

Fluid Simulation

Classroom worksheet · Interactive simulation: <https://lkforge.com/tools/physics/fluid-sim/>

Name: _____ Date: _____

Learning objectives

- Distinguish laminar from turbulent flow.
- Describe how obstacles create vortices.
- Relate flow behavior to speed and viscosity.

Variables to change

- Flow speed
- Viscosity
- Obstacles

Procedure

1. Start a slow, smooth flow and observe the streamlines.
2. Increase the speed and watch the flow become turbulent.
3. Place an obstacle and observe vortices forming downstream.

Observations

Describe the flow pattern (smooth vs chaotic) at low and high speed, and around obstacles.

Questions

1. What is laminar flow?
2. What is turbulent flow?
3. What happens to flow as speed increases?

4. What is a vortex?

5. What equations govern fluid flow?

Answer key (instructors)

- **1.** Smooth flow in parallel layers that do not mix.
- **2.** Chaotic, mixing flow with eddies and vortices.
- **3.** It tends to transition from laminar to turbulent.
- **4.** A region of swirling, rotating fluid, often shed behind an obstacle.
- **5.** The Navier–Stokes equations, expressing conservation of momentum and mass for a fluid.

Fluids flow smoothly (laminar) at low speed and break into chaotic, swirling turbulence at high speed, especially past obstacles that shed vortices. All of this is governed by the Navier–Stokes equations for momentum and mass conservation.