Key Concepts Summary

Concept	Formula	Typical Units
Density	$\rho = \frac{m}{V}$	g/cm³ or kg/m³
Weight	$W = m \times g$	Newtons (N)
Pressure	$P = \frac{F}{A}$	Pascals (Pa)

Tips for Success:

- Convert units when needed: kg ↔ g, m³ ↔ cm³
- An object **floats** if its density is **less than 1 g/cm³** in water
- Show all working clearly in exams!

1. Finding Density

Question:

A metal block has a mass of 240 g and a volume of 30 cm³. What is its density?

Solution:

$$\text{Density} = \frac{\text{Mass}}{\text{Volume}} = \frac{240\ \text{g}}{30\ \text{cm}^3} = \boxed{8\ \text{g/cm}^3}$$

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2. Finding Mass Given Density

Question:

Gold has a density of 19.3 g/cm³. What is the mass of a 50 cm³ gold bar?

Solution:

$$\text{Mass} = \text{Density} \times \text{Volume} = 19.3 \times 50 = \boxed{965\ \text{g}}$$

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3. Finding Volume from Mass and Density

Question:

A liquid has a density of 0.8 g/cm³ and a mass of 200 g. What is its volume?

Solution:

$$\text{Volume} = \frac{\text{Mass}}{\text{Density}} = \frac{200}{0.8} = \boxed{250\ \text{cm}^3}$$

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4. Converting Mass to Weight

Question:

What is the weight of a 10 kg object on Earth? (Use $g = 9.8\ \text{m/s}^2$)

Solution:

$$\text{Weight} = \text{Mass} \times g = 10 \times 9.8 = \boxed{98\ \text{N}}$$

5. Density of an Irregular Solid

Question:

A stone displaces 15 cm³ of water and has a mass of 45 g. Find its density.

Solution:

$$\text{Density} = \frac{45}{15} = \boxed{3\ \text{g/cm}^3}$$

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6. Comparing Densities (Unit Conversion)

Question:

Substance A has a density of 2.7 g/cm³. Substance B has a density of 800 kg/m³. Which is denser?

Solution:

Convert $800\ \text{kg/m}^3 = 0.8\ \text{g/cm}^3$

$$\text{Conclusion: } \boxed{\text{Substance A is denser.}}$$

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7. Real-Life Application: Floating Boat

Question:

A boat has an average density of 0.6 g/cm³ and a volume of 5 m³. What is its mass?

Solution:

Convert volume: $5\ \text{m}^3 = 5,000,000\ \text{cm}^3$

$$\text{Mass} = 0.6 \times 5,000,000 = \boxed{3,000,000\ \text{g}} = \boxed{3,000\ \text{kg}}$$

8. Calculating Pressure

Question:

A 50 kg box rests on a surface area of 2 m². What is the pressure it exerts? (Use $g = 10\ \mathrm{m/s^2}$)

Solution:

1. Weight: $50 \times 10 = 500\ \mathrm{N}$
2. Pressure: $\frac{500}{2} = \boxed{250\ \mathrm{Pa}}$

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9. Is the Crown Pure Gold?

Question:

A crown weighs 1.5 kg and has a volume of 90 cm³. Is it made of pure gold (gold density = 19.3 g/cm³)?

Solution:

Convert mass: $1.5\ \mathrm{kg} = 1500\ \mathrm{g}$

$$\text{Density} = \frac{1500}{90} = 16.7\ \mathrm{g/cm^3}$$

Answer: $\boxed{\text{No, it's not pure gold.}}$

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10. Density Unit Conversion

Question:

Convert a density of 13,600 kg/m³ to g/cm³.

Solution:

$$13,600\ \mathrm{kg/m^3} = 13.6\ \mathrm{g/cm^3}$$

Answer: $\boxed{13.6\ \mathrm{g/cm^3}}$