

8.2 Pressure

Name: _____ Class: _____ Date: _____

Total: 9 marks

KEY WORDS pressure 压强 • depth 深度 • fluid 流体 • density 密度

Objective

Build the skills to answer exam questions on **pressure**.**You must be able to:**

- define **pressure** 压强 as force per unit area, $P = \frac{F}{A}$
- calculate the pressure due to a column of fluid, $P = \rho gh$
- explain how pressure increases with **depth** and acts in all directions

1 Worked examples

Study these first. Each one shows the method for a question type used later.

■ Pressure

$P = \frac{F}{A}$, measured in pascals ($1 \text{ Pa} = 1 \text{ N m}^{-2}$). The same force over a smaller area gives more pressure.

■ Pressure in a fluid

$P = \rho gh$ increases with **depth** h and acts equally in **all directions** at a given depth.

■ Example

At 2.0 m depth in water ($\rho = 1000$, $g = 10$): $P = 1000 \times 10 \times 2.0 = 2.0 \times 10^4 \text{ Pa}$.

2 Practice

2.1 A force of 200 N acts on an area of 0.50 m^2 . Find the pressure. [1]

2.2 Find the pressure 5.0 m below the surface of a lake ($\rho = 1000 \text{ kg m}^{-3}$, $g = 10 \text{ m s}^{-2}$). [2]

2.3 State how the pressure in a fluid changes with depth. [1]

3 Exam-style questions

3.1 Pressure is defined as [1]

- **A** force $\times$ area
 - **B** force $\div$ area
 - **C** mass $\div$ volume
 - **D** density $\times$ depth only
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3.2 The pressure due to a column of fluid depends on [1]

- **A** the shape of the container
 - **B** the surface area
 - **C** the depth and the fluid density
 - **D** the total volume
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3.3 A diver is 12 m below the sea surface ($\rho = 1030 \text{ kg m}^{-3}$, $g = 10 \text{ m s}^{-2}$).

(a) Find the pressure due to the water. [2]

(b) Find the total pressure if atmospheric pressure is $1.0 \times 10^5 \text{ Pa}$. [1]

Solutions

2.1 $P = \frac{F}{A} = \frac{200}{0.50} = 400 \text{ Pa}.$

2.2 $P = \rho gh = 1000 \times 10 \times 5.0 = 5.0 \times 10^4 \text{ Pa}.$

2.3 it increases with depth.

3.1 B.

3.2 C.

3.3 (a) $P = \rho gh = 1030 \times 10 \times 12 = 1.24 \times 10^5 \text{ Pa}.$ (b) total = $1.24 \times 10^5 + 1.0 \times 10^5 = 2.24 \times 10^5 \text{ Pa}.$