Density and Pressure

Forces and matter · 4 questions · step-by-step answers at the end

Name: Date: Score: / 4

USEFUL EQUATIONS

$\rho = m / V \quad p = F / A \quad p = h\rho g$

Questions

Show your working in the space under each question.

1. Find the pressure due to the water at a depth of 3.0 m in a pool (ρ = 1000 kg/m³).

2. A block measuring 0.20 m × 0.10 m × 0.050 m has a mass of 2.7 kg. Find its density and the pressure it exerts when resting on its largest face.

3. A force of 50 N pushes a piston of area 0.0010 m². What force does the liquid exert on a second piston of area 0.020 m²?

4. Why do snowshoes stop you sinking into snow?

Step-by-step answers

Density and Pressure

1. $p = h\rho g = 3.0 \times 1000 \times 9.8 =$ **29 400 Pa**.
2. 1. Volume $= 0.20 \times 0.10 \times 0.050 = 0.0010\ m^3$, so $\rho = 2.7/0.0010 =$ **2700 kg/m³**.
   2. Weight $= 2.7 \times 9.8 = 26.5$ N. Largest face area $= 0.20 \times 0.10 = 0.020\ m^2$.
   3. $p = 26.5/0.020 =$ **1320 Pa**.

   Answer: 2700 kg/m³; about 1300 Pa
3. Pressure $= 50/0.0010 = 50\,000$ Pa; force $= 50\,000 \times 0.020 =$ **1000 N**.
4. Your weight is spread over a **larger area**, so the **pressure is smaller**.