

Hooke's Law

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

Name: _____ Date: _____

Learning objectives

- State and apply Hooke's law.
- Determine a spring constant from force and extension.
- Relate stored elastic energy to extension.

Variables to change

- Applied force
- Extension
- Spring constant

Procedure

1. Apply a known force and record the spring's extension.
2. Increase the force in steps and record the extension each time.
3. Plot or tabulate force versus extension.

Observations

Record force and the resulting extension; look for a proportional relationship.

Questions

1. State Hooke's law.
2. How do you find the spring constant from your data?
3. What does a larger spring constant mean physically?

4. Write the elastic potential energy stored in a stretched spring.
5. What happens if you stretch the spring past its elastic limit?

Answer key (instructors)

- **1.** The restoring force is proportional to extension: $F = -kx$ (magnitude $F = kx$).
- **2.** It is the slope of the force-versus-extension line, $k = F/x$.
- **3.** A stiffer spring that needs more force for the same extension.
- **4.** $E = \frac{1}{2}kx^2$.
- **5.** Hooke's law no longer holds; the spring deforms permanently and the linear relationship breaks down.

Hooke's law ($F = kx$) says spring force is proportional to extension, with k the stiffness read as the slope of force versus extension. Stored elastic energy is $\frac{1}{2}kx^2$, valid until the spring passes its elastic limit.