Science 8
Technical Reading

Waves

EQ: What is in the air that I cannot see?

Targeted Skills
Communication
- Determine purpose
  - use traditional sources

Information Literacy
- Organize and manipulate information
  - diagrams

Enduring Understandings
The transfer of matter and energy within the atmosphere produces global patterns.

Concepts Important to Know and Understand
waves, energy transfer

Broad Brush Knowledge
particle movement

Core Objectives
7. Analyze and interpret the interaction of waves with different media.
9. Illustrate interactions between matter and energy in various systems.

Purpose: To gather and organize information about waves on a diagram and a concept map.

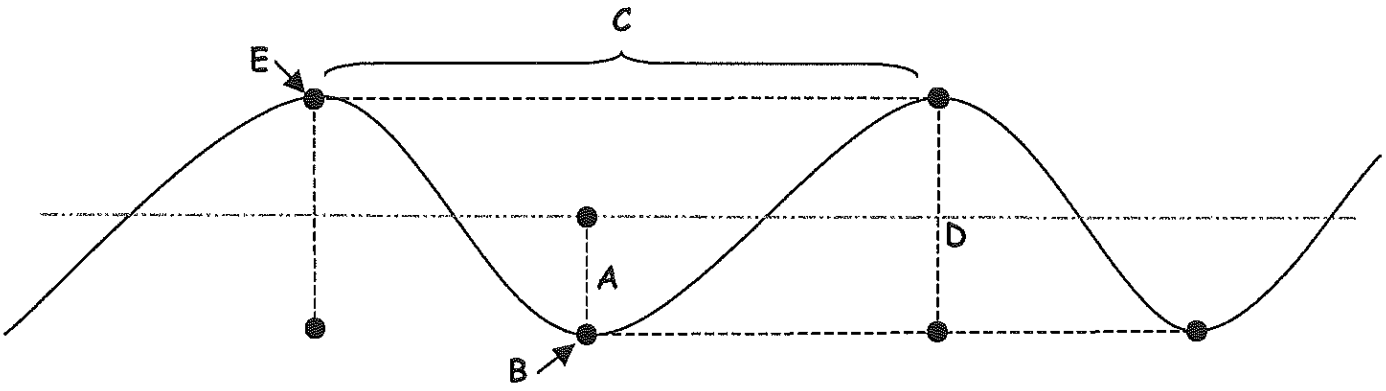
Expert Information: Have you ever wondered what causes water to crash on the beach or why on a cold day the car is warmer inside than out? Why is it called "doing the wave" when everyone at a football or baseball game stands up and sits down one right after the other? The answer is waves. Everywhere around you, there are visible and invisible waves.

Waves are disturbances traveling through matter, called a **medium**. The motion of the wave transfers energy from one place to another. Waves that travel through matter are either transverse or compressional. In a **transverse** wave, matter moves up and down or back and forth in an S-like curve. If you hold one end of a Slinky still while moving the other end back and forth, you create a transverse wave. The **crest** is the highest point of the wave. The **trough** is the lowest point of a wave. The **wavelength** is the horizontal distance from the crest or trough of one wave to the same point on the next wave. **Wave height** is the distance from a crest to a trough. **Amplitude** of a wave is the measurement from the highest or lowest point of a wave to the midline, or normal resting position, of the wave. Light is a special type of transverse wave.

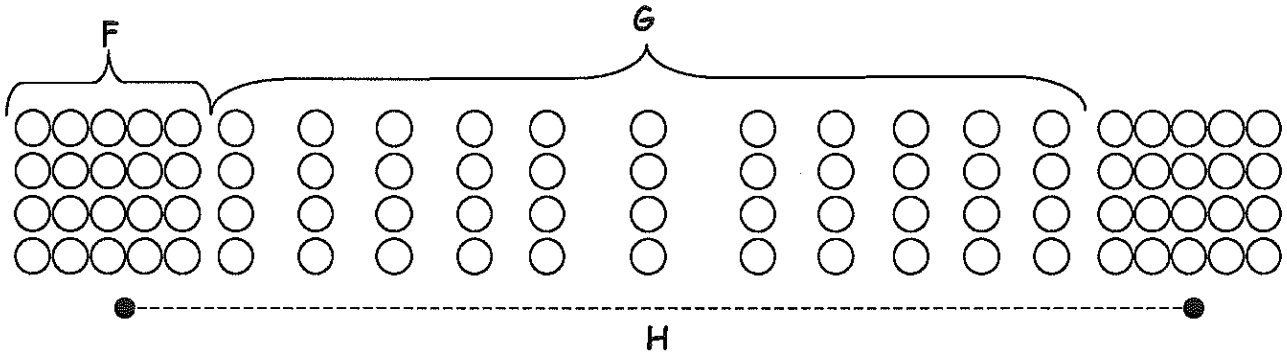
In a **compressional** or longitudinal wave, matter is squeezed or compressed together and then spreads out in the direction the wave travels until it compresses again. If you hold both ends of a Slinky and push one end toward the middle, you create a compressional wave. The matter that is pushed or compressed tightly together is called the **compression**. The area in the wave where the molecules are farther apart is the **rarefaction**. The **wavelength** of a compressional wave is the distance from compression to compression or rarefaction to rarefaction. The **amplitude** of a compressional wave is determined by how tightly the matter in each compression is compacted. The closer the matter is squeezed, the higher the amplitude. Sound is a type of compressional wave.

All waves, regardless of the type, have some characteristics in common. The **speed** of a wave is the distance traveled by a single point on the wave in a given interval of time. The frequency of a wave doesn't refer to an actual part of a wave but a measurement of a wave characteristic. **Frequency** refers to the number of waves that pass a given point within a certain length of time. This is usually described as waves per second, or cycles per second.

Label A-H on the wave diagrams with the correct wave property.



Transverse Wave



Compressional Wave

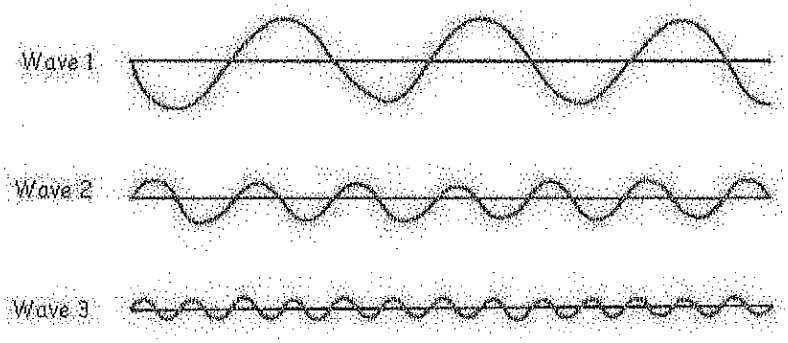
Interpretation (answer all questions in complete sentences)

1. Explain how a transverse wave moves.

2. Explain how a compressional waves moves.

3. What is frequency?

3 Waves are Shown Below



4. Which wave has the biggest amplitude? Explain your answer.

5. Which was has the shortest wavelength? Explain how you determine this.

6. Which wave has the longest wavelength?

Looking at the Waves

All types of light move in wave-like patterns. Scientists also call light electromagnetic radiation. Visible light is only one small portion of a family of waves called electromagnetic (EM) radiation or spetrum. The entire **spectrum** of these EM waves includes **radio waves**, which have very long wavelengths and both **gamma rays** and **cosmic rays**, which are at the other end of the spectrum and have very small wavelengths. Visible light is near the middle of the spectrum. Depending on what type of light you are talking about they all have different wavelengths.

Looking at the Particles

Light not only moves in waves; it also moves with a flow of little particles. Scientists call these particles of light, **photons**. The packets contain the energy that makes up the energy of the light. Scientists measure something called the relative energy of different types of light. The energy increases as the wavelength decreases.