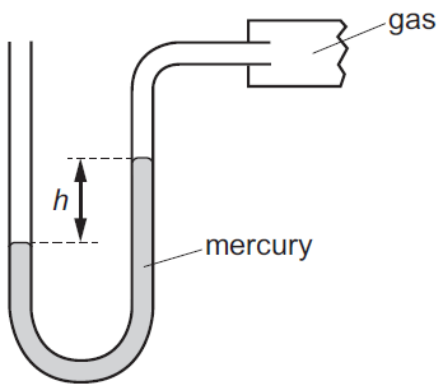
Pressure – 2020 O Level 5054

1. Nov/2020/Paper_11/No.13

A mercury manometer is used to measure the pressure of a gas.



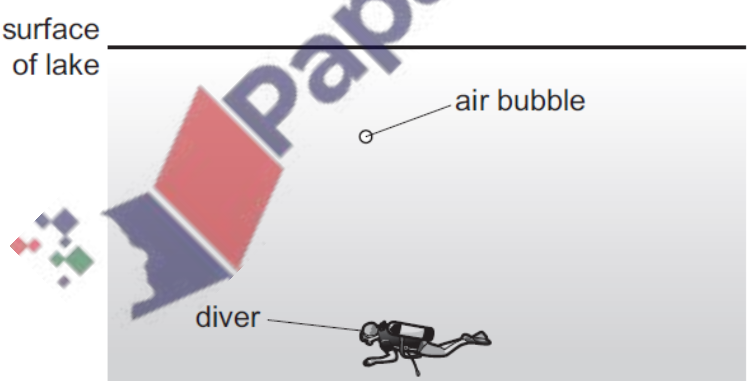
The pressure of the atmosphere is p_0 and the density of mercury is ρ.

What is the pressure of the gas?

A $p_0 - h\rho g$ **B** $p_0 + h\rho g$ **C** p_0 **D** $h\rho g$

2. Nov/2020/Paper_12/No.12

The diagram shows a diver 20 m below the surface of a lake. The total pressure at this depth is 3.0×10^5 Pa.



(not to scale)

An air bubble has a volume of 0.60 cm^3 as it leaves the diver. It rises to the surface of the lake where the pressure is 1.0×10^5 Pa. The temperature of the air in the bubble remains constant.

What is the volume of the air bubble at the surface of the lake?

A 0.20 cm^3 **B** 0.60 cm^3 **C** 1.8 cm^3 **D** 2.4 cm^3

3. Nov/2020/Paper_21/No.8

The density of water in a lake is 1000 kg / m^3.

At a depth of 25 m beneath the surface of the lake, the total pressure is 3.5×10^5 Pa.

(a) State what is meant by *pressure*.

.....

..... [1]

(b) The gravitational field strength is 10 N / kg.

Determine:

(i) the pressure due to 25 m of water

pressure = ... [2]

(ii) the atmospheric pressure.

atmospheric pressure = ... [1]

(c) An underwater depth gauge contains a small cylinder as shown in Fig. 8.1. Gas is trapped inside the cylinder by a piston. The piston is free to move.

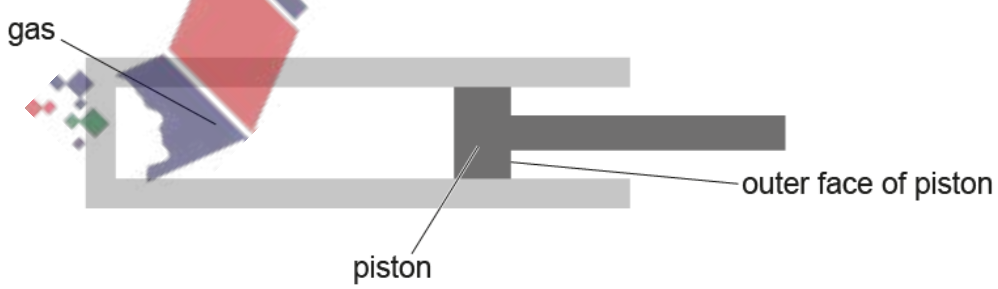


Fig. 8.1

The outer face of the piston is in contact with the water.

As the depth gauge is lowered into the water, the piston moves into the cylinder. This moves a needle on a dial to indicate the depth of the gauge in the water.

(i) Explain why the piston moves into the cylinder.

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..... [3]

(ii) The temperature of the gas does not change as the piston moves into the cylinder.

Explain, in terms of molecules, what happens to the pressure of the trapped gas as the piston moves into the cylinder.

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..... [3]

(iii) At the surface of the water, the volume of the trapped gas in the depth gauge is V_0.

On Fig. 8.2, sketch a graph to show how the volume of trapped gas decreases as the gauge is lowered into the water.

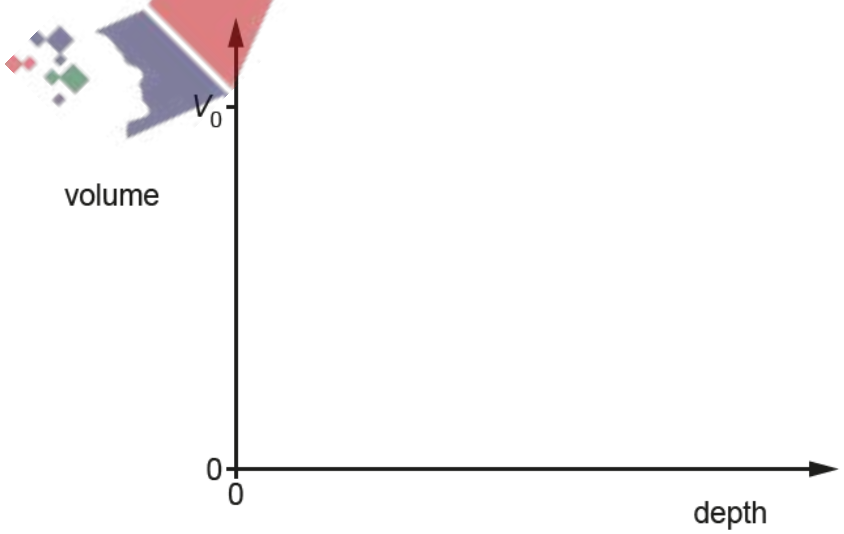

Fig. 8.2

[2]

(iv) The instructions for the depth gauge state that, each time it is used, the needle of the dial must be re-set to zero at the surface of the water.

Suggest **one** reason for this.

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..... [1]

(v) The density of the air trapped in the depth gauge increases. The density of the water remains constant.

Explain, in terms of the molecules of the water, why the density of the water remains constant.

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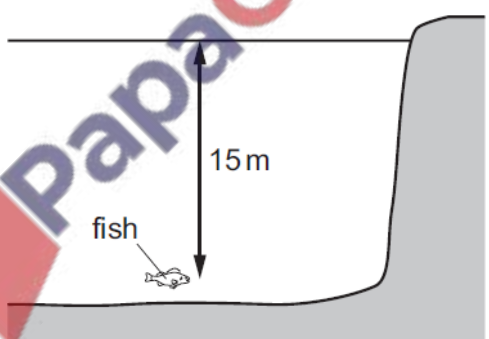
..... [2]

[Total: 15]

4. June/2020/Paper_11/No.14

A fish is swimming 15 m below the surface of a lake, as shown.



The density of the water is 1000 kg / m^3.

Atmospheric pressure is 100 000 Pa.

The acceleration of free fall g is 10 m / s^2.

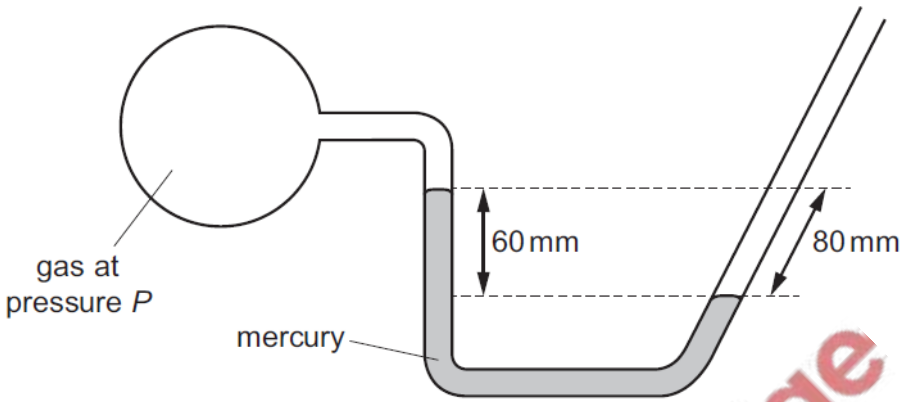
What is the total pressure on the fish?

A 50 000 Pa **B** 120 000 Pa **C** 150 000 Pa **D** 250 000 Pa

5. June/2020/Paper_11/No.15

The diagram shows a mercury manometer. The tube is open to the atmosphere on the right-hand side.

The left-hand side is connected to a container containing a gas at pressure *P*.



Atmospheric pressure on its own supports a column of mercury of height 756 mm.

Which height of column does pressure *P* on its own support?

A 676 mm of mercury

B 696 mm of mercury

C 816 mm of mercury

D 836 mm of mercury

6. June/2020/Paper_12/No.14

An object is placed at different depths in liquids of different densities.

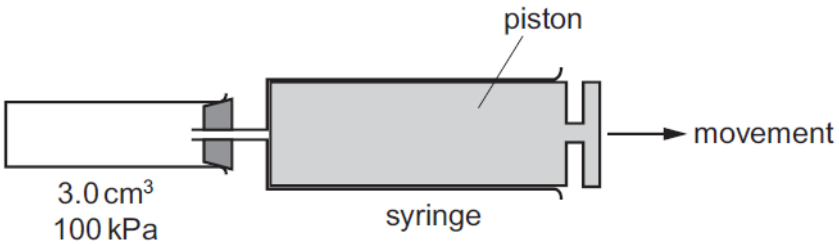
In which liquid and at what depth is the pressure on the object the greatest?

	$\frac{\text{density of liquid}}{\text{kg/m}^3}$	depth / m
A	1000	4.0
B	1000	10
C	1200	4.0
D	1200	10

7. June/2020/Paper_12/No.15

A small vessel of volume 3.0 cm^3 contains air at a pressure of 100 kPa.

The small vessel is connected to a syringe. The piston is fully inserted into the syringe.



The piston is moved slowly to the right so that the air in the syringe has a volume of 12 cm^3. The temperature of the air does not change.

What is the pressure of the air in the syringe?

A 20 kPa **B** 25 kPa **C** 80 kPa **D** 100 kPa

8. June/2020/Paper_21/No.5

(a) Use the relationship between pressure, force and area to explain why it is harder to cut something with a blunt knife than with a sharp knife.

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..... [2]

(b) Experimental measurements on gas pressures were made by Robert Boyle.

He showed that $p_1V_1 = p_2V_2$ where p_1 and p_2 are the initial and final pressures of a gas, and V_1 and V_2 are the initial and final volumes of the gas.

(i) State **two** quantities that must remain constant when this equation is used.

1. .....

2. .....

[2]

(ii) Fig. 5.1 shows the molecules of a gas as the volume of the gas is halved.

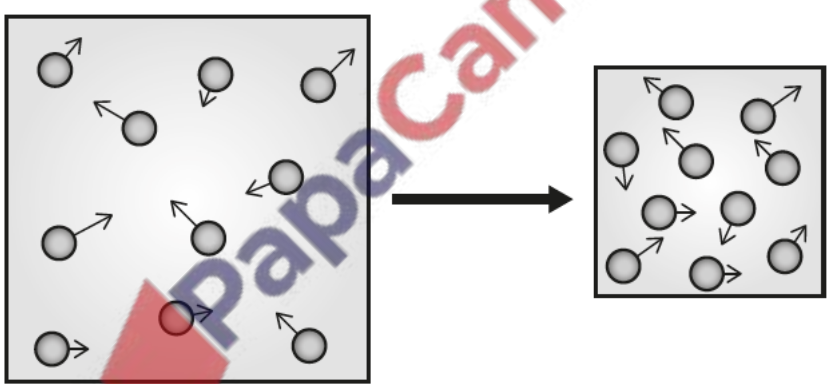

Fig. 5.1 (not to scale)

The equation suggests that when the volume of a gas halves the pressure doubles.

Using ideas about molecules, explain why this happens.

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..... [2]

[Total: 6]