

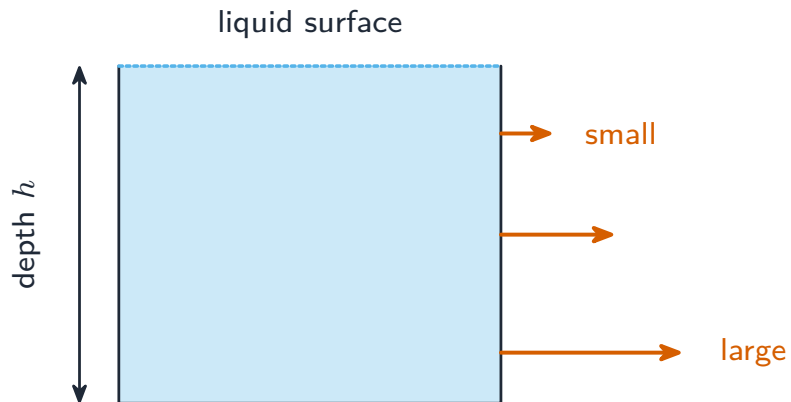
Exercise walk-through

1.8

Pressure

IGCSE Physics

Pressure



Pressure $p = \frac{F}{A}$ (Pa). A small area gives a large pressure. In a liquid it grows with depth: $\Delta p = \rho g \Delta h$.

2.0 m deep in water

$$\Delta p = 1000 \times 10 \times 2.0 = 2.0 \times 10^4 \text{ Pa}$$

Pressure in a liquid



A real dam is built much thicker at the bottom, because the water pushes hardest where it is deepest

Exercises 2.1-2.3

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

2.2 State why a sharp knife cuts more easily than a blunt one. [1]

2.3 A box of weight 60 N stands on a base of 0.25 m^2 . Calculate the pressure on the floor. [2]

Exercises 2.1·2.3

2.1 A force of 200 N acts on an area of 0.50 m². Find the pressure. [2]

2.1

- $p = F/A$

$$p = \frac{F}{A} = \frac{200 \text{ N}}{0.50 \text{ m}^2} = \mathbf{400 \text{ Pa}}$$

2.2 State why a sharp knife cuts more easily than a blunt one. [1]

2.2

- its edge has a very small area, so the same force gives a very large pressure
-

2.3 A box of weight 60 N stands on a base of 0.25 m². Calculate the pressure on the floor. [2]

2.3

- $p = F/A$

$$p = \frac{F}{A} = \frac{60 \text{ N}}{0.25 \text{ m}^2} = \mathbf{240 \text{ Pa}}$$

Exercises 2.4·3.1

2.4 A block rests on a face of 20 cm^2 . Convert this area into m^2 . [1]

3.1 The pressure in a liquid increases with: [1]

☐

A depth only

B density only

C both depth and density

D neither

Exercises 2.4·3.1

2.4 A block rests on a face of 20 cm². Convert this area into m². [1]

2.4

$$A = \frac{20 \text{ cm}^2}{10\,000} = \mathbf{0.0020 \text{ m}^2}$$

3.1 The pressure in a liquid increases with: [1]

☐

A depth only

B density only

C both depth and density

D neither

3.1 C

- liquid pressure increases with both depth and density

Exercise 3.2 (a)

3.2 A diver is 15 m below the surface of sea water of density 1030 kg/m^3 ($g = 10 \text{ N/kg}$).

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

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

(a) $\Delta p = \rho g \Delta h$

$$\Delta p = \rho g \Delta h = (1030 \text{ kg/m}^3)(10 \text{ N/kg})(15 \text{ m}) = \mathbf{154\,500 \text{ Pa}}$$

Exercise 3.2 (b)

3.2 A diver is 15 m below the surface of sea water of density 1030 kg/m^3 ($g = 10 \text{ N/kg}$).

(b) State the direction(s) in which this pressure acts on the diver. [1]

Exercise 3.2 (b)

3.2 A diver is 15 m below the surface of sea water of density 1030 kg/m^3 ($g = 10 \text{ N/kg}$).

(b) State the direction(s) in which this pressure acts on the diver. [1]

(b) in all directions

Exercise 3.3

3.3 A box weighing 240 N stands on the ground on a base of area 0.30 m^2 . Find the pressure it exerts on the ground. [2]

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3.3 A box weighing 240 N stands on the ground on a base of area 0.30 m². Find the pressure it exerts on the ground. [2]

3.3

- $p = F/A$

$$p = \frac{F}{A} = \frac{240 \text{ N}}{0.30 \text{ m}^2} = \mathbf{800 \text{ Pa}}$$

Exercise 3.4 (a)

3.4 A rectangular water tank has a base of area 3.0 m^2 and is filled with water to a depth of 1.5 m . The density of water is 1000 kg/m^3 and $g = 10 \text{ N/kg}$.

(a) Calculate the pressure due to the water at the base of the tank. [2]

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3.4 A rectangular water tank has a base of area 3.0 m^2 and is filled with water to a depth of 1.5 m . The density of water is 1000 kg/m^3 and $g = 10 \text{ N/kg}$.

(a) Calculate the pressure due to the water at the base of the tank. [2]

(a) $\Delta p = \rho g \Delta h$

$$\Delta p = \rho g \Delta h = (1000 \text{ kg/m}^3)(10 \text{ N/kg})(1.5 \text{ m}) = \mathbf{15\,000 \text{ Pa}}$$

Exercise 3.4 (b)

3.4 A rectangular water tank has a base of area 3.0 m^2 and is filled with water to a depth of 1.5 m . The density of water is 1000 kg/m^3 and $g = 10 \text{ N/kg}$.

(b) Calculate the force the water exerts on the base.

[2]

Exercise 3.4 (b)

3.4 A rectangular water tank has a base of area 3.0 m^2 and is filled with water to a depth of 1.5 m . The density of water is 1000 kg/m^3 and $g = 10 \text{ N/kg}$.

(b) Calculate the force the water exerts on the base. [2]

(b) $F = pA$

$$F = pA = (15\,000 \text{ Pa})(3.0 \text{ m}^2) = \mathbf{45\,000 \text{ N}}$$

Exercise 3.4 (c)

3.4 A rectangular water tank has a base of area 3.0 m^2 and is filled with water to a depth of 1.5 m . The density of water is 1000 kg/m^3 and $g = 10 \text{ N/kg}$.

(c) A second tank has the same depth of water but twice the base area. State and explain how the pressure at its base compares with your answer to (a). [2]

Exercise 3.4 (c)

3.4 A rectangular water tank has a base of area 3.0 m^2 and is filled with water to a depth of 1.5 m . The density of water is 1000 kg/m^3 and $g = 10 \text{ N/kg}$.

(c) A second tank has the same depth of water but twice the base area. State and explain how the pressure at its base compares with your answer to (a). [2]

(c) the pressure is the same

- because $\Delta p = \rho g \Delta h$ depends only on the depth and the density, not on the area or shape of the container

Exercise 3.4 (d)

3.4 A rectangular water tank has a base of area 3.0 m^2 and is filled with water to a depth of 1.5 m . The density of water is 1000 kg/m^3 and $g = 10 \text{ N/kg}$.

(d) A concrete block of weight 750 N stands on the ground on a face measuring 50 cm by 30 cm . Calculate the pressure it exerts on the ground. [3]

Exercise 3.4 (d)

3.4 A rectangular water tank has a base of area 3.0 m^2 and is filled with water to a depth of 1.5 m . The density of water is 1000 kg/m^3 and $g = 10 \text{ N/kg}$.

(d) A concrete block of weight 750 N stands on the ground on a face measuring 50 cm by 30 cm . Calculate the pressure it exerts on the ground. [3]

(d) area $A = lw = 50 \text{ cm} \times 30 \text{ cm} = 1500 \text{ cm}^2 = 0.15 \text{ m}^2$

- $p = F/A$

$$p = \frac{F}{A} = \frac{750 \text{ N}}{0.15 \text{ m}^2} = \mathbf{5000 \text{ Pa}}$$

Exercise 3.4 (e)

3.4 A rectangular water tank has a base of area 3.0 m^2 and is filled with water to a depth of 1.5 m . The density of water is 1000 kg/m^3 and $g = 10 \text{ N/kg}$.

(e) Explain why the walls of a dam are made thicker at the bottom than at the top. [2]

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(e) Explain why the walls of a dam are made thicker at the bottom than at the top. [2]

(e) the pressure in the water increases with depth

- so the wall must be thicker at the bottom to withstand the greater outward force there