2026 Sec 4 Physics Assignment 9

Pressure

Name: _____ ( ) Class: 4/ ___ Date: _____

1 A man pushes horizontally on a cubic box to move it rightwards along a flat ground at constant velocity. The mass of the box is 50 kg and the frictional force by the ground on the box is 2.0 N.

The sides of the box measure 1.2 m each and the area of the man's palms in contact with the box is 150 cm^2.

(a) Calculate the pressure at the base of the box.

pressure = ……

(b) Determine the pressure exerted by the man on the box. Express your answer in Pa.

pressure = ……

(c) Explain any change in your answer in **(b)** if the box is accelerating to the right.

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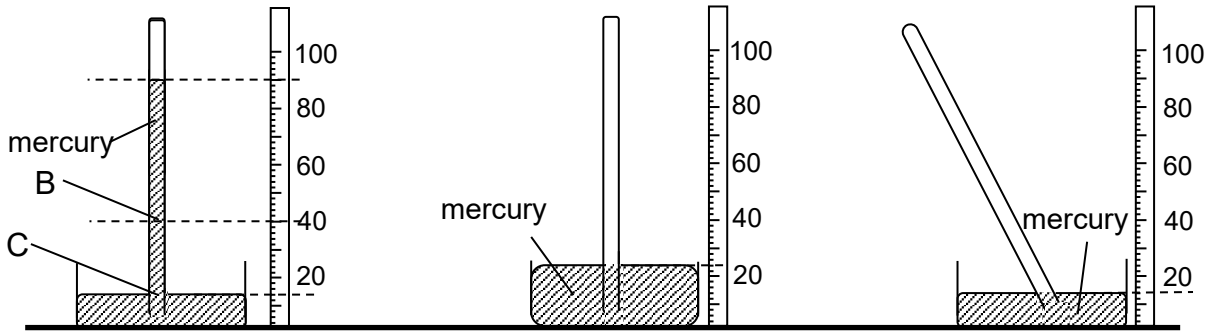
2 Fig. 2.1 below represents a simple mercury barometer on a particular day. The scale alongside the barometer is marked in cm.

Fig. 2.1 **Fig. 2.2** **Fig. 2.3**



(a) Determine the pressure inside the tube in Fig. 2.1

(i) at point C,

pressure = ……

(ii) at point B.

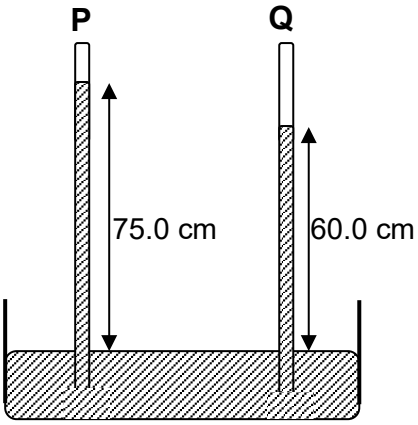
pressure = ……

(b) The mercury levels shown inside the tubes in Fig. 2.2 and Fig. 2.3 are incorrect. Draw the correct levels in:

(i) Fig. 2.2 after pouring more mercury inside the reservoir until it reaches the level shown by the dotted line in the diagram.

(ii) Fig. 2.3 after tilting the tube from the position shown in Fig. 2.1 to the position shown in Fig. 2.3.

3 The diagram shows two vertical tubes **P** and **Q,** each closed at the upper end.
The pressure in the space above the mercury meniscus in tube **P** is negligible. There is a small amount of air in this space in the tube **Q**.
(ρ_{Hg} = 1.36 × 10^4 kg m^{-3} and the g = 10 N kg^{-1})



Using the data given, determine:

(a) the atmospheric pressure, in Pa and cm Hg, during this experiment.

atmospheric pressure = …….. Pa

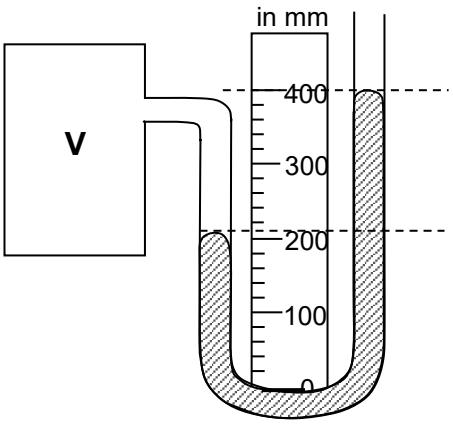
atmospheric pressure = …….. cm Hg

(b) the pressure, in Pa and cm Hg, exerted by the air in the space at the top of tube **Q.**

pressure = …….. Pa

pressure = …….. cm Hg

4 When a mercury manometer is connected to a large tank **V** containing a gas, the steady levels of the mercury are as shown in the diagram.



(a) If the atmospheric pressure is 75.0 cm Hg, calculate the pressure of the gas in **V**.

pressure = ……..

(b) Mark and label on the diagram two points, **A** and **B**, on the manometer at which the pressure is 250 mm Hg greater than atmospheric pressure.

5 The diagram below shows a U-tube manometer. The right-hand tube of the manometer is connected to a large gas cylinder. The atmospheric pressure is 76 cm Hg.

(a) State the pressure at point **A**.

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(b) State the pressure at point **B**.

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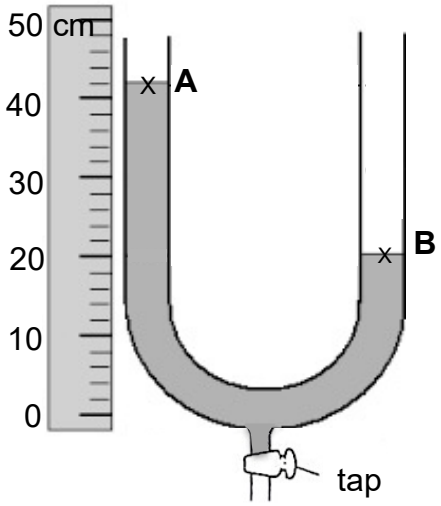
(c) If the gas pressure in the cylinder is increased by 10 cm Hg, state the new levels of mercury in the left and right tubes.

Left tube level: …….

Right tube level: ……..



(d) The tap is then opened and the mercury is allowed to run out until the level in the right-hand tube drops to the 10 cm mark.

(i) Assuming that the pressure in the gas cylinder remains constant at the initial value, what is the new position of the level in the left-hand tube?

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(ii) Explain how you arrived at your answer.

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