

Density: why things float or sink

Grade 6 science (Year 7 · Class 6) · Worksheet answers

Use these answers to check your working. Always write the formula first, then substitute the numbers with their units, then give the result. If your answer differs, look for a unit slip or a divided-the-wrong-way error.

Level: Grade 6 science (Year 7 · Class 6) · **Curriculum:** MS-PS1-2

Problem 1 Density basics

1. $\rho = m \div V$.
2. g/cm^3 and kg/m^3 .
3. **1.00 g/cm³**.

Problem 2 Aluminium block

1. $\rho = m \div V$.
2. $135 \div 50 = \mathbf{2.7 \text{ g/cm}^3}$.

Problem 3 Cooking oil

1. $m = \rho \times V$.
2. $0.92 \times 500 = \mathbf{460 \text{ g}}$.

Problem 4 Float or sink

Compare with 1.00 g/cm^3 .

1. **Floats.**
2. **Sinks.**
3. **Floats.**
4. **Sinks.**
5. **Floats.**

Problem 5 Density units

1. $7.9 \times 1000 = \mathbf{7900 \text{ kg/m}^3}$.
2. $920 \div 1000 = \mathbf{0.92 \text{ g/cm}^3}$.
3. $2700 \div 1000 = \mathbf{2.7 \text{ g/cm}^3}$.

Problem 6 Three objects in water

1. **A and B** float.

2. **C**, since it sinks.
3. **A**: it floats higher, so more of it is above the surface and it is less dense.

Problem 7 Gold pendant

1. $V = m \div \rho$.
2. $38.6 \div 19.3 = \mathbf{2.0 \text{ cm}^3}$.

Problem 8 Density of a liquid

1. $164.0 - 92.0 = \mathbf{72.0 \text{ g}}$.
2. $72.0 \div 80 = \mathbf{0.90 \text{ g/cm}^3}$.
3. 0.90 is less than 1.00, so it **floats**.

Problem 9 Mass against volume

1. **81 g**.
2. $108 \div 40 = \mathbf{2.7 \text{ g/cm}^3}$.
3. Yes, the density matches aluminium.
4. $2.7 \times 25 = \mathbf{67.5 \text{ g}}$.

Problem 10 Two cubes

1. A: $790 \div 100 = \mathbf{7.9 \text{ g/cm}^3}$; B: $270 \div 100 = \mathbf{2.7 \text{ g/cm}^3}$.
2. **Cube A**.
3. $7.9 \div 2.7 = \mathbf{2.9 \text{ times}}$.

Problem 11 Nail and ship

1. Steel is denser than water, and a solid nail has the density of steel, so it **sinks**.
2. The hull encloses a large volume of air, so the **average density** of the whole ship is lower than that of water.

Problem 12 Layers in a jar

1. Top to bottom: **paraffin, sunflower oil, water, corn syrup**.
2. It is denser than water but less dense than syrup, so it rests **between the water and the corn syrup**.

Problem 13 Concrete slab

1. $2.0 \times 1.5 \times 0.10 = \mathbf{0.30 \text{ m}^3}$.
2. $2400 \times 0.30 = \mathbf{720 \text{ kg}}$.

Problem 14 Which metal?

1. Sample 1: $56.7 \div 21 = \mathbf{2.7}$; sample 2: $89 \div 10 = \mathbf{8.9}$; sample 3: $113 \div 10 = \mathbf{11.3}$; sample 4: $39.5 \div 5 = \mathbf{7.9}$ (all g/cm³).
2. Aluminium, copper, lead and iron.

Problem 15 Egg in two liquids

1. It **sinks** in fresh water and **floats** in salt water.
2. The egg is denser than fresh water but less dense than salt water.
3. $\mathbf{1.00 \text{ g/cm}^3} < \rho(\text{egg}) < \mathbf{1.10 \text{ g/cm}^3}$.
4. Dissolved salt adds mass but only a little volume, so mass per volume increases.

Problem 16 Heavy means sinks?

1. $2.0 \div 0.80 = \mathbf{2.5 \text{ g/cm}^3}$.
 2. It is more than 1.00 g/cm³, so it **sinks**.
 3. The light pebble sinks and the heavy plank floats, so mass alone does not decide.
- Density decides.**

Problem 17 Hollow iron ball

1. $600 \div 150 = \mathbf{4.0 \text{ g/cm}^3}$.
2. 4.0 is less than 7.9, so part of the ball must be empty.
3. $600 \div 7.9 = \mathbf{75.9 \text{ cm}^3}$.
4. $150 - 75.9 = \mathbf{74.1 \text{ cm}^3}$.

Problem 18 Mixing two liquids

1. X: $1.2 \times 200 = 240 \text{ g}$; Y: $0.8 \times 300 = 240 \text{ g}$.
2. **480 g** and **500 cm³**.
3. $480 \div 500 = \mathbf{0.96 \text{ g/cm}^3}$.
4. It is below 1.00, so it **floats**.

Problem 19 Floating ice

1. $460 \div 0.92 = \mathbf{500 \text{ cm}^3}$.
2. The displaced water has a mass of 460 g, so $V = 460 \div 1.00 = \mathbf{460 \text{ cm}^3}$.
3. $500 - 460 = \mathbf{40 \text{ cm}^3}$.
4. $460 \div 500 \times 100 = \mathbf{92 \%}$.

Problem 20 Floating in the Dead Sea

1. $60 \times 1000 = \mathbf{60\,000 \text{ g}}$.
2. $60\,000 \div 1.01 = 59\,406 \text{ cm}^3 = \mathbf{59.4 \text{ L}}$.
3. 1.01 is below 1.24, so the body is less dense than the water.

4. $1.01 \div 1.24 = 0.815$, so about **81 %**.