5.5.2 Pressure in fluids – PhET lab

Open the following SIM: https://tinyurl.com/lxar4np

Explore the simulation my moving the pressure gauge to find out how pressure changes in air and water. (Note: Pressure is in kilopascals kPa. $1kPa = 1000Pa$.)

(1)✐What happens to the pressure as you move down through the air?

(2)✐What happens to the pressure as you move down through the water?

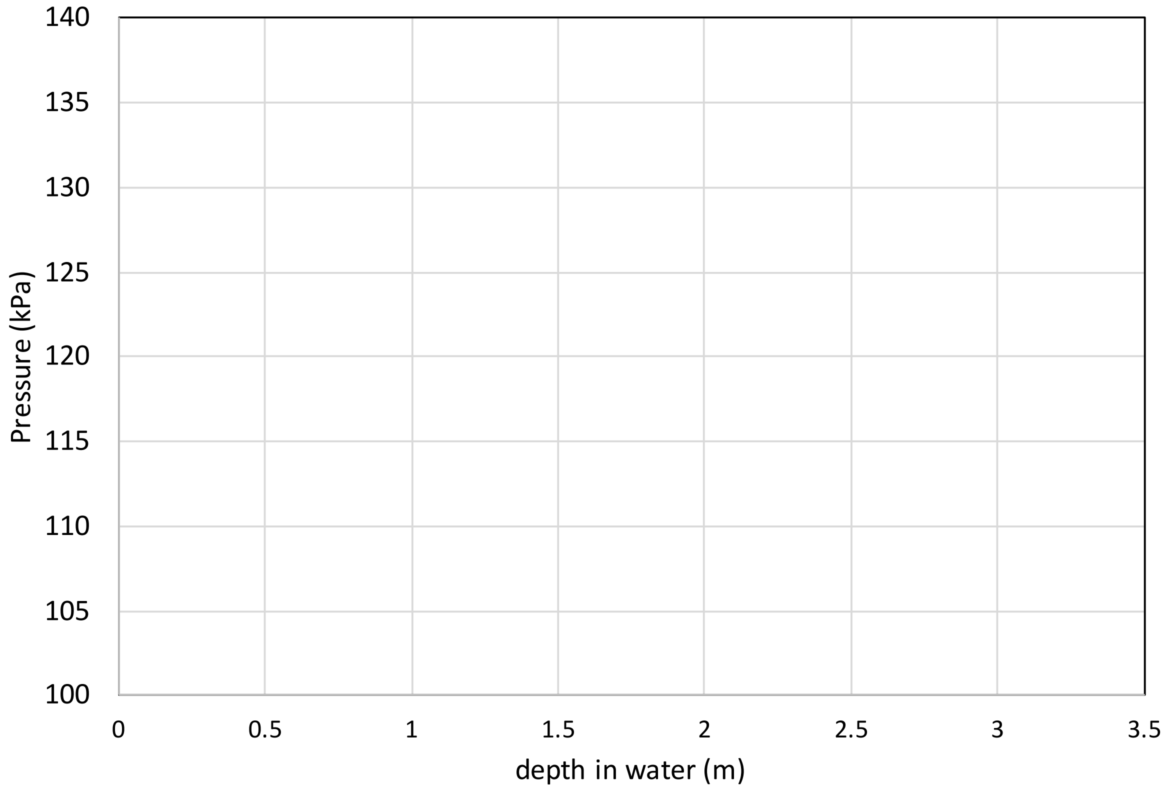
(3)✐How does the pressure change compare between (1) and (2)?

Now fill up the pool by pulling on the  stopper:

(4)✐Use the ruler, and take measurements of the pressure at different depths in the water:

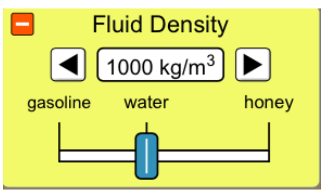
Depth (m)	**Pressure (kPa)**
0.0	
0.5	
1.0	
1.5	
2.0	
2.5	
3.0	

(5) Plot your results:



(6) Describe the relationship between depth in fluid (water) and pressure.

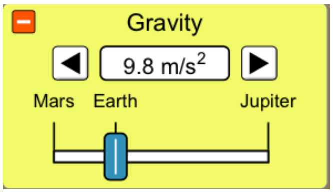
(7) How does the shape of the pool affect pressure at the bottom? Try the "slanty" pools. (Hint: Use the ruler to position the pressure gauge at a particular depth from the surface. Try at different positions.)

Use the slider 

to change the density of the liquid.

(8) How does the density of the fluid affect the pressure?

FLIPPED around PHYSICS

Use the slider 

to change the gravitational field strength (g).

(9)✏How does the gravitational field strength affect the pressure?

At GCSE, you can be asked to calculate the change of pressure as you move up or down in a fluid. The change of pressure (ΔP) is given by:

$$\Delta P = \rho \times g \times \Delta h$$

Where ρ=density of fluid (in Pa), g=gravitational field strength (=9.81 N/kg), Δh=change in depth (in m).

Worked example:

The pressure on a submarine at the surface of the sea is 101kPa. It dives to a depth of 1km. What is the pressure on the submarine at this depth? (the density of salt water =1030kg/m^3)

$$\Delta P = \rho \times g \times \Delta h$$

$$= 1030 \times 9.81 \times 1000$$

$$= 10{,}100 kPa$$

So, the pressure increases by 10,100kPa from 101kPa. Therefore, the new pressure, at depth, is 10,200kPa.

(10)✏A light aircraft climbs to a height of 0.5km. The pressure on the runway is 101kPa. What is the pressure at a height of 0.5km. (density of air = 1.2kg/m^3). (Hint: In this case the pressure will <u>decrease</u> from 101kPa.)

(11)✏What assumption is made in question (10)?