Sabaragmuwa Provincial Department of Education – Week School

Subject - Science

Week - September I

Grade - 10

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Hydrostatic Pressure and its applications

Remember how you make footprints on the ground while you walk on a sandy ground. How does this happen? It's because of the weight of your body puts some thrust towards the ground. You will feel a push on your shoulder as you are lifting the school bag. It is caused by the weight of your bag. In such cases, there is a scientific term you have learned to describe the resulting thrust on a certain surface. It is "Pressure".

(1) The force ………………………………………………... is called "Pressure". Pressure is a ……........... quantity. The standard measuring unit of pressure is …………..

Pressure = ...
. . ..

(2) Pressure is caused by solids as well as liquids. Engage in the following activities to study the nature of pressure in a fluid column.

i. Fill a polythene bag with water. Then lift it up and pierce with a pin in several places. What observations could you get?

   What conclusion can you draw from those observations ?

ii. Take a plastic bottle with a height of about 25cm. Above 2cm from the bottom of the bottle, drill 5 small holes at equal distances. What observations did you see ?
   What conclusion can you draw from those observations ?

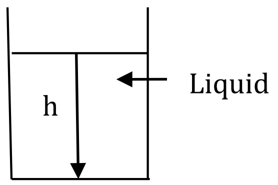
iii. Take a plastic bottle with a height of about 25cm. Make 4 equally spaced (approximately 5cm) holes in a row from bottom to top. Hold the bottle at some height from the ground level and fill the water. What observations did you see ?
   What conclusion can you draw from those observations ?

(3) Liquid pressure does not depend on the shape of the liquid column but only on the vertical height. Set up a suitable demonstration for it. Name the material used and draw the set up.

(4) List the 4 properties of liquid pressure according to the activities you have done above.

(5) Use the example here to build a statement for liquid pressure based on the statement you obtained for "pressure" at (1) above.

Density of liquid filled into the vessel below = ρ (Row symbol)
Liquid column height = h
Liquid pressure at the bottom of the vessel = P
Gravitational acceleration = g



Let's find the volume of the liquid column placed above unit area of the vessel.

Volume = Area x Height = 1 x h = h

The mass of the liquid column in that volume = The density of the liquid x Volume

= …… x ……….

If the weight of the liquid column = W,

W = Mass of the liquid column x Gravitational acceleration

W= ……………… x………………g = …………………..

Pressure = ……………………………………………………………
.   ……………………………………………………………

Therefore; Liquid pressure = Weight of the liquid column / Area

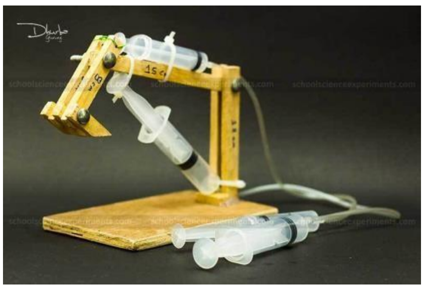
P = ………………… / ……….

P = **hρg**

(6) A fish is swimming at a 10m depth in the sea. Calculate the pressure, caused by seawater on that fish (Consider density of seawater is 1050 kgm^{-3} and gravitational acceleration is $10ms^{-2}$)

(7) A model of "JCB" machine is one of the most interesting items in an exhibition. Here the designer has used only 4 syringes.

i) What is the basic theory behind this apparatus ?



ii) Create a simple setup using only the tools below to demonstrate the above mentioned theory.

- 50ml syringe -01
- 30ml syringe – 01
- 40ml water
- 30cm saline tube

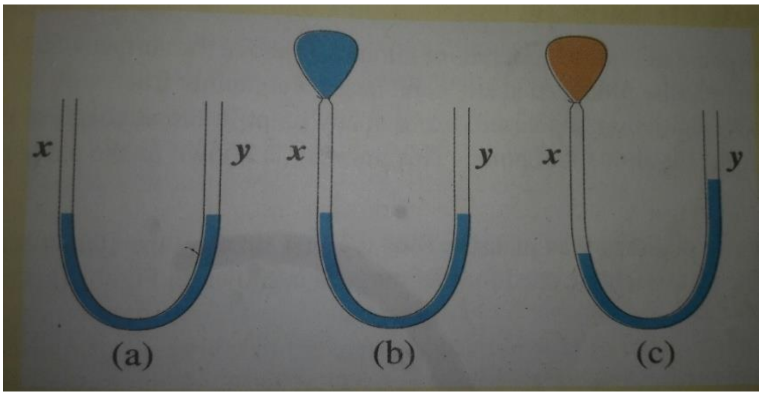
iii) Take observations by operating the above setup.

8) Improve the setup to explain the principle of hydraulic press.

9) Name 3 instances where the principle of liquid pressure transmission is applied.

10) Illustrate using a diagram how principle of liquid pressure transmission works in a vehicle break system (read for more on page no.72 ,part ii grade 10 science book).

11) Answer the questions using the below diagrams.



i) In which instance a pressure occurs due to expansion of compressed air?
ii) Select from the above instances where atmospheric pressure represents correctly.
iii) Explain why the liquid level in the "**x**" arm changes when the balloon knot in the "**c**" is removed.