Name: _____ Group: _____ Date: _____

WAVES

STUDENT BOOK | Ch. 4, pp. 92–99

Frequency, wavelength, amplitude and electromagnetic spectrum

1. For each group of two statements, circle the one that is correct.

a) All waves transport energy from one point to another.

b) Only electromagnetic waves transport energy.

c) A transverse wave propagates parallel to its centre motion.

d) A longitudinal wave propagates parallel to its centre motion.

e) Waves (water) are transverse waves since they move from left to right, while the water around them moves up and down.

f) Waves (water) are longitudinal waves since they move from left to right and their centre also moves from left to right.

g) Longitudinal waves and transverse waves are formed of troughs and crests.

h) Transverse waves have crests and troughs, while longitudinal waves have compression zones and rarefaction zones.

2. Identify the wave characteristic to which each statement refers. One statement refers to two characteristics.

A. Amplitude	B. Frequency	C. Wavelength

a) Number of complete waves per second measured in hertz _____

b) Distance between two crests of a transverse wave _____

c) Density of compression zone of a longitudinal wave _____

d) Characteristics used to calculate speed of a wave _____

e) Distance between crest and rest position of a transverse wave _____

f) Complete cycle of longitudinal wave _____

g) Characteristic of waves represented by the Greek letter λ _____

3. Indicate if the waves described below are mechanical or electromagnetic or both.

Description	Mechanical wave	Electromagnetic wave
a) Ripple that modifies the surface of water	☐	☐
b) Vibration caused by an earthquake	☐	☐
c) Wave associated with radiant energy	☐	☐
d) Wave that can move in empty space	☐	☐
e) Sound of a violin	☐	☐
f) Waves of speed varying according to environment	☐	☐

Name: _____ Group: _____ Date: _____

Frequency, wavelength, amplitude and electromagnetic spectrum (*continued*)

4. Place the following electromagnetic waves in ascending order according to:

	a) Frequency (1 to 6)		**b)** Wavelength (1 to 6)
		Ultraviolet rays	
		Visible light	
		Gamma rays	
		Radio waves	
		Infrared rays	
		X-rays	

5. What conclusions can be drawn about the characteristics of electromagnetic waves—that is, their frequency and their wavelength—based on results obtained in the previous exercise? Circle each statement that applies.

a) The two characteristics vary in opposite ways.

b) The two characteristics vary in the same way.

c) The greater the wavelength, the smaller is the frequency.

d) Wavelength and frequency vary proportionally.

6. Complete the crossword puzzle on the next page with answers to the following definitions.

Across

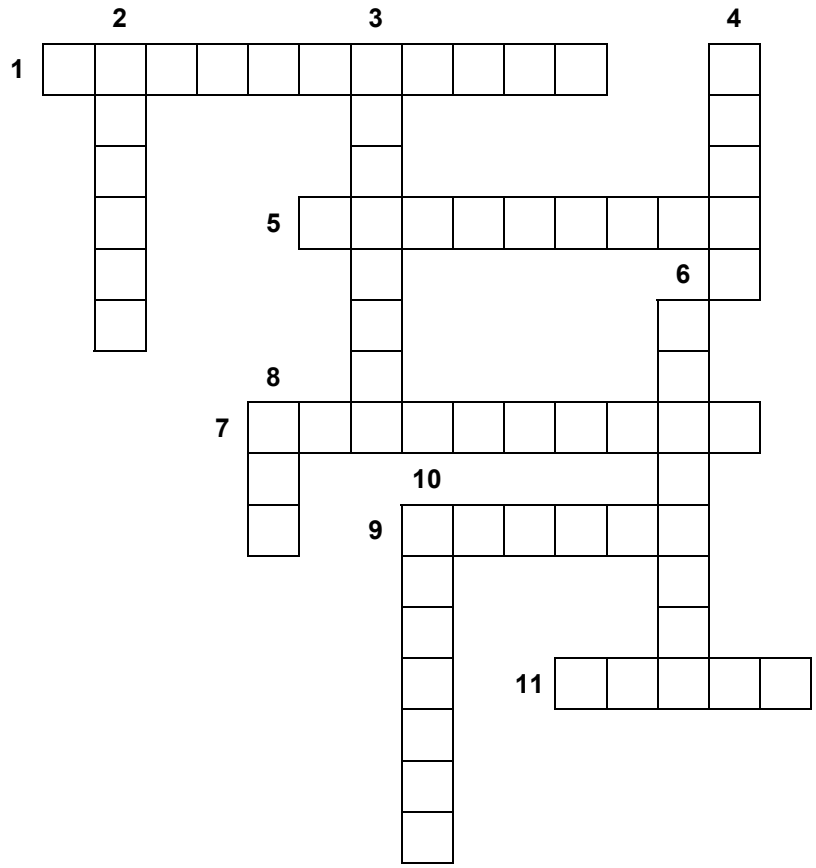
1. Rays invisible to the human eye but visible to certain animals
5. High _____ corresponds to short wavelength.
7. Waves used by radar and cellphones (2 words)
9. Colour of light with the shortest wavelength
11. Rays that carry the most energy and can cause genetic mutations.

Down

2. Characteristic that helps classify electromagnetic waves: wave _____.
3. Invisible rays used in many remote control devices
4. Rays that can pass through a great number of substances.
6. Classification of waves according to their characteristics: electromagnetic _____
8. Colour of light with the lowest frequency
10. Type of electromagnetic wave that can be seen by the human eye: _____ light.

Name: _____ Group: _____ Date: _____

Frequency, wavelength, amplitude and electromagnetic spectrum (*continued*)



Name: _____ Group: _____ Date: _____

WAVES (*continued*)

STUDENT BOOK	Ch. 4, pp. 100–105

Decibel scale

1. Use the following words to complete the sentences below describing a type of wave.

variations	propagate	produce	air	sound
vibration	mechanical	pressure	solid	longitudinal

A _____ wave is a _____ wave. Sound waves _____ in liquid, _____ or gaseous environments. The _____ of an object _____ these waves. In the _____, they propagate by _____ in _____.

2. True or false? If the answer is false, briefly explain why.

a) A 60–dB sound heard at the same time as a 30–dB sound is equal to a 90–dB sound.

_____

b) A 50–dB sound is five times louder than a 10–dB sound.

_____

c) The motor of a space shuttle that produces a 200–dB sound is 100 000 000 times more intense than the motor of a jet, which produces a 120–dB sound.

_____

d) When two 50–dB sounds are heard simultaneously, the intensity perceived is 53 dB.

_____

3. Everyday sounds are perceived by the human ear at varying degrees of intensity according to the decibel scale.

a) Place the following phenomena in ascending order according to sound intensity.

A. A group of teenagers listening to a rock concert
B. Two people speaking normally
C. A person sleeping and breathing
D. A jet taking off
E. A car moving in traffic

_____

b) Identify the sounds that can cause hearing loss.

_____

Name: _____ Group: _____ Date: _____

WAVES (*continued*)

STUDENT BOOK | Ch. 4, pp. 106–116

Deviation of light waves, focal point of a lens

1. Complete the following text.

Light waves are _____ waves, or _____ waves, that can be seen by humans and that propagate in a _____ line. They form _____ and vary in colour from red to _____.They are only a small part of the electromagnetic _____. When meeting an obstacle, light waves can be absorbed or change direction. They can be returned by _____ on contact with a new medium or deviated through _____ by passing from one medium to another.

2. Light can be deviated by reflection or refraction. Identify the deviation that corresponds to each of the following statements.

a) I am the deviation of a light ray when it passes from air to water. _____

b) The deviation of this light ray is put into use with lenses. _____

c) I am a change in direction of a light ray on contact with a new medium and the return to the medium of origin. _____

d) Thanks to this phenomenon, objects that do not emit light can be seen. _____

3. Indicate the type of reflection referred to in each of the following descriptions by placing an X under the corresponding type.

Description	Diffuse reflection	Specular reflection
a) An uneven surface that reflects white light.		
b) The image formed is identical to the reflected object and reversed.		
c) The reflective surface is mercury.		
d) The parallel incident light rays are reflected in parallel.		
e) The virtual image formed is the same size as the object.		
f) The ray reflected is the ray captured by the eye.		
g) Light reflected by a sheet of paper		

Name: _____ Group: _____ Date: _____

Deviation of light waves, focal point of a lens (*continued*)

4. Indicate if the following descriptions refer to a converging lens or a diverging lens.

	Description	Lens
a)	Type of lens used in a magnifying glass	
b)	Lens used to correct presbyopia or hypermetropia	
c)	Lens with two convex surfaces	
d)	Lens used to correct myopia	
e)	Lens with two concave surfaces	

5. For the two following descriptions, identify the one that refers to the focal point of a converging lens and the one that refers to the focal point of a diverging lens.

a) The parallel light rays that pass through the lens are refracted and cross each other at the same point, that is the focal point of the lens. The focal point is located on the other side of the lens where the rays are refracted.

_____

b) The parallel light rays that pass through the lens are deviated by refraction and spread out. They seem to emanate from a virtual point that is the focal point of the lens.

_____

6. What type of lens can be used to correct hypermetropia?

_____

7. What type of lens can be used to correct myopia?

_____