Sound Under Test

Use controlled tests to connect sound waves with loudness and pitch.

P.8.6.4 "Use scientific processes to plan and conduct controlled investigations to conclude sound is a wave phenomenon that is characterized by amplitude and frequency."

NAME _____ DATE _____

1 READ AND MARK

Read it twice

YOUR JOB Underline what students change in each test, circle what they keep the same, and number the observations that support their conclusions. These marks will help you trace how each test links a wave measurement to a sound you hear.

Two Tests, Two Sounds

1. A speaker in the science lab plays a steady tone while a microphone records the sound. Recording software displays a repeating wave pattern from the microphone signal. Each repeated shape represents a cycle. The height of the pattern from its center line shows amplitude, and the number of cycles each second gives frequency, measured in hertz (Hz). To test one cause at a time, the class keeps the same speaker, microphone, room, and distance between them. They also record each setting three times to check whether results are consistent.

2. For the first test, students set the tone generator to 300 Hz and keep that setting fixed. They play the tone at a low speaker output setting, then at a higher one. The microphone stays in the same place. At the higher setting, the recorded pattern rises farther above and below its center line, but the cycles are the same distance apart. Students hear a louder sound, not a higher pitch. Because frequency and distance stayed fixed, the change in loudness matches a change in wave amplitude.

3. Next, students return to one speaker output setting and compare tones of 300 Hz and 600 Hz. They again keep the microphone in place. In equal time windows, the 600 Hz recording contains twice as many cycles as the 300 Hz recording. Its pattern has about the same height, but students hear a higher pitch. The repeated results link pitch to frequency rather than amplitude. Together, the two tests show that sound travels as a wave with measurable amplitude and frequency, and changing one can produce a different effect from changing the other.

2 ANSWER WITH EVIDENCE

Use the passage

1. In the first test, what did students change? Name two conditions they kept the same.

2. What evidence from the first recording supports a change in amplitude rather than frequency?

3. In the second test, which observation shows that frequency increased? How did the sound change?

4. How did keeping the speaker output setting and microphone position the same strengthen the second test's conclusion?

3 YOUR TURN

Your own words

Design a controlled test using a guitar string and a microphone recording to find out whether increasing string tension changes sound frequency. In 4 to 5 sentences, state what you would change, two conditions you would keep the same, what you would measure, and what result would support your conclusion.

ANSWER KEY

Sound Under Test

PART 1 · READ AND MARK

Underline what students change in each test, circle what they keep the same, and number the observations that support their conclusions. These marks will help you trace how each test links a wave measurement to a sound you hear. Accept any marking that follows this job and points at the right text.

PART 2 · ANSWERS

#	QUESTION	ANSWER
1	In the first test, what did students change? Name two conditions they kept the same.	**They changed the speaker output setting. They kept the tone at 300 Hz and the microphone in the same place.**
2	What evidence from the first recording supports a change in amplitude rather than frequency?	**The pattern rose farther above and below its center line, but the cycles stayed the same distance apart.**
3	In the second test, which observation shows that frequency increased? How did the sound change?	**The 600 Hz recording had twice as many cycles in the same time window, and students heard a higher pitch.**
4	How did keeping the speaker output setting and microphone position the same strengthen the second test's conclusion?	**It reduced other possible causes of a change in the recording. The higher pitch could be linked to the increase in cycles per second.**

PART 3 · YOUR TURN (SAMPLE ANSWER)

I would tighten one guitar string with its tuning peg, recording the sound before and after the change. I would pluck it at the same spot with similar force and keep the microphone the same distance away. I would count cycles in equal time windows of the two recordings and repeat each recording three times. If the tighter string produces more cycles per second and a higher pitch each time, I would conclude that increased tension raised the sound wave's frequency.

Accept other reasonable controlled conditions, such as using the same string and recording software. The proposed measurement must compare frequency, such as cycles counted in equal time windows.