

Name: _____ Date: _____

Answer Key: Making Waves: Advanced 3rd Grade Sound and Light Challenge

Students engineer solutions for communication barriers by synthesizing how vibrations move through solids and how light behaves when hitting mirrored surfaces.

1. If you are designing a secret 'string telephone' to talk to a friend, which material would help the sound waves travel most clearly based on how particles are packed together?

Answer: B) A tight, metal wire

Sound waves travel fastest and most efficiently through solids with closely packed particles. Metal is denser and more rigid than wool or rubber, allowing the vibrations to transfer with less energy loss.

2. Imagine you are in a dark room. You shine a flashlight at a shiny silver trophy. The light bounces off and hits the wall. This 'bouncing' behavior is called _____.

Answer: C) Reflection

Reflection occurs when light waves hit a surface and bounce back rather than passing through or being soaked up. Smooth, shiny surfaces provide the most direct reflection.

3. True or False: If an astronaut claps their hands in the empty vacuum of deep space, another astronaut standing nearby would hear the sound.

Answer: B) False

Sound is a mechanical wave that requires a medium (like air, water, or solid) to travel. Since space is a vacuum with no air particles to vibrate, sound cannot travel there.

4. You place a straw into a glass of water and notice it looks 'broken' or bent at the water line. Why does the light do this?

Answer: C) The light waves slow down and bend as they move from air to water.

This is called refraction. Light travels at different speeds through different materials (media). When it moves from air to the denser water, it changes speed and bends.

5. When a whale sings deep underwater, the sound waves move by bumping water particles into each other. These types of waves are known as _____ waves.

Name: _____ Date: _____

Answer: B) Longitudinal

Sound waves are longitudinal waves, meaning the particles vibrate back and forth in the same direction the wave travels, creating areas of 'squishing' and 'stretching'.

6. True or False: A dark black t-shirt feels warmer in the sun than a white t-shirt because the black fabric absorbs more light energy.

Answer: A) True

Dark colors absorb most of the light waves that hit them, turning that light energy into heat. White reflects most light waves, keeping the wearer cooler.

7. If you want to create a higher pitch on a homemade guitar using rubber bands, what should you do to the band?

Answer: C) Stretch the rubber band tighter so it vibrates faster.

Pitch depends on frequency (how fast things vibrate). A tighter string or band vibrates faster, creating more waves per second, which our ears hear as a higher note.

8. A stained-glass window lets some light through but scatters it so you cannot see clearly through it. Scientists call this material _____.

Answer: C) Translucent

Translucent materials allow some light to pass through but diffuse it, making the images on the other side blurry. Clear glass is transparent, and a brick wall is opaque.

9. How does the amplitude of a sound wave change the way we experience it when listening to music?

Answer: B) It changes the volume from quiet to loud.

Amplitude refers to the height or 'strength' of the wave. Higher amplitude means more energy, which results in a louder volume for sound waves.

10. True or False: Light waves can travel through a glass window, but they cannot travel through a vacuum like sound can.

Answer: B) False

This statement is false because light waves *can* travel through a vacuum (that is how sunlight reaches Earth), while sound waves cannot.

Name: _____ **Date:** _____