

Doppler Effect Simulator

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

Name: _____ Date: _____

Learning objectives

- Explain how relative motion shifts observed frequency.
- Predict the shift for approaching and receding sources.
- Connect the effect to everyday and astronomical examples.

Variables to change

- Source speed
- Direction of motion
- Observer position

Procedure

1. Set the source moving toward the observer and note the observed frequency.
2. Reverse the direction so the source recedes and compare.
3. Increase the source speed and observe the size of the shift.

Observations

Record the observed frequency as the source approaches and recedes at different speeds.

Questions

1. What happens to observed frequency as a source approaches?
2. What happens as the source recedes?
3. How does increasing the source speed affect the shift?

4. Give an everyday example of the Doppler effect.
5. How do astronomers use the Doppler effect?

Answer key (instructors)

- **1.** It rises above the emitted frequency (waves are compressed).
- **2.** It falls below the emitted frequency (waves are stretched).
- **3.** A faster source produces a larger frequency shift.
- **4.** The pitch drop of a passing siren or car horn as it goes by.
- **5.** Redshift of a galaxy's light shows it is receding, evidence for the expanding universe.

Relative motion between source and observer changes the observed frequency: approaching compresses waves (higher pitch/blueshift), receding stretches them (lower pitch/redshift). Faster motion means a bigger shift — heard in passing sirens and seen in galaxy redshifts.