Density Worksheet

Name Key Section
Chemistry 101

Density is the **ratio** of the **mass** of the substance to the **volume** of the substance at a given temperature. Density has units of **g/ cm^3 or g/c.c. or g/mL** for liquids and solids, and **g/L** for gases.

Density is an **intensive** property. Density **varies** with change in **temperature.**

1. A gold-colored ring has a mass of 18.9 grams and a volume of 1.12 mL. Is the ring pure gold? (The density of gold is 19.3 g/mL.)

$d = 18.9\,g/1.12\,mL = 16.9\,g/mL$. no - it's not pure gold (or the density would be close to 19.3 g/mL)

2. What volume would a 0.871 gram sample of air occupy if the density of air is 1.29 g/L?

$d = m/V$, so $V = m/d = 0.871\,g/1.29\,g/L = 0.675\,L$

3. Pumice is volcanic rock that contains many trapped air bubbles. A 225 gram sample occupied 236.6 mL. What is the density of pumice? (Answer is 0.951 g/mL)

$d = \frac{225\,g}{236.6\,mL} = 0.951\,g/mL$.

Will pumice float on water? The density of water is 1.0 g/mL.) yes, it will float.

4. A cup of sugar has a volume of 237 mL. What is the mass of the cup of sugar if the density is 1.59 g/mL? (Ans. is 377 grams)

$d = \frac{m}{V}$, so $m = d \cdot V = \frac{1.59\,g}{mL} \cdot 237\,mL = 376.83 \rightarrow$ 377 g

5. Which has the greater mass, 1 liter of water or 1 liter of gasoline? The density of water is 1.00 g/mL and that of gasoline is appoximately 0.68 g/mL.

don't even need a calculation!
If 1 mL of H_2O is 1.00 g and 1 mL of gas is 0.68 g,
H_2O has greater mass
(as long as you are comparing the same volume, the volume itself doesn't matter— the water will be greater in mass for the same volume of gas!)

6. A crumpet recipe calls for 175 grams of flour. According to Julia Child's data, the density of flour is 0.620 g/mL. How many mL of flour are needed for this recipe? (Ans. is 282 mL)

$d = \frac{m}{V}$, so $V = \frac{m}{d} = \frac{175\,g}{0.620\,g/mL} = 282\,mL$.

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7. From their density values, decide whether each of the following substances will sink or float when placed in sea water, which has a density of 1.025 g/mL.

Gasoline 0.66 g/mL float Asphalt 1.2 g/mL sink

Mercury 10.6 g/mL sink Cork 0.26 g/mL float

If the density is greater than 1.025 g/ml, the substance will sink. If less, it will float.

8. Mercury is a liquid metal having a density of 13.6 g/mL. What is the volume of 1.00 lb of mercury metal? (33.4 mL)

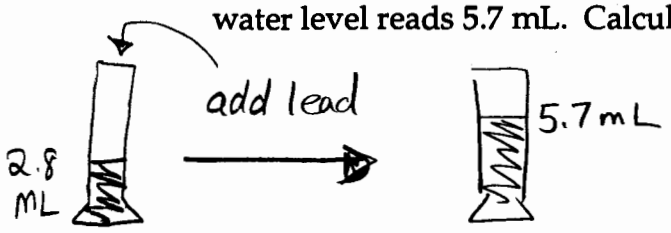
1 lb = 453.6 g

One way to solve this (there are other ways):

$$1.00\ \text{lb} \left| \frac{453.6\ \text{g}}{1\ \text{lb}} \right| \frac{\text{mL}}{13.6\ \text{g}} = 33.3529\ \text{mL} \rightarrow 33.4\ \text{mL}$$

(3 SF)

9. A sample of lead is found to have a mass of 32.6 g. A graduated cylinder contains 2.8 mL of water. After the lead sample is added to the cylinder the water level reads 5.7 mL. Calculate the density of the lead sample. (11g/mL)



$$d = \frac{m}{V} = \frac{32.6\ \text{g}}{2.9\ \text{mL}} = 11.241\ \frac{\text{g}}{\text{mL}}$$

$m = 32.6\ \text{g}$

$V = (5.7 - 2.8)\ \text{mL} = 2.9\ \text{mL}$

$= 11\ \frac{\text{g}}{\text{mL}}$ (2 SFs)

10. A piece of magnesium is in the shape of a cylinder with a height of 5.62 cm and a diameter of 1.34 cm. If the magnesium sample has a mass of 14.1 g, what is the density of the sample? (1.78 g/mL)

$m = 14.1\ \text{g}$

$V = ?$

$V = \pi r^2 h$

$= \pi \left(\frac{1.34\ \text{cm}}{2}\right)^2 \cdot 5.62\ \text{cm}$ B-6 $7.9257 = 7.93\ \text{cm}^3$

$d = \frac{14.1\ \text{g}}{7.93\ \text{cm}^3} = 1.7781\ \text{g/mL}$

$= 1.78\ \text{g/mL}$ (3 SF)