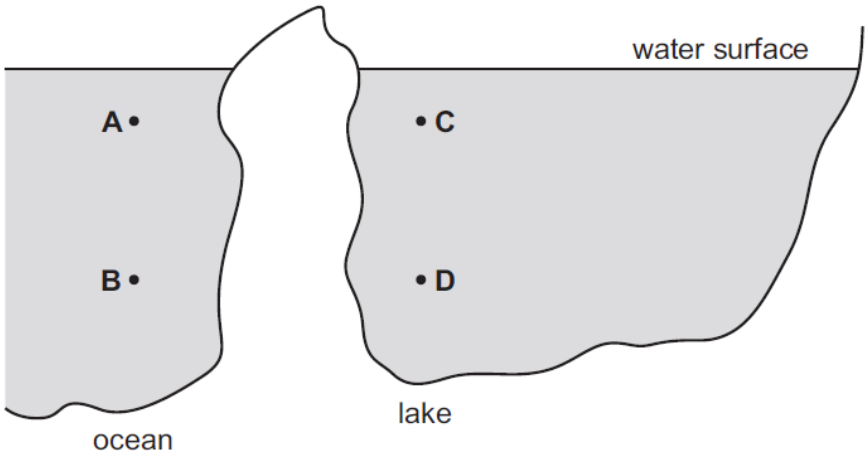
Pressure – 2021 O Level 5054

1. Nov/2021/Paper_11/No.8

An underwater diver moves from the ocean to a fresh water lake.

The density of water in the lake is less than in the ocean.

In which position does the diver experience the smallest pressure due to the water?

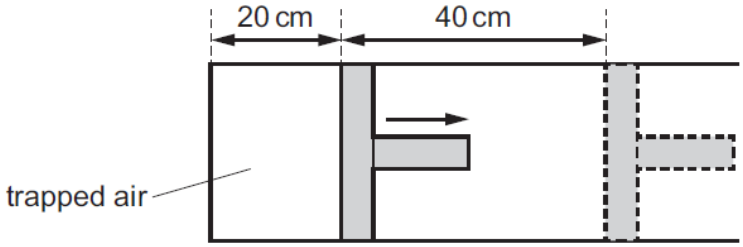


2. Nov/2021/Paper_11/No.9

Air is trapped in a cylinder by a piston. The pressure of the air is p and the length of the air column is 20 cm.

The piston is moved outwards. The length of the air column increases by 40 cm.

The temperature of the air remains constant.

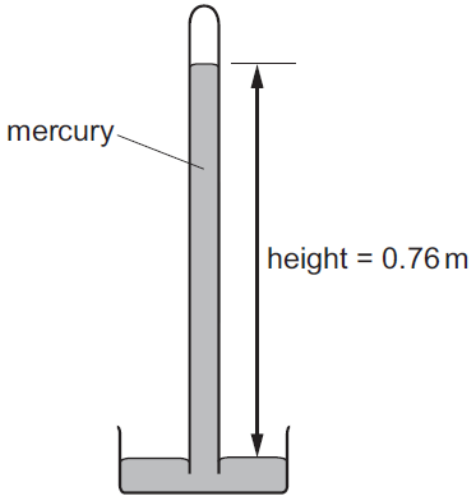


What is the new air pressure?

A $\frac{p}{2}$ **B** $\frac{p}{3}$ **C** $2p$ **D** $3p$

3. Nov/2021/Paper_11/No.10

When the pressure exerted by the atmosphere is 0.10 MPa, the height of the mercury in a barometer is 0.76 m.



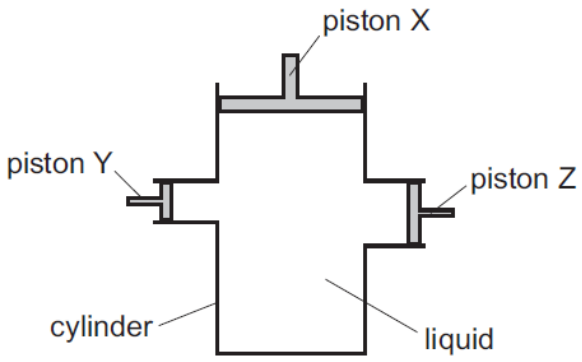
What is the pressure exerted by the atmosphere when the height of the mercury in the simple barometer is 0.57 m?

A 0.025 MPa **B** 0.075 MPa **C** 0.10 MPa **D** 0.13 MPa

4. Nov/2021/Paper_12/No.10

Piston X is pushed into a hydraulic cylinder. Piston X produces a pressure P_X in the liquid in the cylinder.

The diagram shows the cylinder viewed from above.



view from above

There are two other pistons, Y and Z, in the cylinder.

The pressures on piston Y and Z are P_Y and P_Z.

What is the relationship between P_X, P_Y and P_Z?

A $P_X = P_Y + P_Z$

B $P_X > P_Z > P_Y$

C $P_X < P_Z < P_Y$

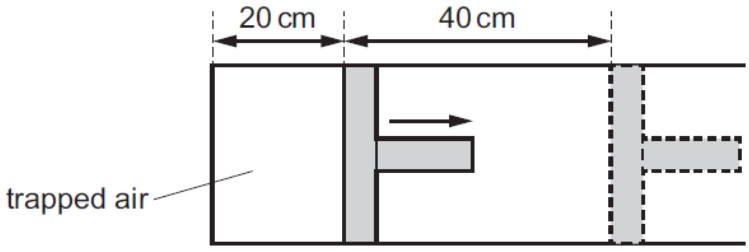
D $P_X = P_Y = P_Z$

5. Nov/2021/Paper_12/No.11

Air is trapped in a cylinder by a piston. The pressure of the air is p and the length of the air column is 20 cm.

The piston is moved outwards. The length of the air column increases by 40 cm.

The temperature of the air remains constant.



What is the new air pressure?

A $\frac{p}{2}$ **B** $\frac{p}{3}$ **C** $2p$ **D** $3p$

6. Nov/2021/Paper_21/No.1a

Fig. 1.1 shows a wooden bench of weight 2000 N.

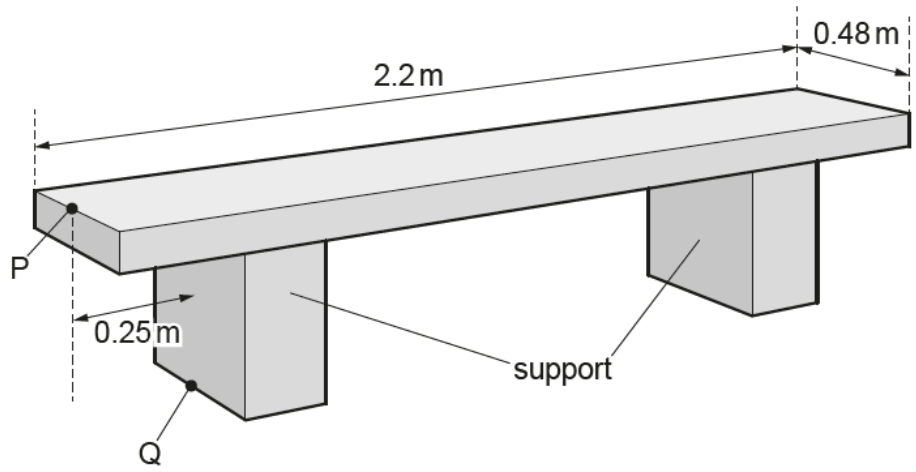


Fig. 1.1

(a) Each of the two supports has an area of 0.040 m^2 in contact with the ground.

Calculate the pressure on the ground due to the bench.

pressure = ... [2]

7. Nov/2021/Paper_22/No.7

A hydraulic press is used at a recycling centre to compress waste material. Fig. 7.1 is a side view of the press.

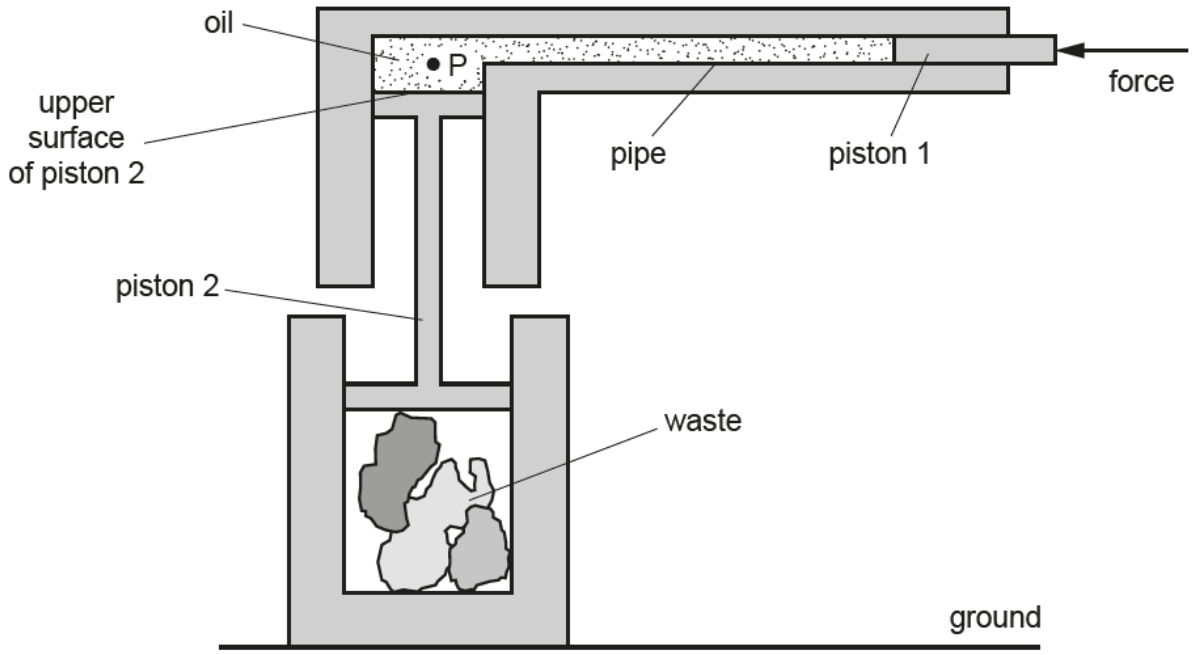


Fig. 7.1 (not to scale)

A force to the left is exerted on piston 1. Oil is pushed along the pipe and this moves piston 2 downwards. Piston 2 compresses the waste.

(a) Oil is a liquid.

(i) State the property of a liquid that makes it suitable for use in a hydraulic system.

.....

..... [1]

(ii) Explain, in terms of molecules, why a liquid has this property.

.....

.....

..... [2]

(b) Suggest one advantage of using oil as the liquid in a hydraulic press.

.....

..... [1]

(c) The cross-sectional area of piston 1 is $0.018\,m^2$.

Piston 1 exerts a force of 4500 N on the oil.

(i) Calculate the pressure of the oil due to this force.

pressure = ... [2]

(ii) The pressure of the atmosphere is 1.0×10^5 Pa.

Calculate the total pressure of the oil in the pipe.

total pressure = ... [1]

(iii) The area of piston 2 that is in contact with the oil is $1.4\,m^2$. Initially, the upper surface of piston 2 is level with point P.

Calculate the force exerted on piston 2 due to the pressure calculated in **(c)(ii)**.

force = ... [1]

(d) **(i)** As piston 1 moves along the pipe:

- the pressure of the oil in the pipe at point P remains constant
- piston 2 moves downwards
- the pressure of the oil at the upper surface of piston 2 increases.

Explain why the pressure at the upper surface of piston 2 increases.

.....

.....

..... [1]

(ii) The density of the oil is 900 kg / m^3. The upper surface of piston 2 is now 0.50 m below the level of the pipe.

Calculate the increase in the force exerted at the upper surface of piston 2 by the oil.

[gravitational field strength g = 10 N / kg]

increase in force = ... [3]

(e) There is air trapped in the plastic bags that contain the waste.

The temperature of the air in the bags remains constant.

Explain, in terms of molecules, why the pressure of the trapped air increases as it is compressed.

.....

.....

.....

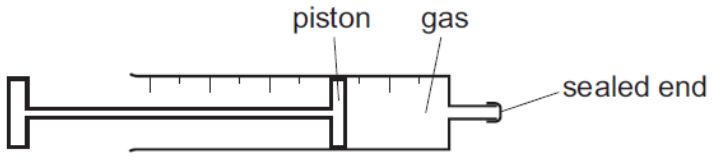
.....

..... [3]

[Total: 15]

8. June/2021/Paper_11/No.10

A sealed gas syringe contains a fixed mass of gas.



The piston is moved and the volume of the gas doubles. The temperature of the gas does not change.

What happens to the pressure of the gas?

A halves

B no change

C doubles

D triples

9. June/2021/Paper_11/No.11

Which expression for pressure is correct?

A force × area

B force ÷ area

C mass × area

D mass ÷ area

10. June/2021/Paper_11/No.12

At a depth d in sea-water, the total pressure experienced by a diver is $2P$, where P is atmospheric pressure.

At which depth is the pressure $4P$?

A $1.5d$ **B** $2d$ **C** $3d$ **D** $4d$

11. June/2021/Paper_12/No.12

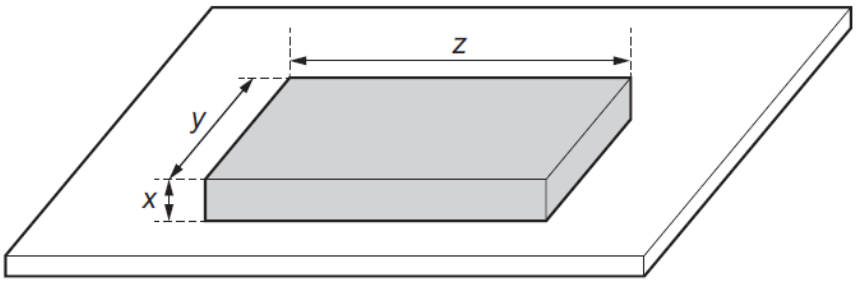
An object is placed at a depth d below the surface of a liquid of density ρ.

On which expression does the pressure on the object depend?

A $d + \rho$ **B** $d \times \rho$ **C** $d \div \rho$ **D** $\rho \div d$

12. June/2021/Paper_12/No.13

The diagram shows the dimensions of a box of mass M and weight W at rest on a table.



What is the pressure on the table due to the box?

A $\frac{M}{xyz}$ **B** $\frac{M}{yz}$ **C** $\frac{W}{xyz}$ **D** $\frac{W}{yz}$

13. June/2021/Paper_12/No.14

Which graph shows the relationship between the pressure and the volume of a fixed mass of gas at constant temperature?