

Density Word Problems

Use the following formula to answer the problems. You must **SHOW** your work!

$$\text{density} = \frac{\text{mass}}{\text{volume}}$$

or, in short form:

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

1. What is the density of carbon dioxide gas if 0.196 g occupies a volume of 100 mL?
 $= 0.196\text{g}/100\text{mL} = 1.96 \times 10^{-3}\text{g/mL}$

Answer: **$1.96 \times 10^{-3}\text{g/mL}$**

2. A block of wood 3.0 cm on each side and has a mass of 27 g. What is the density of this block?
 $V = L \cdot W \cdot H$
 $V = 3 \cdot 3 \cdot 3 = 27\text{cm}^3$
 $D = 27\text{g}/27\text{cm}^3 = 1\text{g/cm}^3$

Answer: **1g/cm^3**

3. An irregularly shaped stone was lowered into a graduated cylinder holding a volume of water equal to 2.0 mL. The height of the water rose to 7.0 mL. If the mass of the stone was 25 g, what was its density?
 $V = \text{final volume} - \text{initial volume}$
 $V = 7\text{mL} - 2\text{mL} = 5\text{mL}$
 $D = 25\text{g}/5\text{mL} = 5\text{g/mL}$

Answer: **5g/mL**

4. A 10.0cm^3 sample of copper has a mass of 89.6 g. What is the density of copper?
 $D = 89.6\text{g}/10.0\text{cm}^3 = 8.96\text{g/cm}^3$

Answer: **8.96g/cm^3**

5. Silver has a density of 10.5g/cm^3 and gold has a density of 19.3g/cm^3 . Which would have a greater mass, 5cm^3 of silver or 5cm^3 of gold?
 $M = D \cdot V$
 $M_{\text{silver}} = 10.5 \cdot 5 = 52.5\text{g}$
 $M_{\text{gold}} = 19.3 \cdot 5 = 96.5\text{g}$

Answer: **5cm^3 of gold**

6. Five mL of ethanol has a mass of 3.9 g and 5.0 mL of benzene has a mass of 4.4 g.
Which liquid is denser?

$$D \text{ of Ethanol} = 3.9\text{g}/5\text{mL} = 0.78\text{g/mL}$$

$$D \text{ of benzene} = 4.4\text{g} / 5\text{mL} = 0.88\text{g/mL}$$

Answer: **Benzene is denser**

7. A sample of iron has the dimensions of 2 cm x 3 cm x 2 cm. If the mass of this rectangular-shaped object is 94 g, what is the density of iron?

$$V = 2 \text{ cm} \times 3 \text{ cm} \times 2 \text{ cm} = 12\text{cm}^3$$

$$D = 94\text{g}/12 \text{ cm}^3 = 7.833 \text{ g/ cm}^3$$

Answer: **7.833 g/ cm³**

8. A rectangular solid of unknown density is 5 meters long, 2 meters high, and 4 meters wide. The mass of this solid is 300 grams. Given this information for this homogeneous material, calculate the density.

Answer: **7.5x 10⁻³kg/m³**

$$V = L \times W \times H = 5\text{m} \times 2\text{m} \times 4\text{m} = 40\text{m}^3$$

$$D = 0.3\text{kg}/40\text{m}^3 = 7.5 \times 10^{-3}\text{kg/m}^3$$

9. A rock occupies a volume of 20 cm³ and has a mass of 54 g. Find the density of this rock.

$$D = 54\text{g}/20 \text{ cm}^3 = 2.7\text{g/cm}^3$$

$$= 2.7\text{g/cm}^3$$

10. A rock has a density of 4 g/mL and a mass of 16 g. Find the volume of the rock.

Answer: **_ = 4mL**

$$V = M/D = 16\text{g}/4 \text{ g/mL} = 4\text{mL}$$

11. A cube made of an unknown material has a height of 9cm. The mass of this cube is 3645 g. Calculate the density of this cube given this information.

$$V = L \cdot W \cdot H = 9\text{cm} \cdot 9\text{cm} \cdot 9\text{cm} = 729\text{cm}^3$$

$$D = 3645\text{g}/729\text{cm}^3 = 5\text{g}/\text{cm}^3$$

Answer: **5g/cm³**

12. A graduated cylinder has 22 mL of water placed in it. An irregularly shaped rock is then placed in the graduated cylinder and the volume of the rock and water in the graduated cylinder now reads 30 mL. The mass of the rock is 24 g. A) Find the volume of the rock. B) Find the density of the rock.

$$V = 30\text{ mL} - 22\text{ mL} = 8\text{ mL}$$

$$D = 24\text{g}/8\text{ mL} = 3\text{g}/\text{mL}$$

Answer(A): **8 mL**

Answer(B): **3g/ mL**

13. An unknown substance from planet X has a density of 10 g/mL. It occupies a volume of 80 mL. What is the mass of this unknown substance?

$$M = D \cdot V = 10\text{ g/mL} \cdot 80\text{mL} = 800\text{g}$$

Answer: **800g**

14. A sample of seawater weighs 158 g and has a volume of 156 mL. What is the density?

$$D = 158\text{g}/156\text{mL} = 1.013\text{g}/\text{mL}$$

Answer: **1.013g/mL**

15. A cylindrical box with a volume of 200 cm³ holds 432 g of sodium chloride. Calculate the density of the salt.

$$D = 432\text{g}/200\text{ cm}^3 = 2.16\text{ g}/\text{cm}^3$$

Answer: **2.16 g/cm³**

16. What is the mass of ethyl alcohol that fills a 200 mL container? The density of ethyl alcohol is 0.789 g/mL.

$$M = D \cdot V = 0.789\text{g/mL} \cdot 200\text{mL} = 157.8\text{g}$$

Answer: **157.8g**

17. A flask that has a mass of 345.8 g is filled with 225 mL of carbon tetrachloride. The mass of the flask and carbon tetrachloride is found to be 703.55 g. Calculate the density in g/mL and kg/L.

$$V = 225\text{mL}$$

$$M = 703.55\text{g} - 345.8\text{g} = 357.75\text{g}$$

$$D = 357.75\text{g}/225\text{mL} = 1.59\text{ g}/\text{mL}$$

Answer: **1.59 g/mL**
1.59 Kg/L

18. A block of lead has dimensions of 4.5 cm by 5.2 cm by 6.0 cm. The block has a mass of 1587 g. Calculate the density.

$$V = 4.5\text{ cm} \cdot 5.2\text{ cm} \cdot 6.0\text{ cm} = 140.4\text{ cm}^3$$

$$D = 1587\text{ g}/140.4\text{ cm}^3 = 11.3\text{ g}/\text{cm}^3$$

Answer: **11.3 g/ cm³**

19. 28.5 g of iron is added to a graduated cylinder containing 45.5 mL of water. The water level rises to the 49.1 mark. Calculate the density.

$$V = 49.1\text{mL} - 45.5\text{mL} = 3.6\text{mL}$$

$$D = 28.5\text{g}/3.6\text{mL} = 7.92\text{ g}/\text{mL}$$

Answer: **7.92 g/mL**

20. The hydrogen stored inside a large weather balloon has a mass of 13.558 g. What is the volume of this balloon if the density of hydrogen is 0.089 g/L?

$$V = M/D$$

$$V = 13.558\text{g}/0.089\text{g/L} = 152.337\text{L}$$

Answer: **152.337L**