

**Short Answer: Please use the following in all responses:**

- \_\_\_ I proof read my response to make sure that I answered the question!
- \_\_\_ I began each sentence with a capital letter, and ended with a period!
- \_\_\_ I wrote in complete sentences!
- \_\_\_ I proof read my answer to make sure that it made sense!
- \_\_\_ I underlined the required terms used in my answers!

**1. Compare and contrast a mechanical and electromagnetic wave.** (*energy, medium, vacuum, force, disturbance*)

**Both mechanical and EM waves carry energy. They are caused by a force or disturbance. The difference is that an EM wave does not require a medium to travel and can travel through a vacuum or empty space while a mechanical wave requires a medium to travel. Another difference is that energy in an EM wave is determined by the frequency, and energy in a mechanical wave is determined by the amplitude.**

**2. What is the relationship between amplitude and energy in a mechanical wave?** (*energy, amplitude*)

**Bonus: Why does this not apply to an EM wave?**

**The relationship between energy and amplitude in a mechanical wave is the higher the amplitude, the higher the energy and vice versa. This does not apply to an EM wave because an EM wave's energy is determined by its frequency and that it how it is ordered on the spectrum.**

**3. What is the relationship between frequency and wavelength?** (*wavelength, frequency, increase, decrease*)

**The relationship between frequency and wavelength is with an increase in frequency there is a decrease in wavelength and with a decrease in frequency there is an increase in wavelength. This is an inverse relationship.**

**4. Explain how we see colors such as grass green and a red fire truck? In your answer you must also explain what is happening when we see black and white colored objects.** (*Color, absorb, reflect, visible light, wavelengths, primary colors of light*) **We can see colors such as grass green and a red fire truck because we see the visible light portion of the EM Spectrum. Visible light includes the colors of the rainbow. The fire truck appears red because the red color wavelengths are being reflected to our eyes. All the other color wavelengths are being absorbed and converted into heat. The primary colors of light, red, green and blue will combine to form white light.**

**We an object appears black, it is absorbing all color wavelengths and converting them into heat. No colors are being reflected.**

**When an object appears white it is reflecting all color wavelengths. No wavelengths are absorbed. When you combine the three primary colors of light you get white.**

## Multiple Choice Questions

1. Sound waves, water waves, and the waves made by a rope are all examples of *mechanical waves*
2. In a longitudinal wave, energy travels *parallel to the medium or in the same direction as the force*
3. When a wave hits a barrier and cannot pass through it, the reaction force causes *reflection*
4. Refraction occurs because waves enter *a different medium (like glass through a lens)*
5. Give an example of diffraction? *Example: water waves moving around a barrier.*
6. If the crests of two waves join up exactly, their energy *& amplitude double (constructive interference).*
7. Forces can cause waves by *creating a disturbance.*
8. At the beach, Paula measures how many wave crests reach the shore in a given time. She is finding the wave's *frequency*
9. Martin wants to know the wavelength of the wave made when he dips his finger into a pond. What should he measure? *The distance from wave crest to the next.*
10. Will shouts "Hello!" in a canyon. The sound bounces back to him as an echo. This is an example of a wave *reflecting*
11. Ronda put two speakers in her room. In one place, the sound was much quieter than in the rest of the room. What might cause this? *Destructive interference*
12. **When a wave's energy moves across a pond, in what direction do the molecules of the pond move?** *The molecules move up and down while the energy moves across the pond.*
13. What color light will be transmitted through red sunglasses? *Red wavelengths*
14. In what direction does a transverse wave transfer energy? *Perpendicular to the force.*
15. Sean is using a rope to make waves. If he increases the speed with which he creates the disturbance, he will *increase the frequency.*
16. Isaac puts a solid wood barrier completely across a tank full of water. What do you predict will happen to waves in the tank when they reach the barrier? *reflection*
17. Mika put one end of a stick into a pond. When she looked down at the stick, it appeared to be broken at the point where the stick entered the water. This was caused by the *light entering a new medium (light moving from air to water). This is an example of refraction.*
18. What does a prism or a rainbow do to visible light to make the colors separate? *It refracts the light making it separate into its primary colors frequencies*

19. If you increase the frequency you *decrease* the wavelength. This is an *inverse* relationship.
20. What determines the energy in an EM wave? *frequency*
21. What parts of your eye refract light? *Cornea, lens, vitreous gel*
22. What parts of your eye help you see color and black and white? *Photoreceptor cells = rods and cones*
23. What happens when light is absorbed into a medium? *They are converted into heat*
24. How is sound produced? *Sound is produced by a vibrating object*
25. In what medium does sound travel the fastest? *Solids (especially elastic solids)*
26. Why does sound travel the fastest in this medium? *Because the molecules are closest together so they do not have far to move to transfer energy.*
27. What determines the pitch of a sound wave? *frequency*
28. What determines the loudness of a sound wave? *Intensity and amplitude*
29. What parts of the eye focuses light? *lens*
30. What parts of the eye open and close to allow more or less light into the eye? *Iris*
31. How does your ear pick up sound waves? *Sound waves enter the ear, making the eardrum vibrate. These vibrations are transferred to the inner ear bones, then to the cochlea, then to the auditory nerve.*
32. Most of the light that hits a transparent window is *transmitted (the light goes through the window)*

Label the parts of the eye diagram.



