

8c. Define amplitude and tell how it is measured:

9a. There are _____ main types of waves.

- a. fourteen
- b. two

9b. How many main kinds of waves are there? _____

9c. What are the two main types of waves?

- 1. _____
- 2. _____

10a. An example of a transverse wave might be:

- a. light
- b. sound

10b. Give an example of a transverse wave: _____

10c. Draw a transverse wave and give an example: _____

11a. Sound is a _____ wave.

- a. soft
- b. longitudinal

11b. What kind of wave is sound? _____

11c. Draw a longitudinal wave and give an example: _____

12a. If we know the _____ and frequency of a wave, we can tell the wavelength.

- a. speed
- b. weight

- 12b. If we know the speed and frequency of a wave, we can easily figure out the _____.
- 12c. What two properties of a wave do we need to know to figure out a wave's wavelength?
 1. _____
 2. _____
- 13a. Interference of two waves occurs when _____.
 a. go away with each other
 b. they run into each other
- 13b. When two waves join together, it is called _____. There are two types: constructive and destructive.
- 13c. What happens during the two types of wave interference? Identify each.

- 14a. Both light and _____ waves experience interference.
- 14b. What kinds of waves can experience interference?

- 14c. Give an example of the result of both sound and light waves experiencing interference.
 Light: _____
 Sound: _____
- 15a. The _____ effect stretches out and bunches up sound and light waves. An example is a siren getting higher pitched as it comes nearer.
 a. Doppler
 b. Watson
- 15b. The _____ effect causes light and sound waves to compress in front of and spread out behind a moving object.
- 15c. Explain how the Doppler effect works with both sound and light.

- 16a. Compression of sound waves occurs when _____.
 a. particles of matter are pushed together
 b. particles of matter are separated

16b. Sound waves are actually _____ where matter is crowded together as the wave travels through.

- a. rarefactions
- b. frequencies
- c. wavelengths
- d. compressions

16c. What do sound waves actually do to the matter they pass through, and what is this action or area called?

17a. When sound travels through matter, the matter _____.

- a. vibrates
- b. disintegrates

17b. The matter through which sound travels moves in a certain way called a _____.

- a. vibration
- b. gyration

17c. What kind of wave causes matter to vibrate? _____

18a. Musical instruments make _____ when parts of them vibrate.

- a. frequency
- b. sound

18b. Musical instruments make _____ when parts of them vibrate.

18c. How does vibration make music?

19a. Light can travel through a vacuum, but _____ cannot.

- a. sound waves
- b. radio waves

19b. Name a type of wave that cannot travel through a vacuum: _____

19c. Where can sound waves not go? _____

20a. Sound travels through matter called a _____.

- a. small
- b. medium
- c. large

- 20b. The name for the matter through which sound travels is A _____ is .
- 20c. What is a “medium” for waves?

- 21a. Sound goes faster through a _____ than through a liquid.
a. vacuum
b. solid
- 21b. Sound goes slower in a _____ than in a solid.
- 21c. Explain how sound travels through each phase of matter:

- 22a. Sound usually travels through _____ at 340m/s.
a. air
b. wires
- 22b. The speed of sound in air at 20°C is:
a. 20m/hr
b. 8,000km/hr
c. 10 mi/min
d. 340 m/s
- 22c. What is the speed of sound in air at 20°C? _____
- 23a. If you fly at three times the speed of sound, you are going _____ 3.
a. Meters
b. Mach
- 23b. If you are traveling at Mach 3, you are going _____ times the speed of sound.
- 23c. What is your actual speed in m/s if you are going Mach 2? _____
- 24a. When an airplane goes faster than the speed of sound it makes a sound called a sonic _____.
a. boom
b. hedgehog
- 24b. Generally, how fast does an airplane or other vehicle have to travel to make a sonic boom? _____

- 24c. What causes a sonic boom?

- 25a. A few decades ago, people thought we would never “break the sound barrier”, which means to travel faster than the speed of _____.
a. waves
b. sound
- 25b. There is a great increase in air resistance right before a plane “breaks the _____ barrier”.
- 25c. What does it mean to “break the sound barrier”?

- 26a. Sound frequency is measured in cycles/second or _____.
a. volts
b. Hertz
- 26b. The two units for sound frequency are _____.
a. dB and Volts
b. Cycles/sec and Hertz
- 26c. The frequency of sound waves is measured in units called _____ or _____.
- 27a. _____ can hear sounds with frequencies between 20 and 20,000 Hz.
a. Bats
b. Humans
- 27b. Humans can hear sound with frequencies between _____ and 20,000 Hz.
- 27c. What frequency range can humans normally hear? _____ to _____ Hz.
- 28a. With sound, the higher the frequency, the higher the _____.
a. pitch
b. wavelength
- 28b. For sound waves, high _____ means the sound will be high pitched.
a. frequency
b. wavelength
- 28c. Explain the correlation between pitch and frequency:

29a. Loud sounds have _____ amplitude waves.

- a. large
- b. small

29b. High/large amplitude sounds are _____.

- a. loud
- b. quiet
- c. high pitched
- d. low pitched

29c. A high/large amplitude wave would result in _____.

30a. Loud sounds can cause _____ damage.

30b. Loud sounds cause hearing damage because _____.

- a. the ear drum bursts
- b. they injure or wear out the hair cells in the cochlea
- c. brain patterns cannot accept wave overload

30c. How do loud sounds damage hearing?

31a. Resonance is when sound waves cause objects, like the body of a violin, to _____ at the same frequency as the sound waves do.

- a. vibrate
- b. freeze

31b. _____ is when objects vibrate in response to sound waves traveling through them. An example is when a glass breaks if you play just the right note on a flute.

- a. Interference
- b. Resonance
- c. Dissonance
- d. Crystallization

31c. What sound property causes a glass to break when someone plays just the right note, and why does it break?

The following Colorado Model Content Standards are addressed in this assessment by the questions indicated:


All questions: Standard 2. Physical Science: Students know and understand common properties, forms, and changes in matter and energy.

Questions 1a, 1b, 1c, 2a, 2b, 2c, 19a, 19b, 19c: Standard 4. Earth and Space Science: Students know and understand the processes and interactions of Earth's systems and the structure and dynamics of Earth and other objects in space.

Questions 23a, 23b, 23c, 24a, 24b, 24c, 25a, 25b, 25c: Standard 5. Students know and understand interrelationships among science, technology, and human activity and how they can affect the world.

Questions 18a, 18b, 18c, 27a, 27b, 27c, 30a, 30b, 30c: Standard 6. Students understand that science involves a particular way of knowing and understand common connections among scientific disciplines.

Answer Key

- 1a. b. energy
1b. energy
1c. energy, matter
- 2a. a. their original place
2b. it goes back to where it came from
2c. Acceptable answers could include:
-particles that are sitting in one place before a wave comes by will move in a circle as a transverse wave goes through, and back and forth as a longitudinal wave goes by
-after the wave is gone, the particles go back to their original positions
- 3a. Wavelength
3b. measure from any point on a wave to the exact same point on the next wave
3c. Drawings will vary. See answer to number 3b for specifics.
- 4a. b. frequency
4b. any variation of “how many”
4c. a. 
- 5a. Wave speed
5b. b. speeds
5c. Acceptable answers could include:
-how fast a wave is going, or how much distance a wave covers in a certain amount of time
- 6a. a. crest
6b. The very top
6c. Drawings will vary, but the crest needs to be the highest point of any wave
- 7a. b. bottom
7b. trough
7c. Drawings will vary, but the label of trough needs to be at the lowest point.
- 8a. a. tall
8b. Amplitude
8c. Acceptable answers could include:
-amplitude is the height of a crest of a wave or the depth of a trough
-from the midline to a crest or from the midline to a trough
- 9a. b. two
9b. Two
9c. longitudinal, transverse

- 10a. a. light
- 10b. Light, any other EM waves
- 10c. Drawings should be some kind of traditional up and down curve wave. Examples can include light or any other EM wave.
- 11a. b. longitudinal
- 11b. longitudinal
- 11c. Drawings should show compressions and rarefactions. Example can include sound or any other kind of mechanical wave, like p waves for an earthquake.
- 12a. a. speed
- 12b. wavelength
- 12c. speed, frequency
- 13a. b. they run into each other
- 13b. interference
- 13c. Acceptable answers could include:
 -Constructive interference results in a wave that is larger than either of the component waves alone.
 -Destructive interference results in a wave that is smaller than either of the component waves alone.
- 14a. sound
- 14b. both light and sound, or both longitudinal and transverse
- 14c. Examples will vary widely according to reading, class discussion and life experience. May include dark spots, light spots, loud spots, quiet spots.
- 15a. a. Doppler
- 15b. Doppler
- 15c. Acceptable answers could include:
 -The Doppler effect bunches together sound and/or light waves in front of a moving object, and stretches them out behind. The effects are that sounds become higher pitched in front of moving objects, and lower pitched behind them. The light shifts towards the blue end of the spectrum in front of and towards the red end behind moving objects.
- 16a. a. particles of matter are pushed together
- 16b. d. compressions
- 16c. Acceptable answers could include:
 -Sound waves compress the matter they pass through- called compressions.
- 17a. a. vibrates
- 17b. a. vibrates
- 17c. longitudinal or sound
- 18a. b. sound
- 18b. sound/noise

- 18c. Acceptable answers could include:
-When musical instruments are played, specific parts of them vibrate at certain frequencies, which make music.
- 19a. a. sound waves
19b. sound/longitudinal/mechanical
19c. Acceptable answers could include:
-where there is no matter through which to travel/space/vacuum
- 20a. b. medium
20b. medium
20c. Acceptable answers could include:
-the matter through which the wave travels
- 21a. b. solid
21b. liquid/gas
21c. Acceptable answers could include:
-Sound passes fastest through a solid and slowest through a gas.
- 22a. a. air
22b. d. 340 m/s
22c. 340 m/s or 1,129 feet/sec, etc.
- 23a. b. Mach
23b. three
23c. 680m/s
- 24a. a. boom
24b. just over the speed of sound
24c. Acceptable answers could include:
-When a vehicle or object travels at or above the speed of sound, the sound waves bunch up in front of it so much that they add together (constructive interference) to make one very high amplitude wave (a very loud sound)
- 25a. b. sound
25b. sound
25c. Go faster than the speed of sound
- 26a. b. Hertz
26b. b. Cycles/sec and Hertz
26c. Cycles/sec, Hertz (Hz)
- 27a. b. Humans
27b. 20
27c. 20, 20000 Hz

- 28a. a. pitch
- 28b. a. frequency
- 28c. Acceptable answers could include:
-the higher the frequency, the higher the pitch
- 29a. a. large
- 29b. a. loud
- 29c. a loud sound
- 30a. hearing
- 30b. b. they injure or wear out the hair cells in the cochlea
- 30c. Acceptable answers could include:
-they injure or wear out the hair cells in the cochlea
- 31a. a. vibrate
- 31b. b. Resonance
- 31c. Acceptable answers could include:
-Resonance
-Every object vibrates at a certain specific frequency of its own. When a note is played that matches this frequency, the vibration of the glass gets stronger (higher amplitude) until the glass can no longer withstand the large vibrations, so it breaks.