

Foundation GCSE: Density, Mass, Volume Calculations

Name: _____

Class: _____

Instructions: Answer all questions. Questions are ordered from easiest (1) to hardest (20). Working out should be shown where appropriate.

1. A block of wood has a mass of 200 g and a volume of 250 cm^3 . Calculate its density in g/cm^3 .
2. A piece of iron has a volume of 50 cm^3 and a density of 7.8 g/cm^3 . Calculate its mass in grams.
3. A liquid has a density of 0.8 g/cm^3 and a mass of 400 g. Calculate its volume in cubic centimeters.
4. A solid metal cube has a side length of 4 cm and a mass of 256 g. Calculate its density in g/cm^3 .
5. A stone statue has a volume of 1.5 m^3 and a density of 2400 kg/m^3 . Calculate its mass in kilograms.
6. A container holds 2000 cm^3 of olive oil with a density of 0.92 g/cm^3 . Calculate the mass of the oil in kilograms.
7. A gold bar has dimensions $20 \text{ cm} \times 5 \text{ cm} \times 2 \text{ cm}$. If the density of gold is 19.3 g/cm^3 , calculate the mass of the bar in kilograms.
8. A cylindrical metal rod has a radius of 3 cm and a height of 10 cm. Using $\pi \approx 3$, calculate its mass if its density is 8 g/cm^3 .
9. A liquid mixture consists of 300 g of liquid A (density 1.2 g/cm^3) and 450 g of liquid B (density 0.9 g/cm^3). Calculate the combined density of the mixture.
10. A solid metal beam measures $100 \text{ cm} \times 10 \text{ cm} \times 5 \text{ cm}$ with a density of 2.7 g/cm^3 . Calculate its mass in kilograms.
11. An alloy is made by melting 500 g of metal X (density 5 g/cm^3) and 500 g of metal Y (density 10 g/cm^3). Assuming no volume change, calculate the density of the alloy.
12. A swimming pool measuring 25 m long, 10 m wide, and 2 m deep is filled with water of density 1000 kg/m^3 . Calculate the total mass of the water in tonnes (1 tonne = 1000 kg).
13. A solid brick measures $20 \text{ cm} \times 10 \text{ cm} \times 5 \text{ cm}$ and has a mass of 2.4 kg. Calculate its density in g/cm^3 .
14. A glass bottle has a mass of 400 g when empty and 950 g when filled with 500 cm^3 of liquid. Calculate the density of the liquid in g/cm^3 .
15. A rectangular metal tank has internal dimensions 1.5 m by 0.8 m by 0.5 m. It is filled with chemical waste of density 1.2 g/cm^3 . Calculate the total mass of the waste in kilograms.
16. A jeweler creates a pendant by combining 42 g of silver (density 10.5 g/cm^3) and 18 g of copper (density 9 g/cm^3). Calculate the overall density of the pendant.
17. A piece of timber has a volume of 0.04 m^3 and a density of 650 kg/m^3 . A second piece has a mass of 35 kg and a density of 700 kg/m^3 . Find the total mass of both pieces.
18. A concrete pillar is a cylinder with radius 0.5 m and height 4 m. If concrete has a density of 2400 kg/m^3 and $\pi \approx 3$, calculate the mass of the pillar in tonnes.
19. A metal sculpture is composed of a cube of side 10 cm (density 8 g/cm^3) welded to a cylinder of radius 5 cm and height 10 cm (density 4 g/cm^3 , $\pi \approx 3$). Calculate the total mass in kilograms.
20. A graduated container is filled with two immiscible liquids: 300 cm^3 of liquid A (density 0.7 g/cm^3) and 500 cm^3 of liquid B (density 1.2 g/cm^3). Calculate the average density of the combined liquid system.

Answers & Worked Solutions

1. $0.8 \text{ g/cm}^3 : 200 \div 250 = 0.8$.
2. $390 \text{ g} : 50 \times 7.8 = 390$.
3. $500 \text{ cm}^3 : 400 \div 0.8 = 500$.
4. $4 \text{ g/cm}^3 : \text{Volume} = 64 \text{ cm}^3, 256 \div 64 = 4$.
5. $3600 \text{ kg} : 1.5 \times 2400 = 3600$.
6. $1.84 \text{ kg} : 2000 \times 0.92 = 1840 \text{ g} = 1.84 \text{ kg}$.
7. $3.86 \text{ kg} : \text{Volume} = 200 \text{ cm}^3, 200 \times 19.3 = 3860 \text{ g}$.
8. $2160 \text{ g} : \text{Volume} \approx 3 \times 9 \times 10 = 270 \text{ cm}^3, 270 \times 8 = 2160$.
9. $1.0 \text{ g/cm}^3 : \text{Mass } 750 \text{ g, volume } 750 \text{ cm}^3$.
10. $13.5 \text{ kg} : \text{Volume } 5000 \text{ cm}^3, \text{mass } 13500 \text{ g} = 13.5 \text{ kg}$.
11. $6.67 \text{ g/cm}^3 : \text{Mass } 1000 \text{ g, volume } 150 \text{ cm}^3$.
12. $500 \text{ tonnes} : \text{Volume } 500 \text{ m}^3, \text{mass } 500000 \text{ kg} = 500 \text{ tonnes}$.
13. $2.4 \text{ g/cm}^3 : \text{Mass } 2400 \text{ g, volume } 1000 \text{ cm}^3$.
14. $1.1 \text{ g/cm}^3 : \text{Mass } 550 \text{ g, volume } 500 \text{ cm}^3$.
15. $720 \text{ kg} : \text{Volume } 0.6 \text{ m}^3 = 600000 \text{ cm}^3, \text{mass } 720000 \text{ g}$.
16. $10 \text{ g/cm}^3 : \text{Mass } 60 \text{ g, volume } 6 \text{ cm}^3$.
17. $61 \text{ kg} : \text{Mass } 26 \text{ kg} + 35 \text{ kg} = 61 \text{ kg}$.
18. $7.2 \text{ tonnes} : \text{Volume } 3 \text{ m}^3, \text{mass } 7200 \text{ kg} = 7.2 \text{ tonnes}$.
19. $11 \text{ kg} : \text{Cube } 8 \text{ kg} + \text{cylinder } 3 \text{ kg} = 11 \text{ kg}$.
20. $1.01 \text{ g/cm}^3 : \text{Mass } 810 \text{ g, volume } 800 \text{ cm}^3$.