

Density, pressure, buoyancy and moving fluids

AP Physics 1 (algebra-based) · Test

Name: _____ Date: _____ Class: _____ Mark: ____ / 20

This test covers pressure, buoyancy, continuity and Bernoulli at AP Physics 1 level. Use $g = 9.81 \text{ m/s}^2$, ρ for fresh water 1000 kg/m^3 and $P_0 = 1.01 \times 10^5 \text{ Pa}$. A calculator is allowed. Show your working for calculations.

Level: AP Physics 1 (algebra-based) · **Curriculum:** AP P1 Unit 8

Time: 45 minutes · 8 questions · Total: 20 marks · Calculator allowed

Question 1 Pressure on a surface (2 marks)

A student of weight 600 N stands on one foot of area 0.020 m^2 .

- Calculate the pressure on the floor. (1 mark)
- State what happens to the pressure when she stands on both feet. (1 mark)

Question 2 Pressure at 8 m (3 marks)

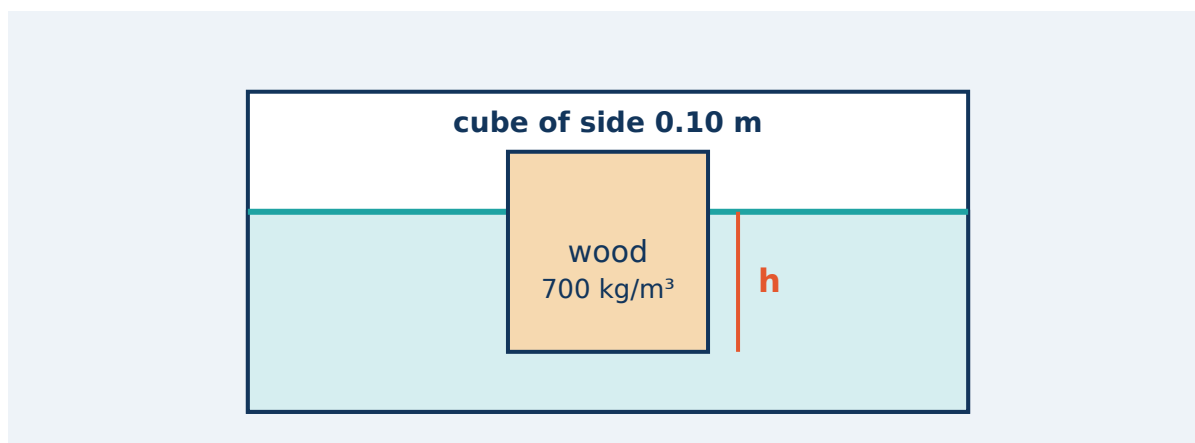
Calculate the absolute pressure at a depth of 8.0 m in a freshwater lake. Use $P_0 = 1.01 \times 10^5 \text{ Pa}$. (3 marks)

Question 3 Thick dam walls (2 marks)

Explain why the base of a dam wall is built much thicker than the top. (2 marks)

Question 4 Floating cube (3 marks)

A wooden cube of side 0.10 m and density 700 kg/m^3 floats in fresh water (shown).



A wooden cube floats with its bottom face at depth h below the water surface.

- a. Calculate its weight. *(1 mark)*
- b. Calculate the depth h of the submerged part. *(2 marks)*

Question 5 River narrowing (2 marks)

A river flows at 0.50 m/s through a wide stretch and then through a channel half as wide and the same depth. Explain what happens to the speed. *(2 marks)*

Question 6 Water pipe rising (3 marks)

Water flows at 2.0 m/s in a pipe of constant diameter where the pressure is 2.50×10^5 Pa. The pipe then rises 4.0 m. Calculate the pressure at the higher point. *(3 marks)*

Question 7 Lift in wind (2 marks)

Explain, using Bernoulli's equation, why a tent roof may lift off in strong wind. *(2 marks)*

Question 8 Boat in the sea (3 marks)

A loaded boat sails from a river into the sea. Predict, with reasoning, whether it floats higher or lower, and state what stays the same. *(3 marks)*