

Pressure In Fluids

GCSE Physics · Written to the shared content for AQA, Edexcel and OCR

Name _____ Class _____ Date _____

1. Worked example

An elephant weighing 50 000 N stands on four feet, each with an area of 0.10 m². Calculate the pressure on the ground. (3 marks)

Step 1 · Total area

$$4 \times 0.10 = 0.40 \text{ m}^2$$

Step 2 · Equation

$$\text{pressure} = \text{force normal to a surface} \div \text{area}, p = F \div A$$

Step 3 · Calculate

$$p = 50\,000 \div 0.40 = 125\,000 \text{ Pa (125 kPa)}$$

Answer: 125 000 Pa

Check: 1 Pa = 1 N/m².

2. Now try one with the steps

A force of 2000 N produces a pressure of 50 000 Pa. Calculate the area it acts on. (2 marks)

Step 1 · Rearrange

Step 2 · Calculate

Answer:

3. Practice

Show your working. The marks tell you how much is expected.

1. Write the equation linking pressure, force and area, and give the unit of pressure. [2]

2. A force of 600 N acts on an area of 0.20 m². Calculate the pressure in pascals. [2]

3. Explain why wearing snowshoes stops a person sinking into deep snow. [2]

4. State the direction in which the pressure in a fluid acts on a surface. [1]
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5. A force of 2000 N gives a pressure of 50 000 Pa. Calculate the area. [2]
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6. Explain why the pressure in a liquid increases with depth. [2]
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7. Explain why atmospheric pressure decreases above sea level increases. [2]
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8. Explain why a dam is built much thicker at the bottom than at the top. [2]
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9. Calculate the pressure due to 10 m of water. Density = 1000 kg/m^3 ; $g = 9.8 \text{ N/kg}$. Give your answer in pascals. [2]
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10. Calculate the pressure due to the water at the bottom of a 2.0 m deep pool, in pascals. Density = 1000 kg/m^3 ; $g = 9.8 \text{ N/kg}$. [2]
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11. Calculate the pressure due to sea water (density 1030 kg/m^3) at a depth of 50 m, in kPa to 3 significant figures. $g = 9.8 \text{ N/kg}$. [3]
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12. Explain what causes upthrust on an object submerged in a liquid. [2]
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13. Explain why a steel ship floats but a solid steel block sinks. [3]
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14. Calculate the depth of fresh water that produces a pressure of 100 000 Pa (about the same atmosphere). Density = 1000 kg/m³; g = 9.8 N/kg. Give your answer to 2 significant figures. [3]

4. Before you hand it in

$p = F \div A$

Pressure = force ÷ area. A bigger area means a smaller pressure.

Using area in cm² with pressure in Pa

Convert to m²: 1 m² = 10 000 cm².

"Pressure in a liquid only pushes downwards."

Pressure in a fluid acts at right angles to every surface, including sideways and upwards.

"Heavy objects sink and light ones float."

An object floats if it can displace its own weight of liquid; a huge steel ship floats, a small pebble sinks.