

Chem 1020
Density worksheet

Densities at 25 °C: Water: 0.997 g/mL Ice: 0.917 g/mL Lead: 11.4 g/mL
 Gold: 19.3 g/mL Mercury: 13.6 g/mL Silver: 10.5 g/mL
 Air: 1.30 g/L Helium: 0.18 g/L Oxygen: 1.43 g/L

A. No unit conversions necessary.

1. What is the mass (in g) of 4.73 mL of water?

$$4.73 \text{ mL} \times \frac{0.997 \text{ g}}{1 \text{ mL}} = 4.72 \text{ g}$$

2. What volume does 82.4 g of mercury occupy (in mL)?

$$82.4 \text{ g} \times \frac{1 \text{ mL}}{13.6 \text{ g}} = 6.06 \text{ mL}$$

3. What is the density of a substance with a mass of 2.36 g and a volume of 1.532 mL?

$$D = \frac{m}{V} = \frac{2.36 \text{ g}}{1.532 \text{ mL}} = 1.54 \text{ g/mL}$$

4. A 98.1 mL block of silver has what mass (in g)?

$$98.1 \text{ mL} \times \frac{10.5 \text{ g}}{1 \text{ mL}} = 1030 \text{ g} = 1.03 \times 10^3 \text{ g}$$

5. How many mL of water will a 63.8 g block of gold displace?

$$63.8 \text{ g} \times \frac{1 \text{ mL}}{19.3 \text{ g}} = 3.31 \text{ mL}$$

6. A block of foam with dimensions 4.2 cm × 2.6 cm × 8.8 cm has a mass of 42.3 g.
What is its density?

$$V = 4.2 \text{ cm} \times 2.6 \text{ cm} \times 8.8 \text{ cm} = 96.096 \text{ cm}^3$$

$$D = \frac{m}{V} = \frac{42.3 \text{ g}}{96.096 \text{ cm}^3} = 0.44 \text{ g/cm}^3$$

B. Units must be converted.

7. How many grams of mass does a 250.0 mL volume of air have?

$$250.0 \text{ mL} \times \frac{1 \text{ L}}{1000 \text{ mL}} \times \frac{1.30 \text{ g}}{1 \text{ L}} = 0.325 \text{ g}$$

8. 1.68 kg of ice has what volume in mL?

$$1.68 \text{ kg} \times \frac{1000 \text{ g}}{1 \text{ kg}} \times \frac{1 \text{ mL}}{0.917 \text{ g}} = 1830 \text{ mL} = 1.83 \times 10^3 \text{ mL}$$

9. 4.23 L mercury has what mass in kg?

$$4.23 \text{ L} \times \frac{1000 \text{ mL}}{1 \text{ L}} \times \frac{13.6 \text{ g}}{1 \text{ mL}} \times \frac{1 \text{ kg}}{1000 \text{ g}} = 57.5 \text{ kg}$$

10. Which has more volume, 2.0 kg of gold or 2.0 kg of silver? What are their volumes in mL?

$$2.0 \text{ kg gold} \times \frac{1000 \text{ g}}{1 \text{ kg}} \times \frac{1 \text{ mL}}{19.3 \text{ g}} = 103.6 \text{ mL} = 1.0 \times 10^2 \text{ mL}$$

$$2.0 \text{ kg silver} \times \frac{1000 \text{ g}}{1 \text{ kg}} \times \frac{1 \text{ mL}}{10.5 \text{ g}} = 190 \text{ mL}$$

Silver is less dense so it makes sense that if we have equal masses of silver and gold, the silver will have a greater volume.

12. What is the density (in g/mL) of an object with a mass of 2.53 mg and a volume of 2.53 mL?

$$2.53 \text{ mg} \times \frac{1 \text{ g}}{1000 \text{ mg}} = 2.53 \times 10^{-3} \text{ g}$$

$$d = \frac{m}{v} = \frac{2.53 \times 10^{-3} \text{ g}}{2.53 \text{ mL}} = 0.00100 \text{ g/mL}$$

11. For an object to float, it must have a smaller density than the fluid around it. Which of the substances in the problems above will float on water?

The objects in 6, 7, 8, and 12 have densities less than water.