

Density, pressure and pressure in liquids

Physics grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · Test answers (mark scheme)

Model answers and mark schemes follow. Award marks for the equation or method, a correct substitution and the final answer with its unit. Accept equivalent wording, and give follow-through marks when a student uses a wrong value from an earlier part correctly.

Level: Physics grades 9-10 (GCSE · IGCSE · O Level · Class 9-10) · **Curriculum:** GCSE P3, IGCSE 1.8

Question 1 Density equation (1 mark)

$\rho = m \div V$ (density = mass $\div$ volume).

Marking: 1 mark.

Question 2 Pressure equation (1 mark)

$p = F \div A$ (pressure = force $\div$ area).

Marking: 1 mark.

Question 3 Density of a block (3 marks)

a. $V = 0.050 \times 0.040 \times 0.10 = \mathbf{2.0 \times 10^{-4} \text{ m}^3}$.

b. $\rho = m \div V = 1.56 \div 2.0 \times 10^{-4} = \mathbf{7800 \text{ kg/m}^3}$.

Marking: (a) 1 mark. (b) 1 mark for substitution, 1 mark for answer with unit.

Question 4 Float or sink (3 marks)

a. It **floats**, because its density (850) is less than the density of water (1000).

b. It **sinks** ($850 > 800$).

Marking: (a) 1 mark for floats, 1 mark for comparison of densities. (b) 1 mark.

Question 5 Pressure under a foot (3 marks)

a. $p = F \div A = 640 \div 0.016 = \mathbf{40\,000 \text{ Pa}}$.

b. The same force acts over a bigger area, so the pressure is smaller, $p = F \div A$.

Marking: (a) 1 mark for substitution, 1 mark for answer with unit. (b) 1 mark.

Question 6 Pressure in a tank (4 marks)

- a. $p = \rho g h = 1000 \times 9.8 \times 3.0 = \mathbf{29\,400\,Pa}$.
- b. $p = 1000 \times 9.8 \times 6.0 = \mathbf{58\,800\,Pa}$.
- c. Pressure increases with depth, so the water pushes with a larger force at the base. The wall must be stronger there.

Marking: (a) 1 mark for substitution, 1 mark for answer. (b) 1 mark. (c) 1 mark.

Question 7 Volume by displacement (3 marks)

Measure the mass of the stone on the balance. Put water in the measuring cylinder and record the level. Lower the stone in on a thread and record the new level; **the rise is the volume**. Divide mass by volume to find the density, $\rho = m \div V$.

Marking: 1 mark for mass, 1 mark for volume from the rise in the level, 1 mark for $\rho = m \div V$.

Question 8 Drawing pin (2 marks)

The force from the thumb acts on the large head, so the pressure on the thumb is small. The same force acts on the tiny area of the point, so the pressure there is very large ($p = F \div A$) and is enough to enter the wall.

Marking: 1 mark for small area gives large pressure, 1 mark for the same force acting on the head and the point.