Floating Sinking and Buoyancy Lab

Liquid density and the fraction submerged

Name _____ Period _____ Date _____

Compare floating blocks of different masses, then change liquid density. Linearize submerged-fraction data and determine the block's density.

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

Model and measurements

Use the prepared block without changing its size. Keep mass at 0.60 kg for Part B. The block floats without touching the tank.

$B = \rho g V_{sub}$ $W = mg$

ρ is liquid density, ρ_s is block density, and V is full block volume. Fraction f is submerged volume divided by V; divide a percent reading by 100.

Predict before running

For the same floating block, will denser liquid leave more or less of the block submerged? Predict and explain.

Part A Compare floating masses

1. Keep Liquid density at 1,000 kg/m³. Test the Specimen masses below in Explore this setup.
2. In Properties → Floating block → Fluid properties, click Set floating position after each change.
3. Read Submerged fraction and Buoyant force. Record both and calculate weight using g = 9.8 m/s².

Mass (kg)	Submerged (%)	Buoyant B (N)	Weight W (N)
0.40			
0.60			
0.80			

A1. Use two trials to compare buoyant force with weight. How did the submerged fraction change?

A2. How can buoyant force change when liquid density and the block's full volume stay the same?

Part B Design and collect

Suggested time 16 minutes

Investigation question How does a floating block's submerged fraction depend on liquid density?

Keep Specimen mass at 0.60 kg and its size unchanged. Choose at least five liquid densities from 700 to 1,800 kg/m³, spread across the range.

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 prepare floating equilibrium and obtain f from the displayed percent?

B5. Write a procedure another group could follow.

Use Set floating position for each density. Read the fraction in Fluid properties while paused.

Record your measurements

Block m = 0.60 kg Full V = 0.00100 m³ Same block size

Trial	Liquid ρ (kg/m³)	Submerged (%)	Fraction f
1			
2			
3			
4			
5			
Extra			

Part C Build and analyze a linear graph

Suggested time 14 minutes

C1. The relationship is $f = \frac{\rho_s}{\rho}$. Describe how f depends on liquid density for the same floating block.

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. Determine block density and interpret the intercept.

Part D Explain and predict

Suggested time 8 minutes

D1. A 1.20 kg block of this same volume is released in water of density 1,000 kg/m³. Will it float? Compare maximum buoyant force with weight.

D2. Does your graph support floating equilibrium? Compare graph-based block density with m/V and discuss the intercept.

D3. Choose an unused liquid density within your range. Predict f from your fit, set the floating position in that liquid, and measure f. Compare.

New ρ (kg/m³)	Predicted f	Measured f

Comparison