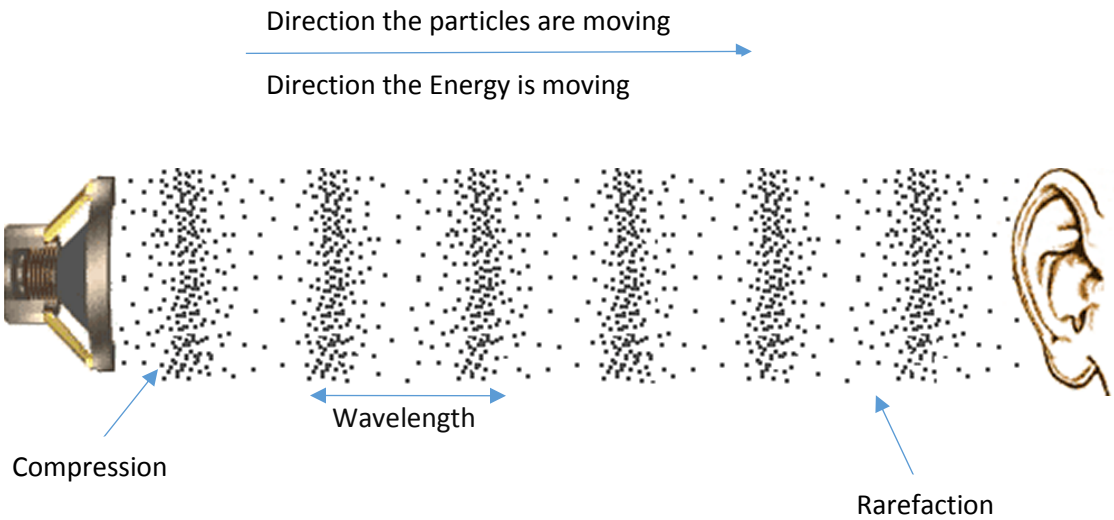
Answers

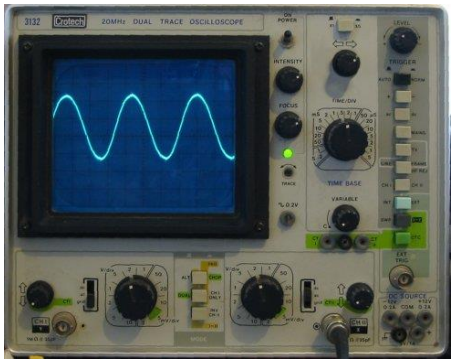
Sound-Chapter 18- Section 1 Questions

1. Sound is the disturbance that travels through a medium. Sound waves are longitudinal waves.
2. To make sound waves you have to have a vibration and a medium for the particles to travel through.

3.



4. An oscilloscope is used to convert sound waves (longitudinal wave) to transverse wave images.



5. Sound waves and light waves differ!
   a. **Sound waves travel as longitudinal waves and light waves travel as transverse waves.**
   b. Sound waves need a medium to travel through and they have compressions and rarefactions.

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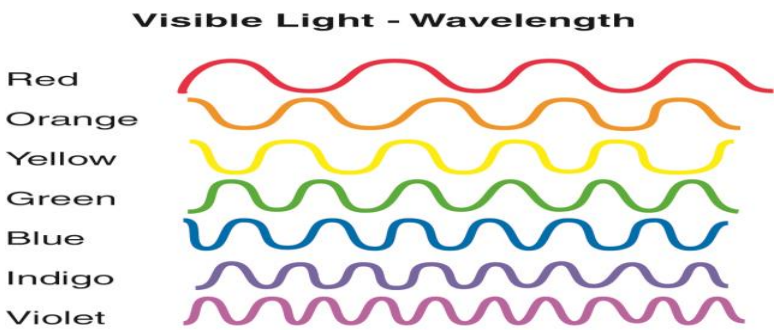
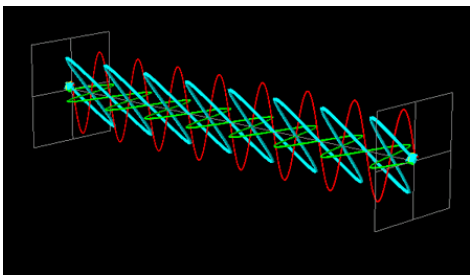
c. Light waves do not need a medium to travel through and light waves do not have compressions or rarefactions; they have crests and troughs.

d. Sound waves travel much slower than light waves. Sound waves only travel 1,088 feet per second and light waves travel 186,000 miles per second.

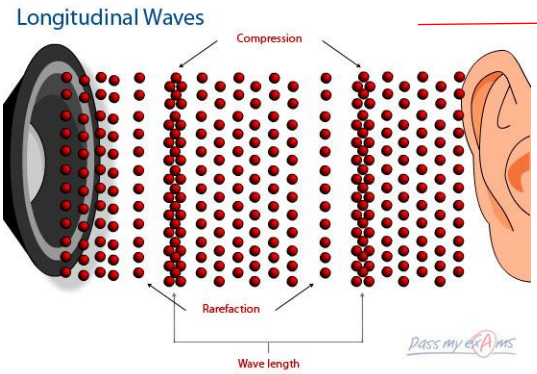
6. See diagrams below to view how light travels: Light travels as a transverse wave!





7. No! The particles do not move with the energy! The particles or molecules vibrate and the molecules go back to their original position. The particles of matter nor the medium move along with the energy as the sound wave travels through it. Sound causes the medium or matter to vibrate.

8.



Energy moves in the same direction as the wave. The energy moves through the medium.

9. Sound can travel through anything except a vacuum or empty space. Sound can travel through air, water, steel, glass, liquids, solids and gases. Sound travels fastest through solids.

10. Sound does not travel through empty space or a vacuum. Sound does not travel when there is no disturbance or vibration. Sound always needs a medium to travel through, without a medium there is no sound. In deep space there is a lack of matter (no medium) thus, sound does not travel in space. If you remove air from a container, it would no longer be able to transport sound waves. There would be no sound if two waves interfered with

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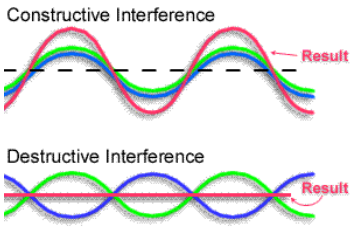
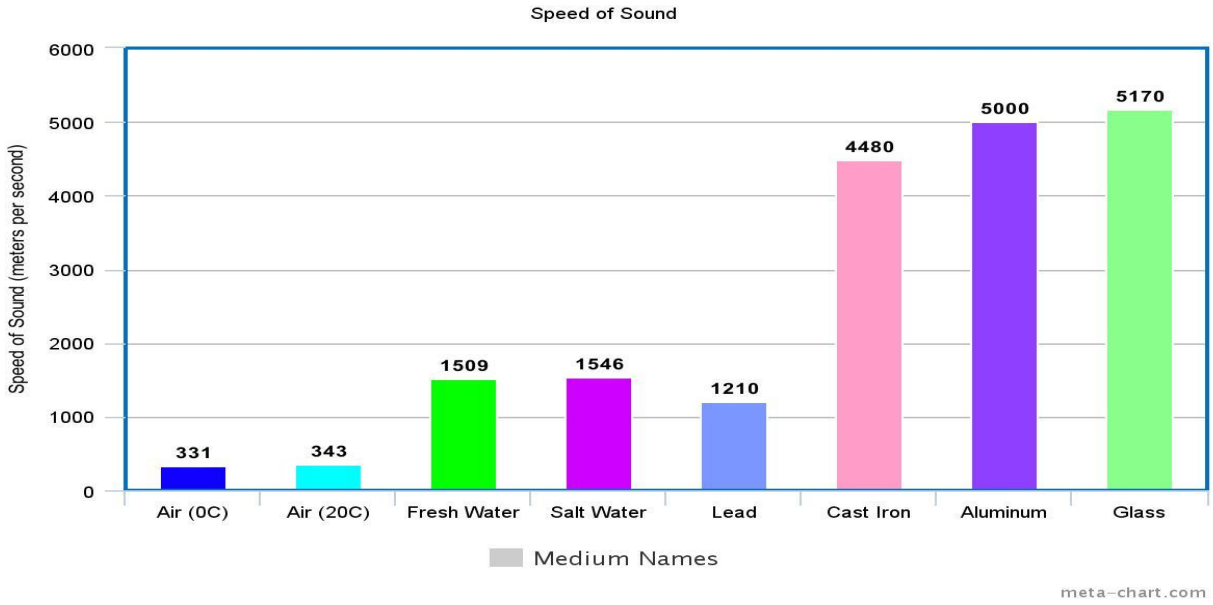
one another and cancelled each other out (destructive interference). No sound if absolute zero is the temperature.



11. No! Sound does not always travel at the same speed! In general, sound travels fastest through solids, then liquids, then gases. The speed at which sound travels depends upon the medium it is travelling through.

12.



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13. In most cases, sound travels fastest through solids (Lead is an exception).

14. In general, about how many times faster does sound travel in solids compared to liquids?
    a. **SOUND TRAVELS ABOUT 3 TIMES FASTER IN SOLIDS COMPARED TO LIQUIDS**

15. In general, about how many times faster does sound travel in solids compared to air?
    a. **SOUND TRAVELS ABOUT 15 TIMES FASTER IN SOLIDS COMPARED TO AIR**

16. About how many times faster does sound travel in water compared to air?
    a. **SOUND TRAVELS ABOUT 4.5 TIMES FASTER IN WATER COMPARED TO AIR.**

Look closely at your graph. What seems to be an anomaly (something that is out of the ordinary, seems strange to you or stands out) or what surprises you?

    b. **IN MOST CASES, SOUND TRAVELS FASTER IN SOLIDS COMPARED TO WATER. BUT IN THE CASE OF LEAD, WHICH IS A SOLID, SOUND TRAVELS SLOWER THAN IN WATER. LEAD IS SO DENSE IT AFFECTS ITS ELASTICITY. THE MOLECULES DO NOT BOUNCE BACK EASY ENOUGH TO TRANSFER THE ENERGY.**

17. Sound waves travel faster in solids than gases because the particles of solids are closer together and can quickly pass the energy of vibrations to the nearby particles.

18. Explain why AT&T uses fiber optic cables (tiny glass strands) to transmit sound data and other data into your home for your television and computer. Look at **page 708** for a picture of optical fibers.

    a. **AS YOU CAN TELL BY THE GRAPH, SOUND TRAVELS VERY FAST IN GLASS. SOUND TRAVELS FASTER IN GLASS THAN IT DOES IN COPPER (COPPER USED TO BE USED TO TRANSMIT THE DATA). CUSTOMERS WANT DATA TO ARRIVE QUICKLY INTO THEIR HOMES FOR their COMPUTERS AND TELEVISIONS. The molecules in glass are more elastic.**

19. Does sound travel faster through warm air or cold air? Explain your answer.
    a. **Sound travels faster in warm air. In warm air sound travels at 343 m/s and in cold air sound travels at 331 m/s. Warm air is more elastic than cold air. Molecules can transfer energy faster because molecules move back easier. When matter is heated it causes molecules to move faster.**

20. The speed at which sound travels depends on what three things?
    a. **The speed at which sound travels, depends on:**
        i. **How elastic the medium is**
        ii. **How dense the medium is**
        iii. **The temperature of the medium**

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21. Look at the graph on page 647. According to the graph, what happens to the speed of sound as the temperature increases?

a. **As the temperature increases, the speed of sound also increases. (Direct correlation)**

22. Explain why a change in air temperature would affect the speed at which sound travels.

a. **In dry air, the speed of sound changes as the temperature changes. Particles move more slowly in colder temperatures. The molecules move and bounce back easier (more elasticity) in warmer temperatures. (When you add heat to something, the molecules move faster.)** Sound has a slower speed at lower (colder) temperatures. A lower temperature means that particles of the medium are moving more slowly, so it takes them longer to transfer the energy of the sound waves.

23. What is elasticity?

a. Elasticity is the ability of a material to bounce back after being disturbed. Warm air is more elastic than cold air. A rubber band has more elasticity than rope or a piece of wool yarn.

24. Why do you think sound travels faster in mediums that are high in elasticity?

a. Mediums with more elasticity help sound travel faster because the molecules move easier and quicker, allowing energy to be transferred to the next molecule quicker.

25. Chuck Yeager was the first person to break the sound barrier. How did he do this? Explain with detail.

a. Chuck Yeager flew his plane to an altitude higher than 12,000 meters where the air temperature is -59 degrees Celsius. At high altitudes, where the air is colder, the sound travels slower. By flying in colder air, it was easier for him to break the sound barrier. Chuck Yeager accelerated his plane to 312 m/s. The speed of sound was 293 m/s at 12,000 meters. He broke the speed of sound!

Extra

If the material is in the same state of matter, what happens to the speed of sound as the density increases?

In most cases, sound travels fastest in solids, then liquids, then gases. But …....

For solids……..in most cases, sound travels faster in less dense solids
For liquids…….in most cases, sound travels faster in less dense liquids
For gases…….in most cases, sound travels faster in less dense gases

Answers

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