mass of 5.00 g. When 8 mL of liquid is added, the mass of cylinder and liquid is 21.00g. What is the density of the liquid?

empty,
m = 5.00g

with 8 mL,
m = 21.00g

mass cylinder + liquid = 21
mass cylinder   = - 5
                    —————
mass liquid   16

$d = ?$ $m = 16g$ $V = 8mL$

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

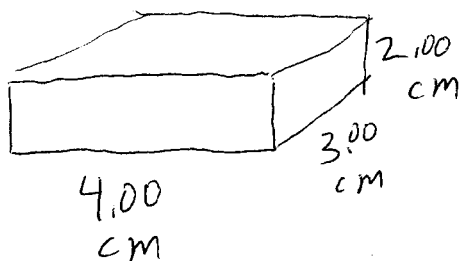$$d = \frac{16}{8}$$

$$d = 2 \; g/mL$$

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?

$$V = \ell \times w \times h$$

$$V = 4.00 \times 3.00cm \times 2.00cm \; cm$$

$$V = 24.0 cm^3$$

$$or \; 24.0 \; mL$$

4.00 cm

3.00 cm
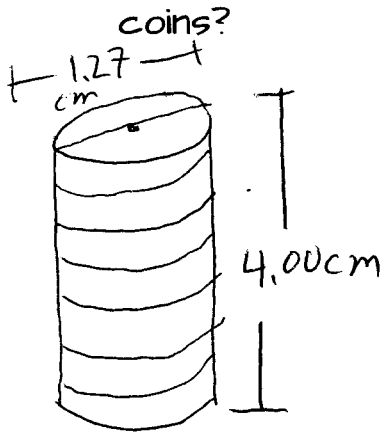
2.00 cm

$d = ?$ $V = 24.0 mL$ $m = 10.00g$

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

$$d = \frac{10.00}{24.0}$$

$$d = 0.41666$$

$$\boxed{d = 0.417 \, g/mL}$$

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?

$\vdash 1.27 \dashv$ cm

4.00cm

$V = \pi r^2 h$

$V = \pi (0.635)^2 4$

$V = 5.067 cm^3$

$d = \dfrac{m}{V}$

$d = \dfrac{12.00}{5.067}$

$d = 2.3682$

$\boxed{d = 2.37 g/mL}$

radius(r) $= \dfrac{1.27}{2}$

$r = 0.635$ cm

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?

10mL

6mL

6mL
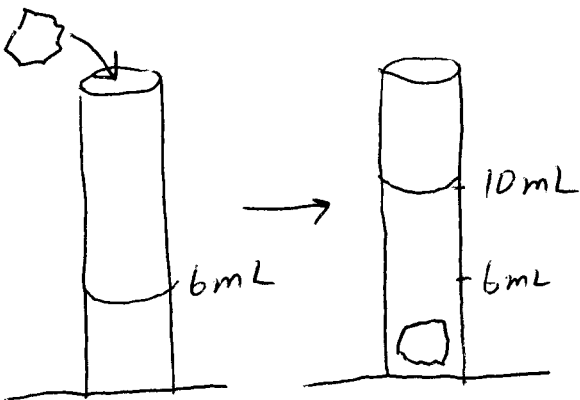
$V = 10.00 - 6.00$

$V = 4.00 mL$

$d = \dfrac{m}{V}$

$d = \dfrac{19.20}{4.00}$

$\boxed{d = 4.80 g/mL}$

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