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Physics for life and science
Exp#1: Under Pressure

Name: [illegible] 240113
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Using the "Under Pressure" simulation at http://phet.colorado.edu/en/simulation/under-pressure, perform the following steps and answer the questions, using supporting observations and data:

1. Explore the simulation by moving the pressure gauge to find out how pressure changes in **air** and **water**. Describe your findings and include specific data from your explorations to support your ideas.

Underwater pressure 111.494 kPa

Pressure in the air 101.310 kPa

- The closer we get to sea level, the more pressure increases by a small percentage. $h \propto \frac{1}{P}$

2. Turn the atmosphere off and compare the pressure at sea level to the bottom of the pool.

Pressure at sea level 235×10^{-3} kPa must be zero

Pressure at the bottom of the sea 29,102 kPa

The higher the depth, the more pressure.

3. Examine the various pressures in the various pools. How does the shape of the poo affect pressure at the bottom? Explain your findings.

Press in the bottom of a square-shaped pond 130.648 kPa
Pressing at the bottom of a triangular-shaped pond 130.648 k

The shape of the pond does not affect the pressure, but the depth of the point, the greater the depth, the greater more the pressure.
Pressure in the triangular pond = pressure in the square pond at the same depth = 3m

4.Now, try a quick 3-part experiment. In the first slide, fill the pool and shut off the atmosphere. For each step, make a note of any observations or data from the simulation

I. Measure the pressure of the water at a depth of 1 meter, then 2 meters, then3 meters.

Depth(m)	Absolute pressure(kPa)	Gauge pressure(kPa)
1	111,312 kPa	9,987 kPa
2	120,814kPa	19,489 kPa
3	130,315 kPa	28,990 kPa

II. Put the gauge at a depth of exactly 1 meter (it should read 9.8 kPa). Now change gravity to 4.9 m/s2, and then to 19.6 m/s².

Gravity(m/s²)	Absolute pressure(kPa)	Gauge pressure(kPa)
4.8	54,520 kPa	4,892 kPa
9.8	111,312 kPa	9,987kPa
19.6	222,624 kPa	19,974 kPa

III.Put the gauge at a depth of **1 meter** and set gravity back to **9.8m/s²**. Change the fluid density to 700 kg/m³, and then to1400 kg/m³.

fluid density kg/m³	Absolute pressure(kPa)	Gauge pressure(kPa)
700	108,316 kPa	8,991 kPa
1000	111,312 kPa	9,987 kPa
1400	115,307 kPa	13,982 kPa

The first rule:

The greater the depth, the greater the pressure

The second rule:

The higher the gravity, the more pressure

The third rule:

The higher the density, the more pressure.

5. Finally, go to the last slide with the question mark in the pool. In this step of the simulation, use your knowledge of pressures in liquids to determine the densities of Fluids A, B and C.

a) What is the density of Fluid A?
b) What is the density of Fluid B?
c) What is the density of Fluid C?
d) What is the acceleration due to gravity of Mystery Planet C?

(a) $P_g = \rho_A g h_A$

$10^3 \times 16,978 = \rho \times 9,8 \times 1$

$\rho_A = 1732,449 \text{ kg/m}^3$

(b) $P_g = \rho_B g h_B$

$10^3 \times 8,389 = \rho_B \times 9,8 \times 1$

$\rho_B = 856,02 \text{ kg/m}^3$

(c) $P_g = \rho_C g h_C$

$10,986 = \rho_C \times 9,8 \times 1$

$\rho_C = 1121,02 \text{ kg/m}^3$

(d) $P_g = \rho_C g h_C$

$7425 = 1121,02 \times g \times 1$

$g = 6,6234 \text{ m/s}^2$