

# Key Physics Concepts and Skills

## Activity Summaries

## Physics Principles

### Activity 1: Making Waves

Students begin the chapter by making waves with a Slinky®, observing pulses, periodic, standing, and compressional waves. From these observations, then measurements, they establish the relationships among wavelength, frequency, and speed of the wave.

- Wave motion
- Periodic, standing, and compressional waves
- Wavelength – Frequency, speed

### Activity 2: Sounds in Strings

To connect waves to sound, students observe the vibration of a plucked string and compare how vibration and pitch vary when the tension of the string changes. They then explore the effect on vibrations and pitch when the length of the string is changed. Reading explains the physics concepts in the observed phenomena.

- Sound waves
- Wave motion
- Tension and pitch
- Frequency

### Activity 3: Sounds from Vibrating Air

Drinking straws and test tubes filled with water are used to model instruments that use columns of vibrating air to produce sounds. The relationship of pitch to length of the column of air provides another look at frequency and wavelength, helping students understand how sound is produced by compressional and standing waves.

- Sound waves
- Wave motion
- Compressional waves
- Frequency and wavelength

### Activity 4: Making Sound Electronically

This activity shifts the study of waves to include technology familiar to students. After constructing a circuit board, students explore how they can control the sound produced by changing resistors and capacitors. Feeling the speaker vibrate reinforces the fact that sound waves are produced by vibrations.

- Sound waves
- Vibration and pitch
- Components of an electric circuit – capacitors and resistors

### Activity 5: Reflected Light

In this activity, students begin looking at how light can be incorporated into the Chapter Challenge. They explore the result of changing the angle at which light rays are aimed at a mirror and learn to predict and control where images will be visible.

- Light rays
- Reflection of light
- Real images – focus, focal length

### Activity 6: Curved Mirrors

Shining a light beam on concave and convex mirrors increases student understanding of the variables that are involved in creating an image. They apply what they have learned to predict the path of a light beam reflected off a mirror.

- Reflection of light
- Real images – focus, focal length
- Controlling variables

### Activity 7: Refraction of Light

In this activity, a block of gelatin allows students to explore what happens when light goes from air into another substance. They observe and measure the angle of incidence and the angle of refraction as they learn about Snell's Law and how to mathematically predict where the beam of light can be observed.

- Refraction of light
- Snell's Law

### Activity 8: Effect of Lenses on Light

Shining a light through different lenses enables students to observe how focal length and the size of the image changes as the light source moves closer to, then farther away from a lens. They then consider how the variables in this phenomenon can enhance their sound and light show for the Chapter Challenge.

- Refraction of light
- Lenses and image formation
- Focus, focal length

### Activity 9: Color

This final activity adds to the study of light with observations of shadows. By carefully tracing the light ray and noting the areas without any light and the areas of gray light, students begin to learn about diffusion of light. They extend their investigations to include the effect of shining different colored lights on objects.

- Light and shadows
- White light
- Color addition