Pressure and Depth Lab

Find the depth needed for the same gauge pressure

Name _____ Period _____ Date _____

Compare pressure at different depths, then find the depth needed for one pressure in different liquids. Linearize the results and determine g.

Time 50 minutes • Open buildphysics.com/?experiment=fluid-pressure

Model and measurements

Keep the tank surface open to atmosphere and Liquid fill height at 1.50 m. Use g = 9.8 m/s².

$$P = P_s + \rho g h$$

h is depth below the liquid surface. Gauge pressure ΔP is pressure above atmospheric pressure. Convert kPa to Pa: 1 kPa = 1,000 Pa.

Predict before running

To obtain the same gauge pressure in a denser liquid, should the probe be deeper or shallower? Predict and explain.

Part A Compare depths in water

1. In Explore this setup, set Liquid density to 1,000 kg/m³ and Liquid fill height to 1.50 m. Test the Probe A depths below.
2. Open Properties → Probe A → Live values. Read Depth and Gauge pressure.
3. Record both readings while paused. Keep depth measured from the liquid surface.

Set depth (m)	Read h (m)	Gauge ΔP (kPa)
0.30		
0.60		
0.90		

A1. Use two trials to compare the depth ratio with the gauge-pressure ratio.

A2. Why does gauge pressure increase with depth even when the tank surface remains open to atmosphere?

Part B Design and collect

Suggested time 16 minutes

Investigation question How does the depth needed for 6.00 kPa gauge pressure depend on liquid density?

Choose at least five liquid densities from 600 to 1,800 kg/m³, spread across the range. For each, adjust Probe A depth until gauge pressure is within 0.02 kPa of 6.00 kPa.

B1. Identify the independent and dependent variables.

B2. What will you keep constant? How will you do this?

B3. List your settings. Why is this set useful?

B4. How will you adjust depth and judge whether the target pressure has been reached?

B5. Write a procedure another group could follow.

Record your measurements

Target ΔP = 6.00 kPa Open surface Liquid fill height = 1.50 m

Trial	Liquid ρ (kg/m³)	Read depth h (m)	Gauge ΔP (kPa)
1			
2			
3			
4			
5			
Extra			

Part C Build and analyze a linear graph

Suggested time 14 minutes

C1. The relationship is $h = \frac{\Delta P}{\rho g}$. Describe how h depends on ρ for the same gauge pressure.

C2. Choose quantities for a straight-line graph. Label the table with your choices and units, and calculate the transformed values.

Trial	_____ Units _____	_____ Units _____
1		
2		
3		
4		
5		
Extra		

C3. Plot your transformed data and draw a best-fit line. Label both axes with quantities and units.



C4. Find slope and units using two separated points on your fitted line. Use the fit and target ΔP to determine g. Interpret the intercept.

Part D Explain and predict

Suggested time 8 minutes

D1. A student claims, “The same gauge pressure always means the same depth.” Evaluate the claim using two liquids.

D2. Does your graph support the pressure model? Compare inferred g with 9.8 m/s² and discuss the intercept.

D3. Choose an unused liquid density within your range. Predict the depth for 6.00 kPa from your fit. Set that depth and measure gauge pressure. Compare with the target.

New ρ (kg/m³)	Predicted h (m)	Measured ΔP (kPa)

Comparison