

AP Physics 1

Name: _____ Score: _____

1. A block has mass 600 g and volume 200 cm^3 . What is its density, in $\frac{\text{g}}{\text{cm}^3}$?
_____ g/cm^3
2. A force of 200 N presses on an area of 0.5 m^2 . What is the pressure, in Pa?
_____ Pa
3. A block of volume 0.002 m^3 is submerged in water ($\rho = 1000 \frac{\text{kg}}{\text{m}^3}$, $g = 10 \frac{\text{m}}{\text{s}^2}$). What is the buoyant force, in N?
_____ N
4. Water at $2 \frac{\text{m}}{\text{s}}$ flows from a pipe of area 6 cm^2 into one of area 2 cm^2 . What is the new speed, in $\frac{\text{m}}{\text{s}}$?
_____ m/s
5. Density is defined as:
 - ☐ mass per unit volume
 - ☐ weight per unit area
 - ☐ volume per unit mass
 - ☐ mass times volume
6. Find the water pressure 2 m deep ($\rho = 1000 \frac{\text{kg}}{\text{m}^3}$, $g = 10 \frac{\text{m}}{\text{s}^2}$), in Pa.
_____ Pa
7. Archimedes' principle says the buoyant force equals:
 - ☐ the weight of the fluid displaced
 - ☐ the weight of the object
 - ☐ the density of the object
 - ☐ the volume of the object
8. The continuity equation $A_1 v_1 = A_2 v_2$ is a statement of the conservation of:
 - ☐ mass
 - ☐ charge
 - ☐ momentum
 - ☐ energy

9. A large, heavy object always has a high density.

☐ True ☐ False

10. The same force on a **smaller** area produces:

- ☐ less pressure
- ☐ zero pressure
- ☐ the same pressure
- ☐ more pressure

AP Physics 1

1. **3 g/cm³**

$$\rho = m/V = 600/200 = 3 \frac{\text{g}}{\text{cm}^3}.$$

2. **400 Pa**

$$P = F/A = 200/0.5 = 400 \text{ Pa}.$$

3. **20 N**

$$F_b = \rho Vg = 1000 \times 0.002 \times 10 = 20 \text{ N}.$$

4. **6 m/s**

$$A_1 v_1 = A_2 v_2 \Rightarrow 6 \times 2 = 2v_2 \Rightarrow v_2 = 6 \frac{\text{m}}{\text{s}}.$$

5. **mass per unit volume**

$$\rho = m/V - \text{mass per unit volume}.$$

6. **20000 Pa**

$$P = \rho gh = 1000 \times 10 \times 2 = 20\,000 \text{ Pa}.$$

7. **the weight of the fluid displaced**

$$F_b = \rho_{\text{fluid}} Vg - \text{the weight of the fluid the object pushes aside}.$$

8. **mass**

No fluid piles up or disappears – it is conservation of mass.

9. **False**

Density is mass **per volume**. A large object can be low-density if its mass is spread over a big volume.

10. **more pressure**

$P = F/A$: a smaller area gives a larger pressure – why knives and needles are sharp.