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1. The diagram shows a simple manometer that contains a liquid.



Side X is connected to a gas supply of pressure R.

Side Y is open to the atmosphere at pressure S.

Which pressure is the length h used to measure?

**A**  R

**B** S

**C**  R – S

**D** R + S

1. Fig. Shows a diver working below the surface of a lake. The density of the water in the lake is 1000 kg / m3, the atmospheric pressure at the surface is 1.0 × 105 Pa and the gravitational field strength is 10 N / kg.



The diver inflates a balloon with air at a depth of 15 m and attaches the balloon to a tray of objects.

(a) Calculate

(i) The pressure due to 15 m of water,

(ii) The total pressure at 15 m below the surface of the lake.

(b) The air in the balloon occupies a volume of 0.048 m3 at the pressure calculated in (a) (ii).

The diver releases the tray and the balloon, and they begin to rise. The temperature of the air in the balloon does not change.

1. Calculate the volume occupied by the air in the balloon at atmospheric pressure.
2. The pressure of the air inside the balloon is less at the surface than at a depth of

15 m. Explain, in terms of the air molecules inside the balloon, why the pressure is less.

(c) State one difference between the arrangement of the molecules of water in the lake and the molecules of air in the balloon.

(d) When the diver releases the tray, the balloon accelerates upwards and reaches a constant speed before it arrives at the surface.

(i) Explain how the forces acting on the balloon cause it to behave in this way.

(ii) On the axes, sketch the distance-time graph for the balloon as it travels 15 m to the surface.

