Pressure

Question Paper 2

Level	IGCSE
Subject	Physics
ExamBoard	CIE
Topic	General Physics
Sub-Topic	Pressure
Paper Type	(Extended) Theory Paper
Booklet	Question Paper 2

Time Allowed: **68 minutes**

Score: **/57**

Percentage: **/100**

1 Fig. 3.1 shows a house brick of dimensions 21.0 cm × 10.0 cm × 7.00 cm.

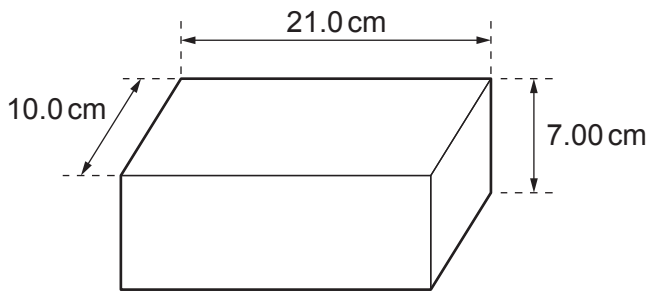

Fig. 3.1

The brick is held under water with its largest surfaces horizontal. The density of water is 1000 kg / m^3.

(a) Calculate the difference in pressure between the top and the bottom surfaces of the brick.

pressure difference = ... [2]

(b) Use your value from **(a)** to calculate the upward force exerted on the brick by the water.

upward force = ... [2]

(c) The mass of the brick is 3.09 kg. Calculate the acceleration of the brick when it is released.

acceleration = ... [3]

[Total: 7]

2 A soldier wears boots, each having an area of 0.016 m^2 in contact with the ground.

The soldier weighs 720 N.

(a) **(i)** Write down the equation that is used to find the pressure exerted by the soldier on the ground.

(ii) Calculate the pressure exerted by the soldier when he is standing to attention, with both boots on the ground.

pressure = ...
[2]

(b) The soldier is crossing a sandy desert.

Explain, stating the relevant Physics, why this soldier is at an advantage over another soldier who has the same weight but smaller feet.

.....

.....

.....

.....[2]

(c) The soldier's unit is sent to a cold country, and on one occasion he has to cross a frozen lake.

Suggest one way that the soldier can reduce the risk of the ice breaking under his weight.

.....

.....

.....[1]

[Total: 5]

3 Fig. 3.1 shows a hydraulic lift in a car repair workshop.

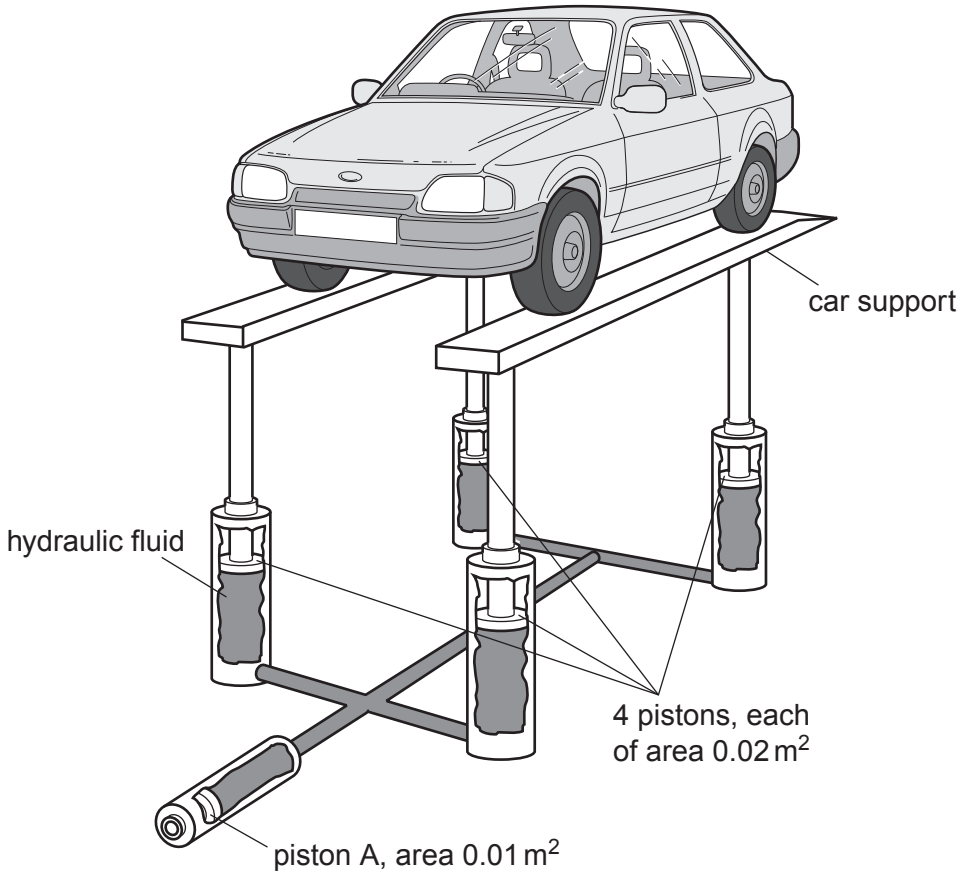

Fig. 3.1

The hydraulic fluid transmits the pressure, caused by piston A, equally to each of the four pistons holding up the car supports. The pressure throughout the fluid is the same.

A force of 1000 N on piston A is just enough to raise the car.

(a) Using values from Fig. 3.1, find

(i) the pressure caused by piston A on the fluid,

pressure = ... [2]

(ii) the total upward force caused by the fluid.

force = ... [3]

(b) The weight of each of the two car supports is 1000 N.

Calculate the mass of the car.

mass = ... [2]

[Total: 7]

4 **(a)** A man squeezes a pin between his thumb and finger, as shown in Fig. 6.1.

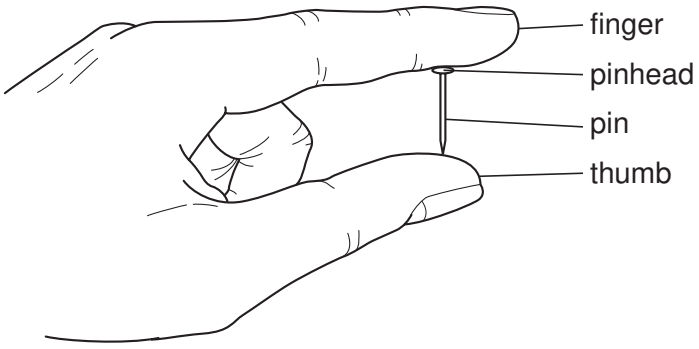

Fig. 6.1

The finger exerts a force of 84 N on the pinhead.

The pinhead has an area of 6.0 10^{-5} m^2.

(i) Calculate the pressure exerted by the finger on the pinhead.

pressure = ... [2]

(ii) State the value of the force exerted by the pin on the thumb.

..... [1]

(iii) Explain why the pin causes more pain in the man's thumb than in his finger.

.....

..... [2]

(b) The density of the water in a swimming pool is 1000 kg / m^3. The pool is 3 m deep.

(i) Calculate the pressure of the water at the bottom of the pool.

pressure = ... [2]

(ii) Another pool has the same depth of water, but has twice the area.

State the pressure of the water at the bottom of this pool.

pressure = ... [1]

[Total: 8]

5 A vertical cylinder has a smooth well-fitting piston in it. Weights can be added to or removed from a tray on the top of the piston.

(a) Weights are added to the tray, as shown in Fig. 6.1.

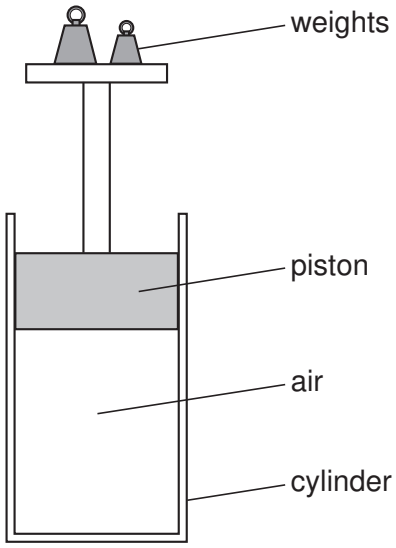

Fig. 6.1

(i) State what happens to the pressure of the air in the cylinder as a result of adding these weights.

..... [1]

(ii) The initial pressure of the trapped air is 1.05×10^5 Pa. When the weights are added, the volume of the air decreases from 860 cm^3 to 645 cm^3.

The temperature of the air does not change.

Calculate the final pressure of the trapped air.

pressure = ... [3]

(iii) The area of the piston is $5.0 \times 10^{-3}\,m^2$.

Calculate the weight that is added to the piston.

weight added = ... [4]

(b) The weights are kept as shown in Fig. 6.1. The temperature of the air in the cylinder is increased.

(i) State what happens to the volume of the air in the cylinder as a result of this temperature rise.

..... [1]

(ii) State how, if at all, the pressure of the air changes as the temperature changes.

..... [1]

(iii) State what must be done to prevent the volume change in **(b)(i)**.

..... [1]

(iv) The volume change in **(b)(i)** is prevented. State what happens to the pressure of the air in the cylinder.

..... [1]

[Total: 12]

1 **(a)** A submarine descends to a depth of 70 m below the surface of water.

The density of the water is 1050 kg/m^3. Atmospheric pressure is 1.0×10^5 Pa.

Calculate

(i) the increase in pressure as it descends from the surface to a depth of 70 m,

increase in pressure = ... [2]

(ii) the total pressure on the submarine at a depth of 70 m.

total pressure = ... [1]

(b) On another dive, the submarine experiences a total pressure of 6.5×10^5 Pa. A hatch cover on the submarine has an area of 2.5 m^2.

Calculate the force on the outside of the cover.

force = ... [2]

(c) The submarine undergoes tests in fresh water of density 1000 kg/m^3.

Explain why the pressure on the submarine is less at the same depth.

.....

..... [1]

[Total: 6]

2 Fig. 3.1 shows a pond that is kept at a constant depth by a pressure-operated valve in the base.

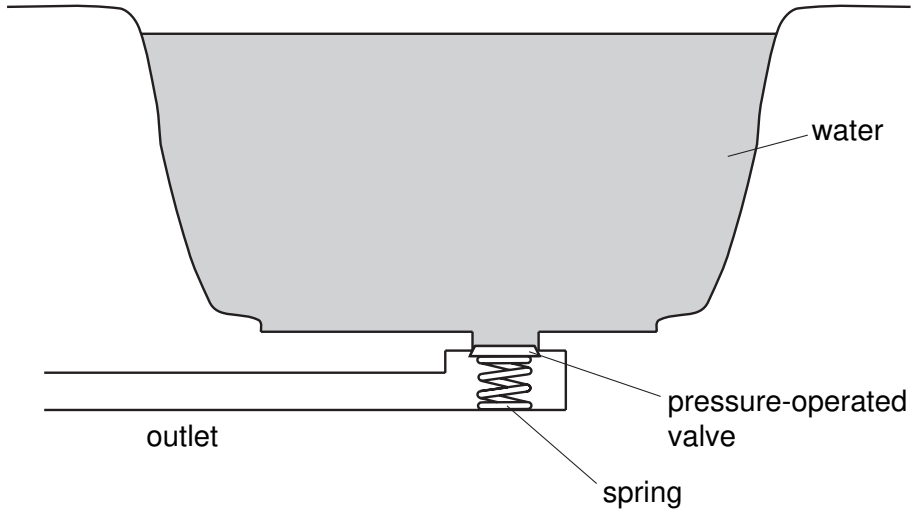

Fig. 3.1

(a) The pond is kept at a depth of 2.0 m. The density of water is 1000 kg/m^3.

Calculate the water pressure on the valve.

pressure =..... [2]

(b) The force required to open the valve is 50 N. The valve will open when the water depth reaches 2.0 m.

Calculate the area of the valve.

area = ... [2]

(c) The water supply is turned off and the valve is held open so that water drains out through the valve.

State the energy changes of the water that occur as the depth of the water drops from 2.0 m to zero.

.....

..... [2]

[Total : 6]

3 Fig. 2.1 shows a diver 50 m below the surface of the water.

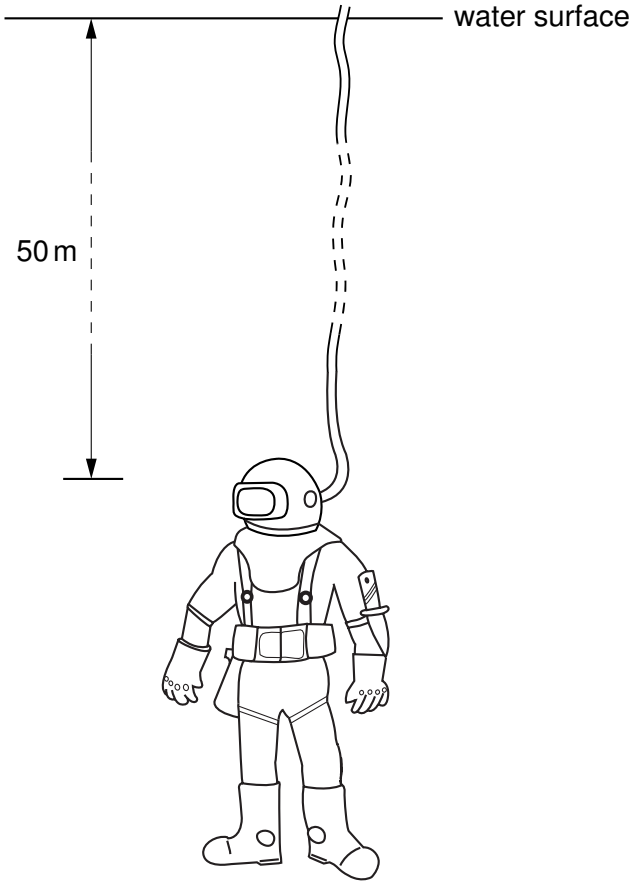

Fig. 2.1

(a) The density of water is 1000 kg/m^3 and the acceleration of free fall is 10 m/s^2. Calculate the pressure that the water exerts on the diver.

pressure = ... [3]

(b) The window in the diver's helmet is 150 mm wide and 70 mm from top to bottom.

Calculate the force that the water exerts on this window.

force = ... [3]

[Total : 6]