Glencoe Science

Chapter Resources

Waves, Sound, and Light

Includes:

Reproducible Student Pages

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Reproducible Student Pages

Reproducible Student Pages

■ Hands-On Activities

■ Meeting Individual Needs

Extension and Intervention

■ Assessment

■ Transparency Activities

Hands-On Activities

TRY AT HOME Mini LAB

Refraction of Light

Procedure

1. Fill a **drinking glass** about half full with drinking water.
2. Place a **pencil** in the glass. Describe the appearance of the pencil.
3. Slowly add water to the glass. Describe how the appearance of the pencil changes.

Observations

Analysis

1. How does the appearance of the pencil depend on the level of water in the glass?

2. Where do the light waves coming from the pencil change speed?

3. **Infer** how the appearance of the pencil and the change in speed of the light waves are related.

Mini LAB

Separating Wavelengths

Procedure

1. Place a **prism** in sunlight. Adjust its position until a color spectrum is produced.
2. Place the prism on a **desktop.** Dim the lights and shine a **flashlight** on the prism. Record your observations.
3. Shine a **laser pointer** toward the prism. Record your observations.

WARNING: *Do not shine the laser pointer into anyone's eyes*

Observations

Observations	
Flashlight on Prism	**Laser Pointer Toward Prism**

Analysis

1. **Determine** whether sunlight and the light emitted from the flashlight contain light waves of more than one wavelength.

2. **Determine** whether the light emitted from the laser pointer contains light waves of more than one wavelength.

Sound Waves in Matter

Lab Preview

Directions: *Answer these questions before you begin the Lab.*

1. What factors affect the speed of sound?

2. What is the order of increasing density of the materials that you are testing?

In this lab you can hear differences in sound when the sound waves travel through various materials.

Real-World Question

How does the movement of sound waves through different materials affect the sounds we hear?

Goals

- **Notice** the variations in sound when waves travel through different materials.
- **Infer** what property of the materials cause the sound waves to produce a different sound.

Materials

150-mL beakers (4)
water
vegetable oil
corn syrup
pencil

Safety Precautions

Procedure

1. Use the data table on the next page for your data.

2. Fill a beaker to the 140-mL line with water. Fill another beaker with 140 mL of vegetable oil. Fill a third beaker with 140 mL of corn syrup. Leave the fourth beaker empty.

3. Hold the pencil securely and tap the side of the beaker about halfway down from its rim. Use the metal band near the end of the pencil to make a clear sound.

4. Pay careful attention to the pitch of the sound. Notice whether the sound continues for a moment after the tap or if it stops suddenly. In your data table, write a description of the sound that you hear.

5. Repeat steps 3 and 4 for the remaining beakers. You may wish to tap each beaker several times to be sure you hear the sound well.

6. **Compare** the sounds made by the beaker filled with air and the beaker filled with the different liquids.

LAB (continued)

Data and Observations

Sound Waves through Materials	
Beaker	
Water	
Vegetable Oil	
Corn Syrup	
Empty	

Conclude and Apply

1. **List** the materials in the beakers in order of increasing density.

2. **Infer** how the pitch of the sound changes as the density of the material in the beaker increases.

3. How does the density of the material in the beaker affect how long the sound continued to be heard after the beaker was tapped?

Communicating Your Data

Compare your results with other students in your class.

Bending Light

Lab Preview

Directions: *Answer these questions before you begin the Lab.*

1. Draw a sketch of a light wave being reflected off a flat surface.

2. Draw a sketch of a light wave being refracted as passes from one medium into another.

What happens to light waves when they strike the boundary between two materials? Some of the light waves might be reflected from the boundary and some of the waves might travel in to the second material. These light waves can change direction and be refracted in the second material. Transmission occurs when the light waves finally pass through the second material.

Real-World Question

What happens to light waves when they strike a boundary between air and other materials?

Goals

- **Compare and contrast** the reflection, refraction, and transmission of light.
- **Observe** how the refraction of white light can produce different colors of light.

Materials

small piece of cardboard	prism
tape	scissors
flashlight	flat mirror
clear plastic CD case	250-mL beaker

Safety Precautions

Procedure

1. Use the data table on the next page to record your observations.

2. Cut a slit about 3 cm long and 2 mm wide in a circular piece of the cardboard. Tape the cardboard to the face of the flashlight to make a mask.

3. In a darkened room, shine the flashlight at an angle toward the mirror. Determine whether the flashlight beam is reflected, refracted, or transmitted. Look at the color of the light beam after it strikes the mirror. Has the white light been changed into different colors of light? Record your observations on the chart.

4. Remove the clear plastic front from an empty CD case. Shine the flashlight at an angle towards the plastic. Does transmission occur? Record your observations about how the direction of the beam changes the colors of the light.

5. Fill the beaker with water. Shine the flashlight toward the side of the beaker so that the light shines through the water. Move the light beam from side to side. Record your observations.

6. Shine the flashlight toward a side of the prism. Move the light beam around until you see the outgoing beam spread into different colors. Record your observations.

LAB (continued)

Data and Observations

Bending of Light by Different Surfaces		
Surface	**How Beam Is Affected**	**Colors Formed**
Mirror		
CD case		
Water		
Prism		

Analyze Your Data

1. For which objects did reflection occur? For which objects did refraction occur? For which objects did transmission occur?

2. For which objects did refraction cause the flashlight beam to be separated into different colors?

Conclude and Apply

1. **Compare and contrast** the behavior of light waves when they strike the mirror and the CD case.

2. **Explain** why the beam that passes through the CD case does or does not change direction.

3. **Describe** how the light beam changes as it passes through the prism.

Communicating Your Data

Create a sketch showing how light refracts in a prism and divides into different colors.

LAB 1 Laboratory Activity

Transverse Waves

You are surrounded by a variety of waves such as visible light waves, sound waves, and radio waves. These waves interact with matter, and waves of the same type interact with each other. You are about to explore two questions. What happens when a wave strikes a boundary between two materials? What happens when two waves traveling in the same material meet?

Strategy

You will use a long rope to observe the behavior of a wave at a boundary. You will observe the behavior of waves that travel from both ends of a long rope and meet in the middle.

Materials

rope, 8–10 meters long

Procedure

1. Make a data table in your Science Journal like the one shown to record your observations. Be sure to leave enough room for your comments.
2. With a partner, lay the rope on the floor and stretch the rope to its full length. Hold one end of the rope still while your partner creates a wave with a single crest or trough by moving their end of the rope horizontally back and forth. Observe the behavior of the wave when it reaches the end of the rope and strikes a boundary—your hand.
3. Using the same procedure as before, create a single crest of a wave in both ends of the rope at the same time. Observe the behavior of the wave when the two crests meet in the center of the rope.
4. Using the same procedure, create a crest at one end of the rope and a trough at the other end of the rope at the same time. Observe the behavior of the wave when the crest and trough meet in the center of the rope.

Data and Observations

Wave Observations

Wave	Observation
Step 2	
Step 3	
Step 4	

Laboratory Activity 1 (continued)

Questions and Conclusions

1. What changes occurred in the wave in step 2 when the wave hit the boundary?

2. Did the wave have the same amount of energy after it hit the boundary? Explain.

3. What happened when the waves met in the center of the rope in steps 3 and 4?

4. Infer why the size of the waves changed when the two waves met in steps 3 and 4.

5. Infer how you can determine the amplitude of the wave created when two waves traveling in opposite directions on the same rope meet.

Strategy Check

_____ Can you describe what happens when a wave strikes a boundary?

_____ Can you describe what happens when two waves traveling in opposite directions on the same rope meet?

LAB 2 Laboratory Activity

Scattering of Light Waves

On a sunny day, you might have seen dust particles in a beam of sunlight. When light waves in the sunbeam strike a dust particle, they are reflected in all directions. This process, in which light traveling in one direction is made to travel in many directions, is called scattering. Sunlight is scattered when it strikes dust particles floating in the air. You see the dust particles as bright specks of light when some of these scattered light waves enter your eyes. Just like dust particles, tiny droplets of water in the air can cause scattering. Also, milk contains tiny particles of milk fat that can cause scattering of light waves.

Strategy

You will use a clear glass beaker, water, whole milk, and a flashlight to observe the scattering of light by particles of milk fat in a beaker of water.
You will record your observations in a data table as more milk is added to the water.

Materials

clear glass 500-mL beaker
50-mL beaker
whole milk
eye dropper
small flashlight
3" x 5" index card (2)
hole punch
distilled water

Procedure

1. Turn off the lights in the room and darken the room. Allow enough light into the room so that you can safely work.
2. Put about 250 mL of distilled water into the 500-mL beaker.
3. Put about 25 mL of whole milk into the 50-mL beaker. This will be used later in the lab.
4. Use a hole punch to make a hole in one of the index cards. Position the hole so that the center of the flashlight goes through the hole when the card is sitting on the lab table.
5. Place the index card with the hole next to the clear beaker of water. Have a lab partner hold the other index card about 30 cm away from the beaker directly opposite the index card with the hole.
6. Turn on the flashlight and hold it against the index card with the hole. Position the flashlight so that the center of the beam goes through the hole in the index card. Observe the image on the index card on the other side of the beaker.
7. Record your observations in your data table.
8. Add ½ dropper of milk to the water in the beaker and stir. Repeat steps 5–7.
9. Repeat step 8 until the water appears to look more like milk than water.

Laboratory Activity 2 (continued)

Data and Observations

Amount of Milk	Observations
No Milk	

Questions and Conclusions

1. What did you observe when the light traveled through the beaker that contained only water?

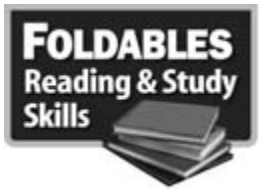
2. What did you observe when the light traveled through the beaker of water as you progressively added more milk?

3. Why did adding more milk to the beaker cause the image on the index card to change?

Strategy Check

_____ Can you describe how a light beam is affected when it travels through a medium that does not contain other particles?

_____ Can you describe how a light beam is affected as it travels through a medium that contains particles of another material?



Waves, Sound, and Light

Directions: *Use this page to label your Foldable at the beginning of the chapter.*

Transverse Waves

Both

Compression Waves

cause particles in matter to move back and forth at right angles to the direction in which the waves travel

are mechanical waves

carry energy from one place to another

cause particles in matter to move back and forth along the same direction in which the wave travels

high points in the waves are called crests

low points in the waves are called troughs

places where the coils are squeezed together are called compressions

places where the coils are spread apart are called rarefactions

have the properties of wavelength, frequency, and amplitude

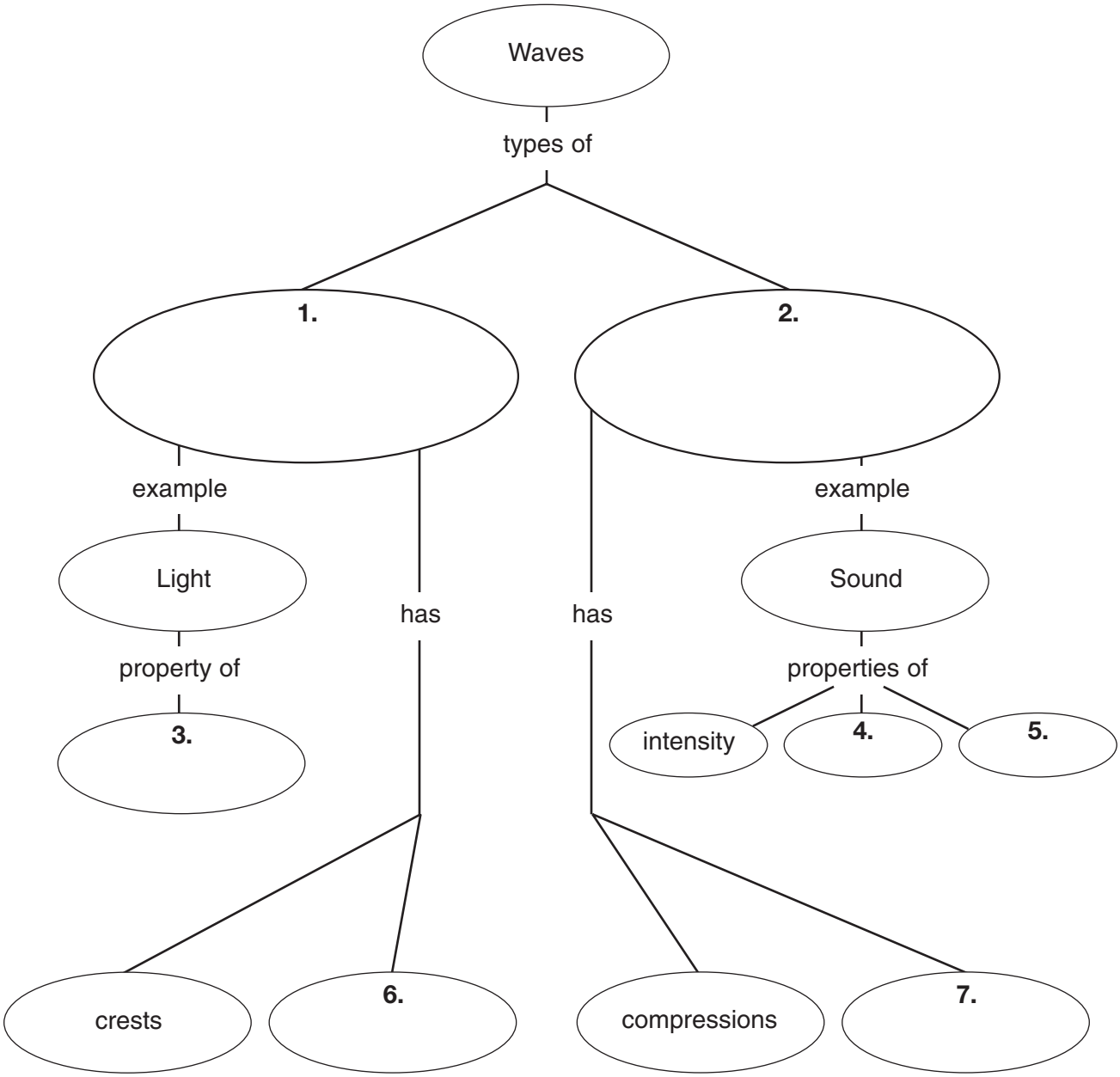
Meeting Individual Needs

Directed Reading for Content Mastery

Overview
Waves, Sound, and Light

Directions: *Complete the concept map using the terms in the list below.*

compressional **transverse** **intensity**
rarefactions **troughs** **pitch**
reverberation



Name Date Class

Directed Reading for Content Mastery

Section 1 ▪ Waves
Section 2 ▪ Sound Waves

Directions: *Match the terms in Column I with the phrases in Column II. Write the letter of the correct phrase in the blank at the left.*

Column I

_____ **1.** wave

_____ **2.** wavelength

_____ **3.** frequency

_____ **4.** refraction

_____ **5.** diffraction

_____ **6.** intensity

_____ **7.** pitch

_____ **8.** reverberation

Column II

a. measured in units called decibels

b. change in direction of a wave when it travels from one material to another

c. transports energy from one place to another

d. how low or high a sound seems

e. measured in units called Hertz

f. repeated echoes

g. bending of waves around objects

h. the distance between one point on a wave and another one like it

9. What is the law of reflection?

10. Describe how a sound travels through air when a student taps his pencil on a desk.

Meeting Individual Needs

Name Date Class

Directed Reading for Content Mastery

Section 3 ▪ Light

Directions: *Use the following terms to complete sentences below.*

electromagnetic waves **electromagnetic spectrum**
infrared waves **ultraviolet waves**

1. Waves that can travel through empty space are _____.
2. The _____ is the complete range of electromagnetic wave frequencies and wavelengths.
3. Waves that have wavelengths between one thousandth and 0.7 millionths of a meter are known as _____.
4. Waves that have wavelengths between about 0.4 millionths and ten billionths of a meter are known as _____.
5. You must protect your skin from _____ because they can damage your skin.
6. All warm bodies emit _____.
7. Night vision goggles use _____ to help locate people in the dark.
8. Visible light waves are part of the _____.
9. All _____ have an electric and magnetic part.
10. The waves emitted by the Sun are _____.

Meeting Individual Needs

Directed Reading for Content Mastery

Key Terms
Waves, Sound, and Light

Directions: *Use the clues below to complete the crossword puzzle.*

Across

1. Carries energy from one place to another

3. How low or high a sound seems

4. The number of wavelengths that pass by a point each second

8. The change in direction of a wave when it travels from one medium to another

10. The bending of a light wave around an object

11. A property of waves that is measured in units called decibels

Down

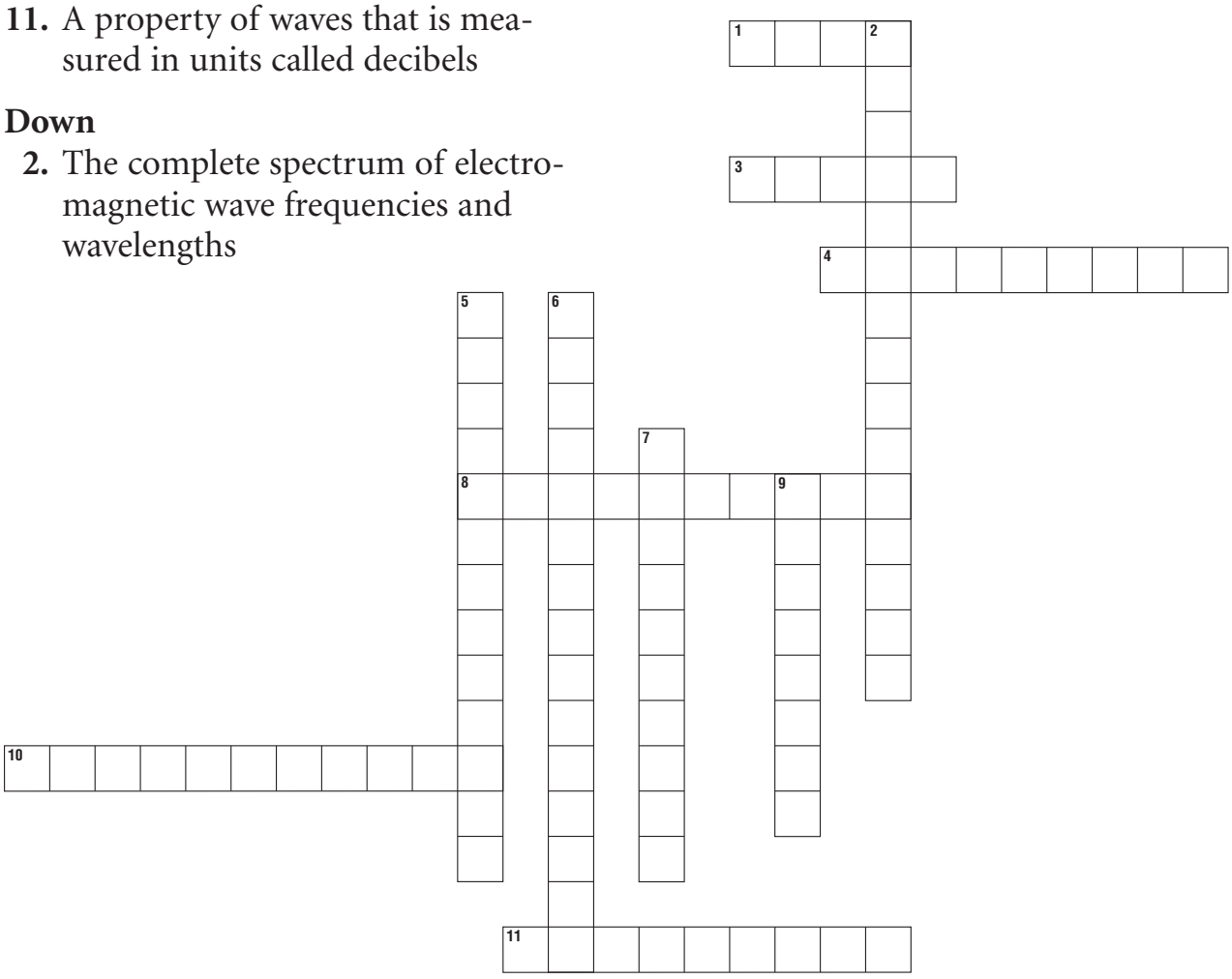
2. The complete spectrum of electromagnetic wave frequencies and wavelengths

5. A series of compressions and rarefactions forms this wave

6. Describes the behavior of waves when they strike a surface

7. The distance between two adjacent crests or between two adjacent troughs

9. A type of wave that is emitted by all warm bodies

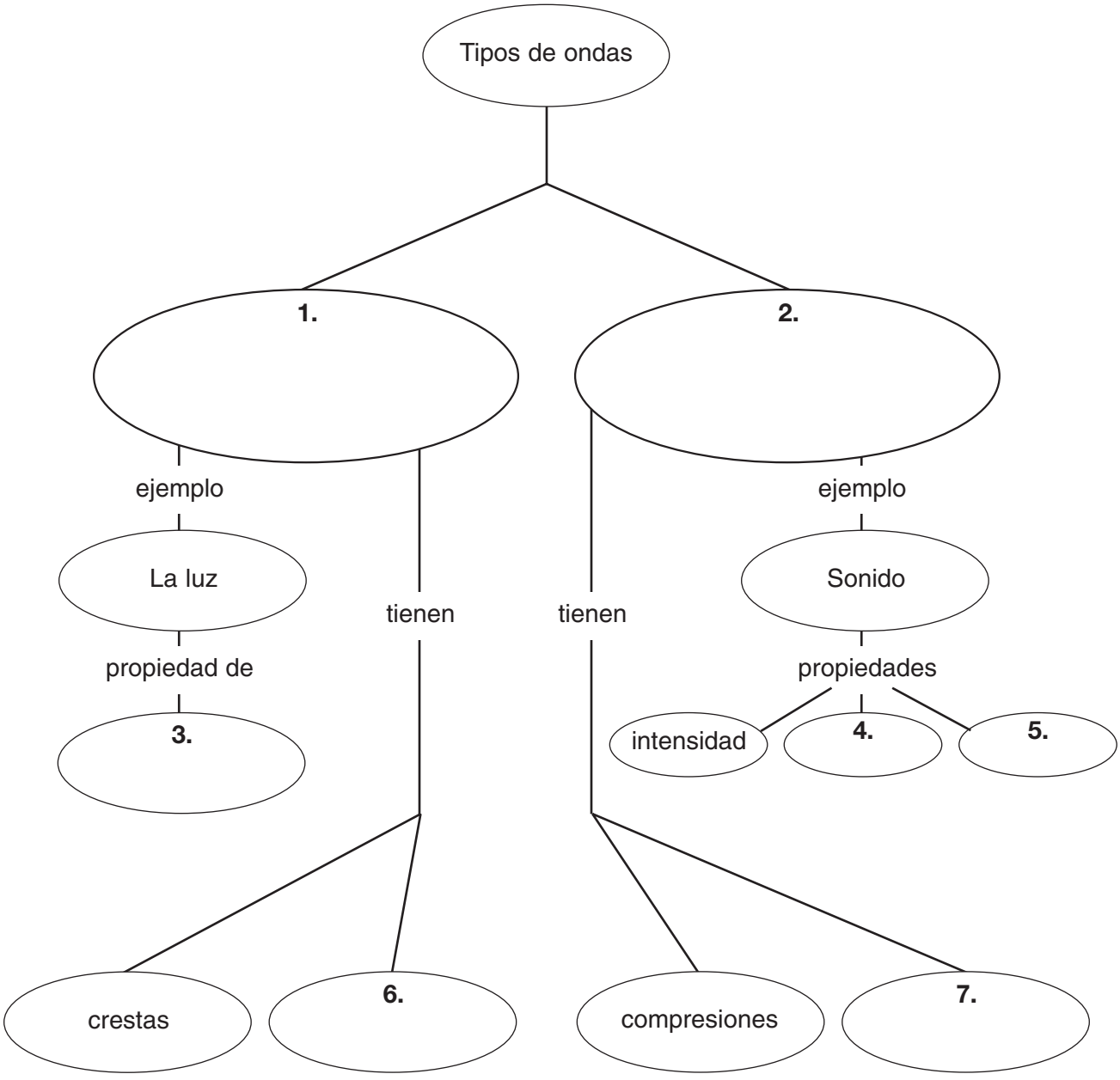


Lectura dirigida para Dominio del contenido

Sinopsis
Las ondas, el sonido y la luz

Instrucciones: *Completa el mapa de conceptos con los términos de la siguiente lista.*

de compresión **transversales** **intensidad**
rarefacciones **senos** **tono**
reverberación



Satisface las necesidades individuales

Lectura dirigida para Dominio del contenido

Sección 1 ▪ Las ondas
Sección 2 ▪ Las ondas sonoras

Instrucciones: *Relaciona los términos de la Columna I con las frases de la Columna II. Escribe la letra de la frase correcta en el espacio en blanco de la izquierda.*

Columna I

_____ **1.** onda

_____ **2.** longitud de onda

_____ **3.** frecuencia

_____ **4.** refracción

_____ **5.** difracción

_____ **6.** intensidad

_____ **7.** tono

_____ **8.** reverberación

Columna II

a. se mide en unidades llamadas decibeles

b. cambio de dirección de una onda cuando se propaga de un material a otro

c. transporta energía de un lugar a otro

d. lo alto o lo bajo de un sonido

e. se mide en unidades llamadas Hertz

f. ecos repetidos

g. doblamiento de las ondas alrededor de los objetos

h. la distancia entre un punto de una onda y otro punto igual en otra onda.

9. ¿Qué es la ley de la reflexión?

10. Describe cómo viaja el sonido por el aire cuando un estudiante golpea su escritorio con un lápiz.

Satisface las necesidades individuales

Lectura dirigida para Dominio del contenido

Sección 3 ▪ La luz

Instrucciones: *Completa las oraciones con los siguientes términos.*

ondas electromagnéticas **espectro electromagnético**
ondas infrarrojas **ondas ultravioleta**

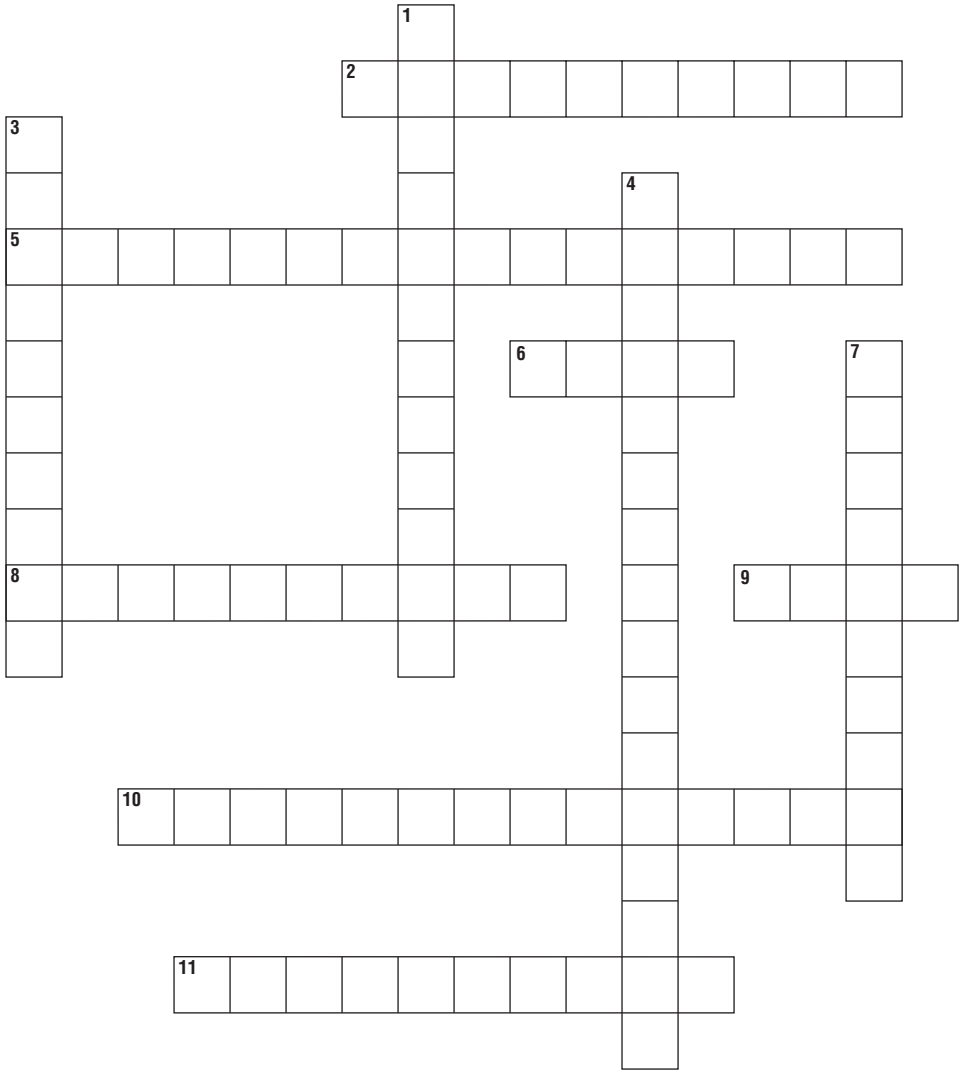
1. Las ondas que se propagan a través de espacios vacíos se llaman _____.
2. El _____ es la gama completa de frecuencias y longitudes de ondas electromagnéticas.
3. Las ondas cuya longitud está comprendida en la gama de un millonésimo a 0.7 millonésimos de metro se llaman _____.
4. Las ondas cuya longitud está comprendida en la gama de 0.4 millonésimos a diez mil millonésimos de metro se llaman _____.
5. Debemos proteger nuestra piel de las _____ porque pueden dañarla.
6. Todos los cuerpos calientes emiten _____.
7. Las _____ se utilizan en las gafas de visión nocturna para localizar personas en la oscuridad.
8. Las ondas de luz visible forman parte del _____.
9. Todas las _____ tienen una parte eléctrica y una magnética.
10. Las ondas emitidas por el Sol son _____.

Satisface las necesidades individuales

Lectura dirigida para Dominio del contenido

Términos claves
Las ondas, el sonido y la luz

Instrucciones: *Completa el crucigrama usando las siguientes pistas.*



Horizontales

2. Cambio en la dirección de una onda cuando se propaga de un medio a otro.

5. El espectro completo de frecuencias y longitudes de ondas electromagnéticas.

6. Transporta energía de un lugar a otro.

8. Tipo de onda que emiten todos los cuerpos calientes.

9. Altura de un sonido.

10. La distancia entre dos crestas o senos adyacentes.

11. Fenómeno por el cual una onda luminosa se dobla alrededor de un objeto.

Verticales

1. Esta onda está compuesta por una serie de compresiones y rarefacciones.

3. La cantidad de longitudes de onda que pasan por un punto cada segundo.

4. Describe el comportamiento de las ondas cuando chocan contra una superficie.

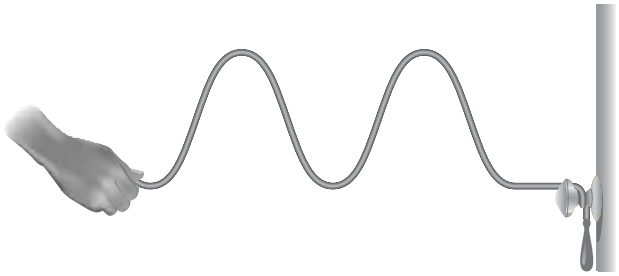
7. Propiedad de las ondas que se mide en unidades llamadas decibeles.

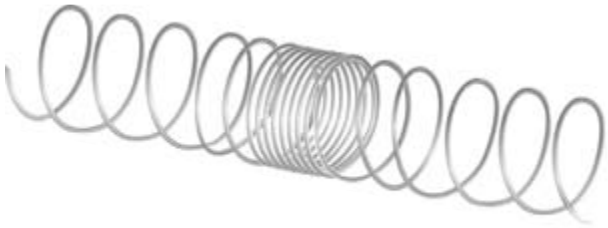
Satisface las necesidades individuales

SECTION 1 Reinforcement

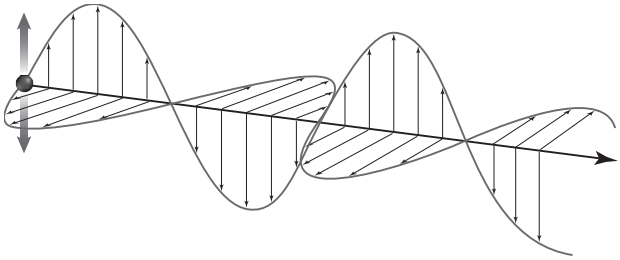
Waves

Directions: *On the line below each diagram, write the type of wave that is shown in the diagram.*





1. _____ **2.** _____



3. _____

Directions: *Answer the following questions on the lines provided.*

4. What is refraction? _____

_____

5. What is reflection? _____

_____

6. What is diffraction? _____

_____

7. What is the mathematical relationship between frequency, wavelength, and wave speed?

_____

Name Date Class

SECTION 2 Reinforcement

Sound Waves

Directions: *Answer the questions on the lines provided.*

1. How does a vibrating drum produce a sound wave?

2. Does sound travel outside Earth's atmosphere in space? Explain.

3. Explain how intensity, sound, and energy are related.

4. What are the three main parts of the human ear and what is the function of each?

5. Explain why sound travels faster through iron than through air.

Meeting Individual Needs

Name Date Class

SECTION 3 Reinforcement

Light

Directions: *Answer the questions on the lines provided.*

1. Compare and contrast light waves and sound waves.

2. Describe the electromagnetic spectrum.

3. What are ultraviolet waves, X-rays, and gamma rays used for?

4. How do the cornea, lens, and retina aid in the vision process?

5. What are rod and cone cells?

Meeting Individual Needs

Name Date Class

SECTION 1 Enrichment

Waves

Materials

pie plate
water
drinking glass
pencil

Procedure

1. Pour water into the pie plate. Fill the pie plate half full.
2. Using the pencil, gently tap the water in the plate to create waves.
3. Put a drinking glass in the center of the pie plate. Put water into the glass if it is not heavy enough to stay upright.
4. Using the pencil, gently tap the water in the pie plate to create waves.

Data and Observations

1. Describe the waves created in **step 2.**

2. Describe the waves in **step 4?**

Conclude and Apply

1. What type of mechanical waves did you create?

2. What was the matter that carried the wave?

3. What happened to the waves when they reached the glass?

Meeting Individual Needs

SECTION 2 Enrichment

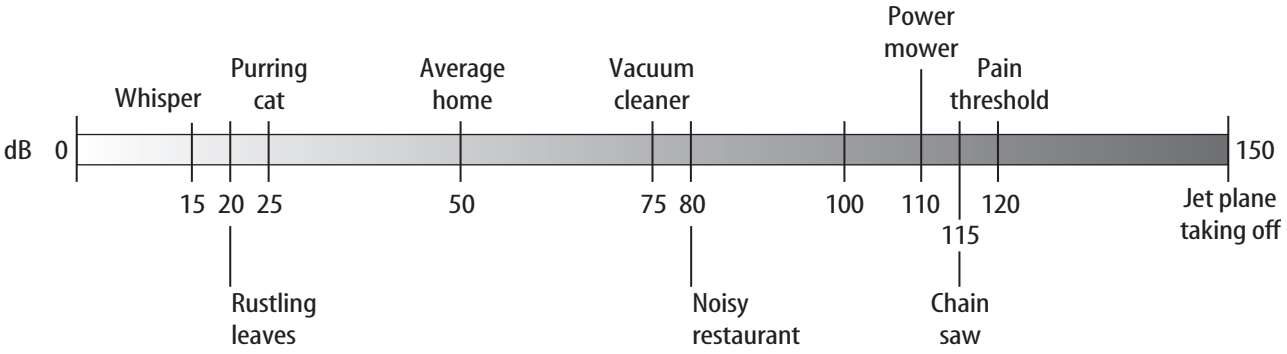
Protect Your Hearing

Noise is part of everyday life whether you live in the city or in the country. Prolonged exposure to noises above 85 decibels can cause permanent hearing loss. Exposure to loud noises can be a result of walking on a busy street, eating in a crowded restaurant, operating machinery, or engaging in recreational activities.

How do you know if the noise is too loud? One rule of thumb is if you cannot hear people talking when you are just a few feet away, the noise may be damaging your hearing. Protect your hearing by decreasing the volume on personal stereos and by wearing hearing protection when you are around loud noises.

You may not be sure if you are exposed to noises above 85 decibels. The list below contains the approximate noise level of some sounds. Plot the sounds on the chart below.

- Rock concert 100–130 decibels
- Power mower 105 decibels
- Motorcycle 90–110 decibels
- Personal stereo at a high volume 105–120 decibels
- Chain saw 110 decibels



1. What activities do you do that may expose you to high noise levels?

2. What can you do to prevent hearing damage or loss while you do your activities?

Meeting Individual Needs

SECTION 3 Enrichment

Lasers

A laser is a device that produces an intense beam of light. The word laser stands for Light Amplification by Stimulated Emission of Radiation. Light that you normally see is a mixture of many colors and many wavelengths. You have probably seen light passing through a prism being divided into many colors. Lasers, though, emit light with a single color or frequency. The light waves travel in the same direction and all of the waves are in phase. *In phase* means that the troughs and crests of all the waves are aligned. If you drew a line perpendicular to the waves, the same point along the wave would be intersected in each of the individual waves. This produces a beam of light that is very intense and can be directed with great accuracy.

Because laser light waves are in phase and are traveling in the same direction, a laser light beam spreads out very little as it travels. As a result a laser beam can be made very narrow so that all the light energy is spread over a very small area. This makes the beam very intense so that it can be used to cut materials.

Lasers are used in a wide variety of applications. Lasers are used to drill holes in diamonds, to measure long and short distances, and to record laser discs. They are used in computer printers, as cutting instruments for delicate eye surgeries, and in many other applications.

1. What does the term *laser* stand for?

2. What does *in phase* mean?

3. Why can laser beams be made very intense?

Name Date Class

Note-taking Worksheet

Waves, Sound, and Light

Section 1 Waves

A. Waves carry _____, not matter.

1. A _____ is a disturbance that moves through matter or space.
2. _____ can travel only through some type of matter. _____ can travel either through matter or through empty space.
3. A _____ causes particles in matter to move back and forth at right angles to the direction in which the wave travels.
4. High points in a transverse wave are called _____. Low points are called _____.
5. A _____ wave causes particles in matter to move back and forth along the same direction in which the wave travels.
6. The places in a compressional wave in which the coils are squeezed together are called _____. The places in the wave in which the coils are spread apart are called _____.
7. The three types of seismic waves are _____, _____, and _____.
8. Electromagnetic waves are _____ waves. Electromagnetic waves contain _____ and _____ parts that vibrate perpendicular to the direction that the wave travels.

B. The properties of waves depend on the _____ that produce the waves.

1. The distance between one point on a wave and the nearest point moving the same speed and direction is the _____. The _____ of a transverse wave is the distance between two adjacent crests or two adjacent troughs. The _____ of a compressional wave is the distance between two adjacent compressions or rarefactions.
2. The _____ of a wave is the number of wavelengths that pass by a point each second. For a transverse wave, the _____ of a wave is the number of crests or troughs that pass a point each second. For a compressional wave, _____ is the number of compressions or rarefactions that pass a point each second.
3. Frequency is measured in units of _____.

Meeting Individual Needs

Note-taking Worksheet (continued)

4. The _____ of a wave depends on the medium in which the wave travels. The speed of a wave can be found using this equation: _____.

C. Waves can _____ (bounce off a surface), _____ (change direction), or _____ (bend around an obstacle).

1. The _____ states that the angle that the incoming wave makes with the normal equals the angle that the outgoing wave makes with the normal. A line that makes an angle of 90 degrees with a surface is called the _____ to the surface.
2. _____ is the change in direction of a wave when it travels from one material to another.
3. _____ is the bending of waves around an object. The amount of diffraction depends on the _____ of the obstacle the wave encounters.

Section 2 Sound Waves

A. A sound wave is a _____ wave.

1. A vibrating drum head produces a _____ each time it moves upward and a _____ each time it moves downward.
2. Sound waves cannot travel through empty space because they need particles to transport _____.

B. Sound waves travel _____ through solids.

C. The amount of energy that a wave carries past a certain area each second is the _____ of the sound.

1. Sound waves with greater _____ also have a greater intensity. The intensity of sound waves is measured in units of _____.

D. _____ is the human perception of the frequency of sound.

1. Sounds with _____ have a low pitch and sounds with _____ have high pitch.

E. The human ear can be divided into _____ parts. The _____ is the sound collector.

1. The _____ is the sound amplifier. The _____ is the sound interpreter.

Note-taking Worksheet (continued)

F. Repeated echoes are called _____.

1. _____ is the process of locating objects by bouncing sounds off them.

Section 3 Light

A. _____ are waves that travel through matter or through empty space.

B. Light waves are composed of two parts—an _____ part and a _____ part.

1. The intensity of waves is a measure of the amount of energy the waves carry. For light waves, the intensity determines the _____ of the light.

C. The _____ is the complete range of electromagnetic wave frequencies and wavelengths.

1. The waves that carry radio and television signals to your home are _____.

2. _____ have wavelengths between one thousandth and 700 billionths of a meter.

3. All _____ bodies emit infrared energy.

4. The range of electromagnetic waves between 700 and 400 billionths of a meter is the range of waves that we see. These waves are known as _____.

5. Electromagnetic waves with wavelengths between about 0.4 millionths and ten billionths of a meter are _____. These waves cause sunburn.

6. The electromagnetic waves with the highest energy, highest frequency, and shortest wavelengths are _____ and _____.

7. Light waves enter your eye through the _____ and lens and then are focused on the _____.

8. You see color when light waves are _____ off an object or _____ by an object.

Assessment

Name Date Class

Chapter Review

Waves, Sound, and Light

Part A. Vocabulary Review

Directions: *Match the terms with the correct phrase below. Write the letter of the correct term in the blank at the left of the phrase.*

a. compressional wave	**b.** diffraction	**c.** electromagnetic spectrum
d. electromagnetic wave	**e.** frequency	**f.** infrared waves
g. intensity	**h.** law of reflection	**i.** pitch
j. refraction	**k.** reverberation	**l.** transverse wave
m. ultraviolet waves	**n.** wave	**o.** wavelength

_____ **1.** the complete range of electromagnetic wave frequencies and wavelengths

_____ **2.** waves with wavelengths between one thousandth and 700 billionths of a meter

_____ **3.** causes particles in matter to move back and forth along the same direction in which the wave travels

_____ **4.** the distance between one point on a wave and the nearest point moving with the same speed and direction

_____ **5.** the angle that the incoming wave makes with the normal equals the angle that the outgoing wave makes with the normal

_____ **6.** the amount of energy that a wave carries past a certain area each second

_____ **7.** the human perception of the frequency of sound

_____ **8.** repeated echoes

_____ **9.** waves with wavelengths between about 0.4 millionths and ten billionths of a meter

_____ **10.** a disturbance that carries energy through matter or space

_____ **11.** causes particles in matter to move back and forth at right angles to the direction in which the wave travels

_____ **12.** waves that can travel through matter or empty space

_____ **13.** the change in direction of a wave when it travels from one material to another

_____ **14.** the bending of a wave around an object

_____ **15.** the number of wavelengths that pass by a point each second

Chapter Review (continued)

Part B. Concept Review

Directions: *Write the name of the type of wave described in the space beside each phrase.*

transverse wave **compressional wave** **electromagnetic wave**

_____ **1.** can travel through matter or empty space

_____ **2.** contains high points called crests

_____ **3.** contains rarefactions in the wave

_____ **4.** contains electric and magnetic parts

_____ **5.** detected by the ear

_____ **6.** detected by the eye

Directions: *Answer the following questions on the lines provided.*

7. Explain the relationship between loudness and sound intensity.

_____

_____

8. What are the three parts of the human ear and what is the function of each part?

_____

_____

_____

9. Explain how humans see color.

_____

_____

_____

Transparency Activities

Name Date Class

SECTION 1 Section Focus Transparency Activity

Waves

Waves carry energy from one place to another. These examples show two types of waves—compression and transverse. Waves such as these need a medium to transfer energy.

1. **What do the waves in this ocean scene and the sound coming from this instrument have in common?**
2. **What other things can you think of that share common properties with ocean waves and sound? What properties do they share?**

Name Date Class

SECTION 2 Section Focus Transparency Activity

Music and Waves

Music is one way people enjoy sound waves. All of these musical instruments and the person singing are producing sound waves to make music. The sound waves travel from the instruments, through the air, and into your ears allowing you to hear the sounds they make.

1. **Look at each of the musical instruments in the photo. How do you think each instrument vibrates air molecules to start a sound wave?**
2. **How does the singer vibrate air molecules to create sound waves? Hint: Put your finger tips on your throat and say a few words. Do you feel something vibrating?**

Name Date Class

SECTION 3 Section Focus Transparency Activity

Electromagnetic Waves

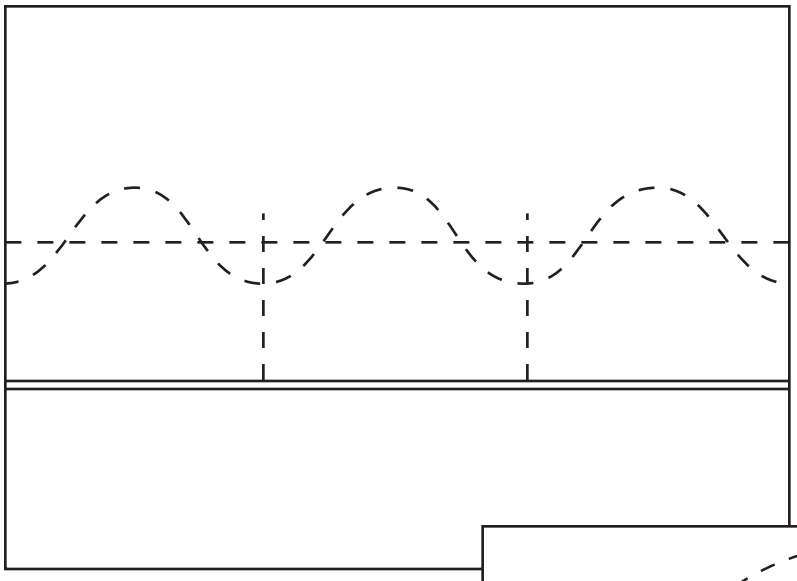
You have electromagnetic waves to thank for seeing these beautiful, vibrant colors on these tropical birds. Only a small part of the electromagnetic spectrum called visible light can be seen by humans.

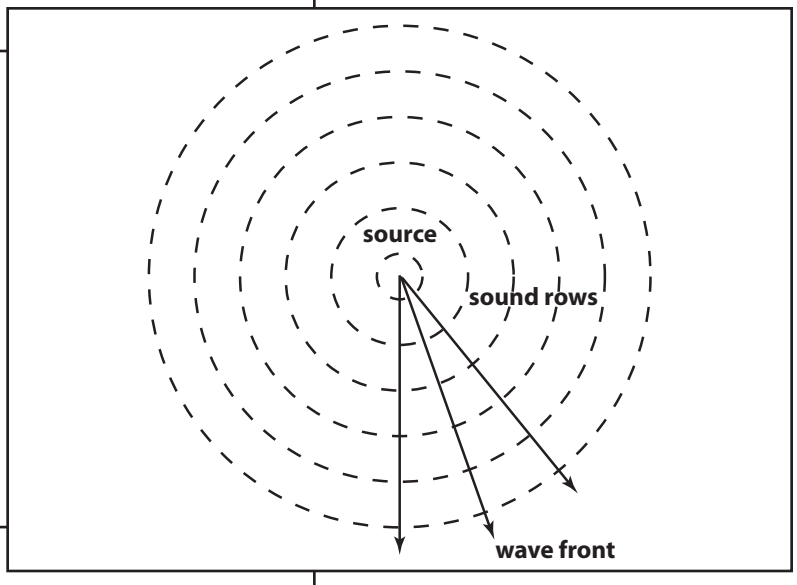
1. **How do you think light waves are used to see these images?**
2. **We use light waves for more than perceiving images. Look closely at the photo and identify the things that are dependent upon light waves.**
3. **Do you know of any other type of electromagnetic waves?**

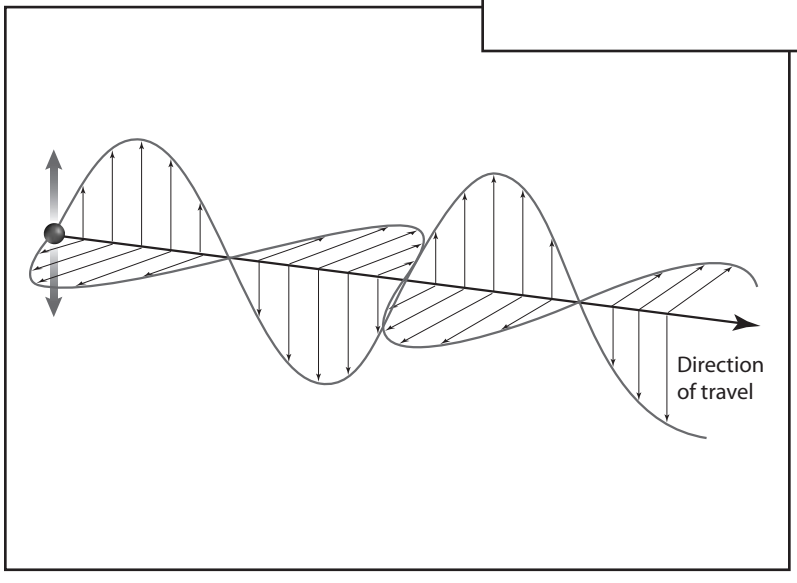
Transparency Activities

SECTION 1 Teaching Transparency Activity

Three Types of Waves







Teaching Transparency Activity (continued)

1. How does a transverse wave transport energy through matter?

2. How does a compressional wave transport energy through matter?

3. Transverse and compressional waves are mechanical waves. What does this mean?

4. What are the two components of an electromagnetic wave?

5. Is an electromagnetic wave a mechanical wave? Explain your answer.

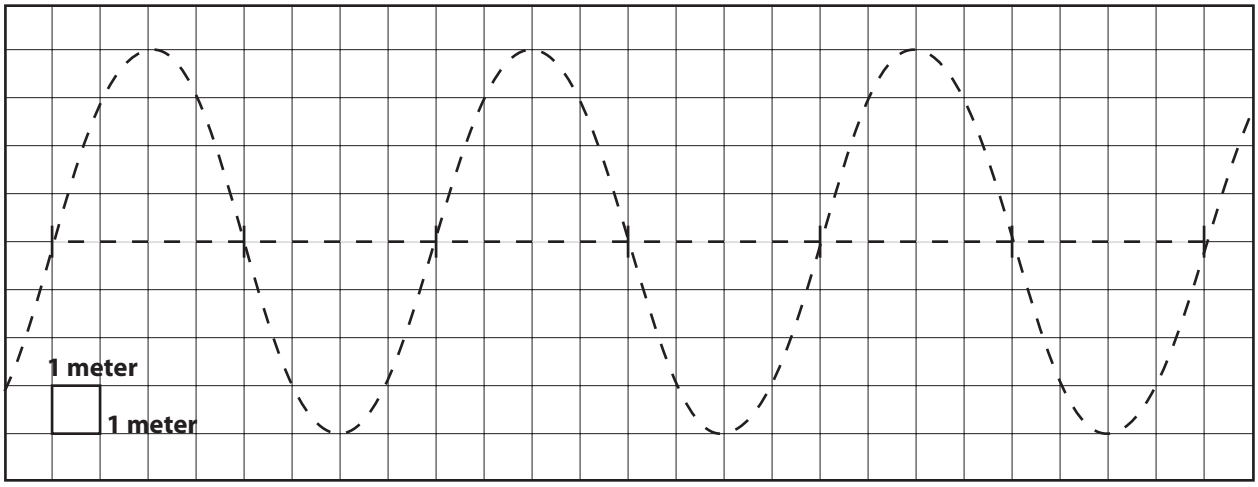
6. How is the wavelength determined for transverse and compression waves?

Name Date Class

Assessment Transparency Activity

Properties of Waves

Directions: *Carefully review the table and answer the following questions.*



1. What type of wave is this?

A compressional
B transverse
C seismic
D rolling

2. What is the amplitude of this wave?

F 1
G 4
H 6
J 8

3. What is the wavelength of this wave?

A 1
B 5
C 10
D 11

4. If this wave travels at a speed of 450 m/s, what is its frequency?

A 5 Hz
B 10 Hz
C 45 Hz
D 4500 Hz