S.2 PHYSICS

21 DAYS OF QUARANTINE

PRESSURE REVISION QUESTIONS

EXERCISE ONE

1. Calculate the pressure exerted by a box of mass 15kg when placed on an area of $3m^2$.

2. Calculate the pressure exerted at a point by a drawing pin pushed against a board with a force of 20Nassuming the area of the point of contact is $0.1mm^2$.

3. A mass of 30kg creates a pressure of $15Nm^{-2}$. Calculate the area over which the force is spread

4. What force acting on a rectangular surface 80cm X 50cm would produce a pressure of 30 Nm^{-2}?

5. Calculate the pressure exerted on the road by a car of mass 740kg if the area of contact between the road and each of the four tyres is $50cm^2$

EXERCISE TWO

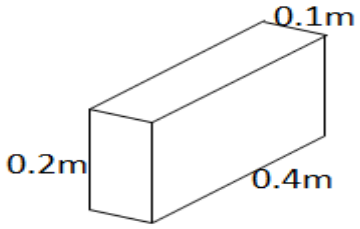
1. A cubical metal block of mass 10kg exerts a pressure of 10,000Pa on a flat surface Calculate;-

(i) Area of the block in contact with the flat surface
(ii) Length of each edge in cm
(iii) Volume of the block
(iv) Density of the material that makes the block

2. A rectangular block of mass 48kg measures 4mx3mx2m. What is the least pressure it can exert on a given surface?

3. A rectangular block of metal weighs 3N and measures $(2x3x4)cm^3$. What is the greatest pressure it can exert on a horizontal surface?

4.The figure below shows a concrete block of mass 10kg that measures 0.1m X 0.2m X 0.4m.



Find the minimum and maximum pressure it exerts.

5. A pile of crates of soda have dimensions 100cm by 200cm by 300cm while resting on the floor. If the average density of the pile is $40kgm^{-3}$, calculate the maximum and minimum pressure it exerts on the floor.

6. A rectangular block of dimensions 4cmx2cmx1cm exerts a minimum pressure of $50Nm^{-2}$ when resting on a table. Calculate the mass of the block.

EXERCISE THREE

1. In the figure below, piston A has a diameter of 14cm while piston B has a diameter of 280cm. If a force of 77N is exerted on piston A, calculate the force exerted on Piston B.

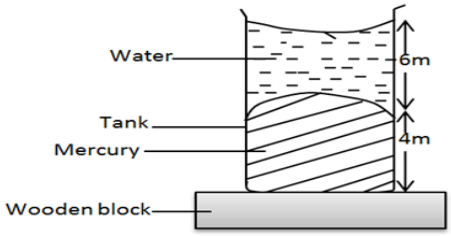
2. A hydraulic press has a large circular piston of radius 0.8m and a circular plunger of radius 10cm. If a force of 200N is exerted by the plunger, calculate the force exerted by the piston.
3. A hydraulic machine has a mass of 60kg on the smallest piston and a mass of 1920kg on the largest piston. If the cross sectional area of the largest piston is $80cm^2$, determine the diameter of the smallest piston.
4. A mass of 20kg is to be lifted using a hydraulic machine. If this mass is to be put on a larger piston of radius of 14cm and a force of 40N is used, find the radius of the smallest piston.
5. In a hydraulic lift, a force of 100N acts on a piston of radius 2cm. What force will act on a piston of radius 72cm?

EXERCISE FOUR

1. A cylindrical tank of diameter 14m and height 21m is filled with water of density $1000kgm^{-3}$. Find the; -

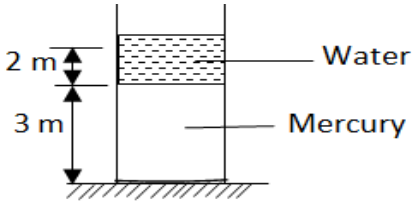
(a) The pressure at the base of the tank.
(b) The volume of water in the tank
(c) The force exerted by water on the tank base.

2. The tank below contains mercury and water of density 13,600kg/m and $1,000kgm^3$ and at heights 4m and 6m respectively.



Find the pressure exerted by the liquids on the wooden block placed at the bottom of the tank.

3. A metal cylinder contains a liquid of density $1,100kgm^3$.The area of the base of the cylinder is $0.005m^2$ and the height of the liquid is 5m.calculate the force exerted by the liquid on the base of the cylinder.
4. A liquid of density $1.03x10^3kgm^{-3}$ fills a vessel of uniform cross-sectional area of $10^{-3}m^2$ to a depth of 0.24m. Calculate the force exerted by the liquids on the bottom of the vessel.
5. The Figure below shows a tank containing mercury and water.



Find the pressure exerted by the two liquids on the bottom of the tank (*Density of water = 1.0 X10^{3}kgm^{-3}, Density of mercury = 1.36X10^4 kgm^{-3})*

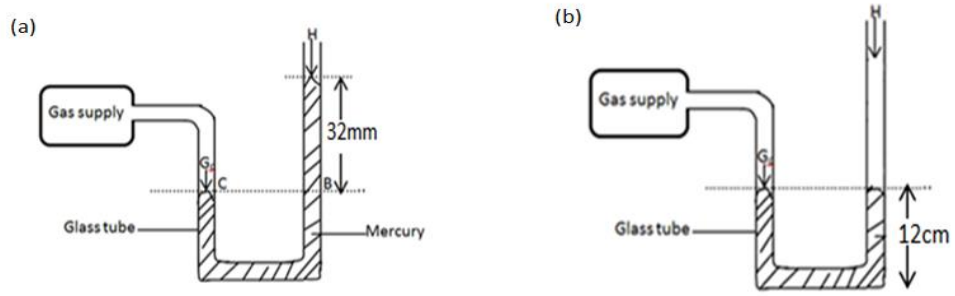
EXERCISE FIVE

1. The barometric height at sea level is 76cmHg while that at the top of a high land is 74cmHg. What is the altitude of the point if the density of air is 1.25kgm^{-3}?
2. The air pressure at the top of a mountain is 60cmHg. Given that the height of the mountain is 850m and that the average density of air is 1.25kgm^{-3}. Find the pressure at the bottom of the mountain in Nm^{-2}.
3. Find the length of a mercury column in a simple barometer when the barometer is raised from sea level to a height of 2.5 km given that the average density of air is 1.2 kgm^{-3} and the density of mercury is 1.36×10^4 kgm^{-3}. Atmospheric pressure at sea level is 76cm of mercury.

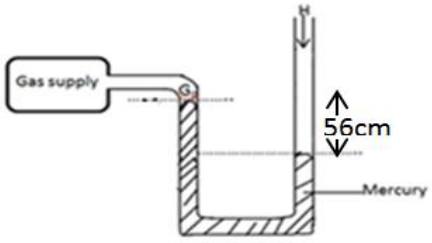
4. The difference between the atmospheric pressure at the top and bottom of a mountain is 1×10^4 Nm^{-2}. If the density of air is 1.25kgm^{-3}, calculate the height of the mountain.
5. A barometer reads 76cmHg and 73.8cmHg at the bottom and top of the mountain respectively. If the density of air is 1.35kgm^{-3} and that of mercury is 13600kgm^{-3}, find the height of the mountain.

EXERCISE SIX

1. Below are diagrams of manometers connected to a gas supply tank. Determine the gas pressure in each case in cmHg and Nm^{-2} given that the manometer contains mercury of density 13.6gcm^{-3} and the atmospheric pressure is 760mmHg



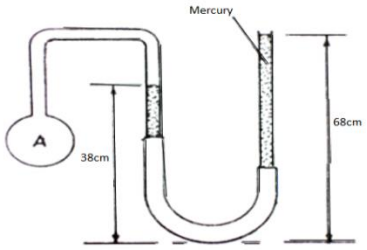
2. In the figure below, determine the pressure exerted by the gas in;



(i) cmHg

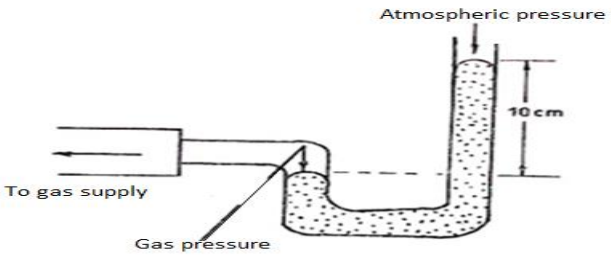
(ii) (ii) mmHg

(iii) (iii) Pa

3. 

In the figure, a fixed mass of dry air is trapped in bulb A. Calculate the total pressure of the air in A, given that atmospheric pressure is 76 cm of mercury.

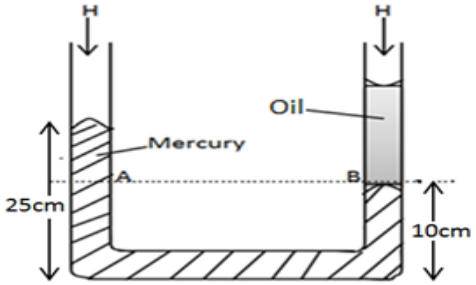
4. The diagram in the figure below shows an instrument used for measuring gas pressure in a laboratory. Find the pressure in Nm^{-2} of the gas if atmospheric pressure is 76cm Hg [density of mercury $=13.6x10^{3}kgm^{-3}$]



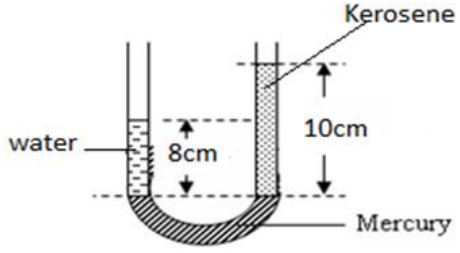
5. What is 730mmHg in Nm^{-2}?

EXERCISE SEVEN

1. The U-tube in the figure below contains mercury and oil of density $13600kgm^{-3}$ and $600kgm^{-3}$ respectively. Calculate the height of the oil column.



2. The level of mercury in the arms of the manometer shown below is equal.

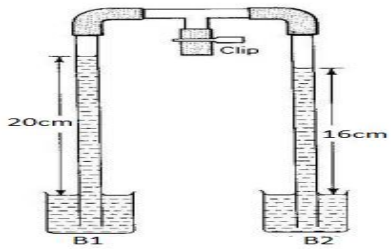


Determine the;-

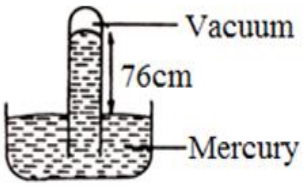
(a) density of kerosene

(b) Relative density of kerosene

3. Two liquids were sucked up in two identical tubes as shown below



Given that the liquid in beaker B_1 is water, determine the density of the liquid in beaker B_2.

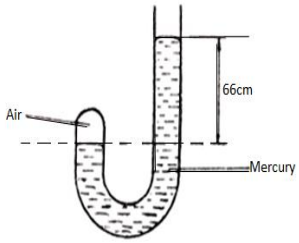
4. 

The figure shows a simple barometer. The height of the mercury column is 76cm. When the tube is slightly tilted, the height of the mercury column will

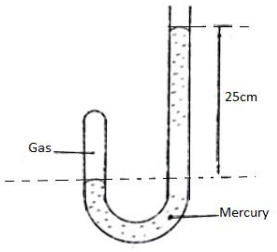
A. be slightly higher than 76cm B. be lower than 76cm

C. not change D. oscillate about 76cm

5. If a mercury barometer reads 760mm of mercury, what is the atmospheric pressure in Nm^{-2}(the density of mercury is $1.36x10^4 kgm^{-3}$)

6. 

The diagram shows air trapped by a column of mercury in a J-tube. The atmospheric pressure is 76cmHg. At what pressure is the enclosed air

7. 

(a) The figure shows a gas trapped by a mercury column in a J-tube. If the atmospheric pressure is $1.0 x10^5$ Pa and the density of mercury is $1.36x10^4 kg\ m^{-3}$, find the pressure at which the gas is.

(b) What would happen if the closed end of the J-tube was opened

(c) Would it have been better to use water instead of mercury in the J-tube? Give a reason for your answer .