O Level Physics Tutorial 5: Pressure

Syllabus :
(a) define pressure in terms of force and area

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1. Define pressure in terms of force and area.

(b) recall and apply the relationship pressure = force / area to new situations or to solve related problems

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2. A box on a table has a weight of 10 N and a base area of 10 cm x 10 cm. Find the pressure of the box on the table.

(c) describe and explain the transmission of pressure in hydraulic systems with particular reference to the hydraulic press

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3. This figure shows a simple hydraulic press.

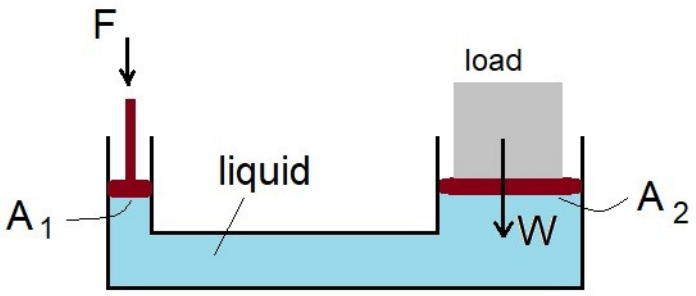

Figure 5-1

(i) Explain how a relatively small force F can be used to raise a much heavier load with this hydraulic press.

(ii) The area A_1 is 100 cm^2, and A_2 is 1 m^2. F is 100 N. What weight W of the load can be lifted?

(d) recall and apply the relationship density = mass / volume to new situations or to solve related problems

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4. The mass of 2 cm^3 of an alcohol is 1.6 g. Find the density of this alcohol.

(e) recall and apply the relationship pressure due to a liquid column = height of column × density of the liquid × gravitational field strength to new situations or to solve related problems

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5.

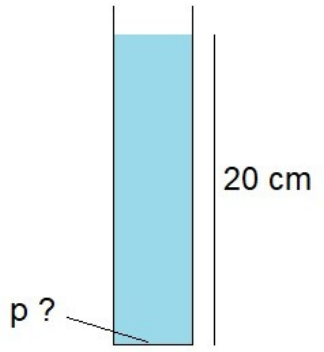

Figure 5-2

A liquid has a density of 0.8 g/cm^3. It fills a measuring cylinder up to a height of 20 cm. Find the pressure at the bottom of the liquid.

(f) describe how the height of a liquid column may be used to measure the atmospheric pressure

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6.

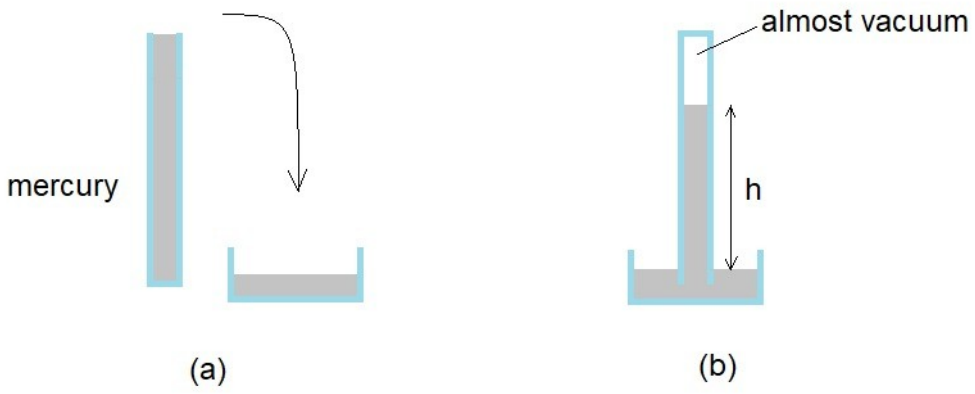

Figure 5-3

A mercury barometer can be made, if you are very careful, with the simple steps above. When the fully filled glass tube in figure (a) is inverted – without spilling – into the half filled pot, some mercury flows out into the pot.

(a) Why does the rest of the mercury in the tube not flow out also?

(b) Why is the space in the tube in figure (b) not a complete vacuum?

(c) The density of mercury is 13.6 g/cm^3.

(g) describe the use of a manometer in the measurement of pressure difference

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7. The following figure shows a setup for a simple manometer, used to measure pressure from a gas cylinder. It consists of a J shaped glass tube with mercury around the lower part.

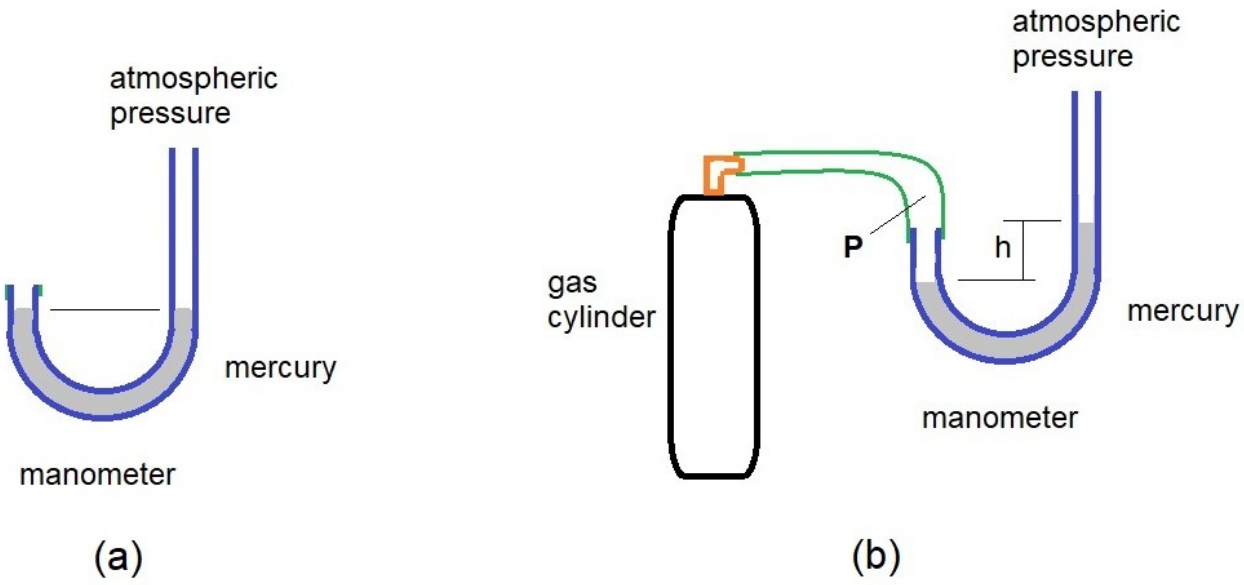

Figure 5-4

When a tube from a gas cylinder is connected to the manometer and the gas tap opened, mercury level falls on one side and rises on the other side of the glass tube. The mercury eventually stops moving when the difference in heights on the two sides reaches a certain value.

(i) Explain why.

(ii) The difference in height is 2 cm. Density of mercury 13.6 g/cm^3. Find the pressure in Pa in the gas cylinder above atmospheric pressure.