Venturi Pressure and Speed Lab

Throat speed and the pressure it produces

Name _____ Period _____ Date _____

Compare pressure along a Venturi pipe, then vary throat area. Linearize pressure-speed data and determine liquid density.

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

Model and measurements

The pipe is horizontal. Flow is steady, incompressible, and without energy loss. Keep Volume flow rate at 0.060 m³/s.

$$P + \frac{1}{2}\rho v^2 + \rho g y = constant$$

P_1 and v_1 refer to Station A; P_2 and v_2 refer to Station B at the throat. Convert kPa to Pa for analysis: 1 kPa = 1,000 Pa.

Predict before running

Will the narrow throat have higher or lower static pressure than the wide inlet? Predict and explain.

Part A Compare stations along the pipe

1. Set Volume flow rate to 0.060 m³/s and Throat area to 0.020 m² in Explore this setup.
2. In Properties, select Stations A, B, and C in turn. Read Area, Speed, and Absolute pressure in Live values.
3. Collect the readings while paused. Use the actual area at each station.

Station	Read A (m²)	Speed v (m/s)	Pressure P (kPa)
A			
B			
C			

A1. Use two stations to compare speed and pressure. Which station had the smallest area?

A2. Explain how pressure can decrease while speed increases in a horizontal pipe.

Part B Design and collect

Suggested time 16 minutes

Investigation question How does throat pressure depend on throat speed for the same inlet flow?

Choose at least five Throat areas from 0.015 to 0.070 m^2, spread across the range. Keep Q at 0.060 m^3/s and Station A and B positions unchanged.

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 pair the throat's pressure and speed while keeping the inlet conditions fixed?

B5. Write a procedure another group could follow.

Use Station A's Part A pressure and speed as fixed inlet readings. Read each throat pressure and speed at Station B.

Record your measurements

Q = 0.060 m^3/s P_1 = _____ kPa v_1 = _____ m/s

Trial	Throat A (m^2)	Read v_2 (m/s)	Pressure P_2 (kPa)
1			
2			
3			
4			
5			
Extra			

Part C Build and analyze a linear graph

Suggested time 14 minutes

C1. The relationship is $P_2 = P_1 + \frac{\rho}{2}({v_1}^2 - {v_2}^2)$. Describe how P_2 depends on v_2 while P_1 and v_1 stay fixed.

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 liquid density and interpret the intercept.

Part D Explain and predict

Suggested time 8 minutes

D1. A student claims, “Faster flow must mean greater static pressure.” Evaluate the claim using your results.

D2. Does your graph support the horizontal-flow model? Compare inferred density with 1,000 kg/m³ and explain the intercept.

D3. Choose an unused throat area within your range. Calculate its speed from Q/A and predict P_2 from your fit. Set that area and measure P_2. Compare.

New A (m^2)	Predicted P_2 (Pa)	Measured P_2 (Pa)

Comparison