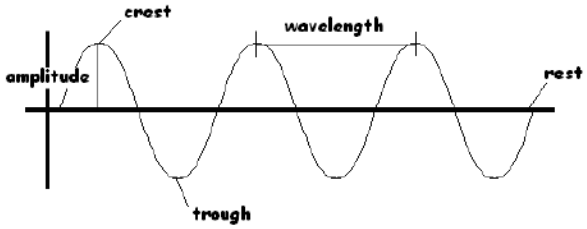
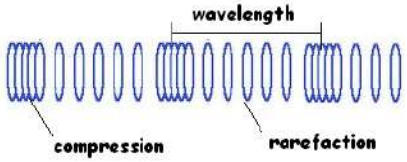
Waves, Sound, and Light Test Review

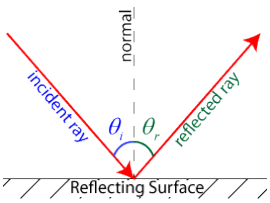
1. **Label the following items on the wave:**
   a. **amplitude**
   b. **wavelength**
   c. **crest**
   d. **rest**
   e. **trough**



2. **Label the following items on the wave:**
   a. **wavelength**
   b. **compression**
   c. **rarefaction**

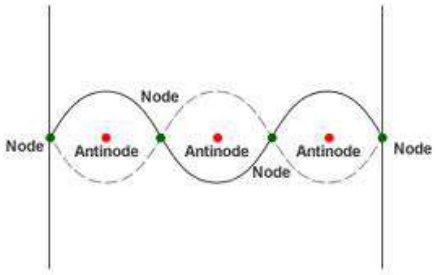


3. **What type of energy is associated with a wave?** ***kinetic energy***
4. **What two properties affect the speed of a wave?** ***density/elasticity***
5. **Of the phases of matter, which phase allows waves to travel the fastest through it? Why?** ***solid; it is the most elastic***
6. **How does temperature affect the speed of a wave?** ***higher temperatures cause faster molecular movement therefore waves will move faster***
7. **What type of wave is represented in question #1? Is sound or light representative of this type of wave?** ***transverse; light***
8. **What type of wave is represented in question #2? Is sound or light representative of this type of wave?** ***longitudinal (compressional); sound***
9. **How is the speed of sound calculated?** ***Speed of wave = frequency (Hz) X wavelength (λ) (meters)***
10. **Solve the following problems:**
    a. **What is the speed of a wave with a frequency of 10 hz and a wavelength of 2 meters?** ***10 hz X 2 meters= 20 m/sec***
    b. **What is the frequency of a wave with a speed of 60 m/sec and a wavelength of 200 cm?**
       convert 200 cm to 2 m first; 60 m/sec / 2 m= 30 hz
    c. **What is the wavelength of a wave with a speed of 15 m/sec and a frequency of 10 hz?** ***1.5 m***
11. **What will cause a wave to change speed or direction?** ***a change in medium***
12. **List and define the 4 type of wave interactions.**
    reflection- bouncing back of a wave
    refraction- bending of a wave as it enters a new medium
    diffraction- bending of a wave around a barrier
    interference- when 2 or more waves arrive at the same time and combine into a single new wave.
13. **What is the diagram below representing? Explain the concept.**



Law of reflection; the angle that light enters will reflect off at the exact same angle

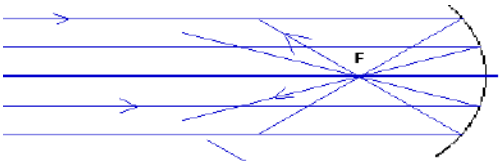
14. **What are the two types of interference? Which one will make a sound louder and which one will make a sound softer?** ***constructive and destructive; constructive gets louder and destructive gets softer***
15. **Label the node and antinodes on the standing wave below.**



16. **What is the frequency of a standing wave (natural frequency)?** ***resonant frequency***
17. **Give an example of an object that uses resonant frequency to function?** *radio stations broadcast at a specific frequency therefore the radio must match the same frequency in order to pick up the station; glass breaking when a sound frequency matches the resonant frequency of the glass causing it to vibrate*
18. **What must be present in order for a sound wave to occur?** *matter*
19. **What three factors affect the speed of a sound wave?** *temperature, elasticity, and density*
20. **What is the speed of sound in air?** *340 m/sec*
21. **What term is used to describe frequency in sound?** *pitch*
22. **What is the human range of hearing in hertz?** *20 hz to 20,000 hz*
23. **How do the words *infrasonic* and *ultrasonic* apply to human hearing?** ***below 20 hz is infrasonic; above 20,000 hz is ultrasonic***
24. **What is SONAR?** ***sound navigation and ranging; sends out sound waves and measures distance of object based on time it takes reflected sound to return***
25. **What is the Doppler Effect? How does the pitch change as the sound source moves past the observer?** *change in frequency due to a change in the motion of the object or the observer; the pitch is higher as the sound approaches and then goes lower has it passes*
26. **What other terms are used to refer to amplitude?** *intensity/loudness*
27. **What are the decibel readings of the following:**
    a. **Threshold of Human Hearing** ***0 db***
    b. **Ear Damage** ***85 db and up***
    c. **Threshold of Pain** ***120 db***
28. **What is the science of sound?** ***acoustics***
29. **What are the two types of tones? What effect is achieved as the tones are mixed constructively?** ***fundamental tone (lowest frequency); overtones (higher frequencies); harmony***
30. **What criteria must be met to classify a sound as music?** *pleasing quality; definite pitch; repeated timing (rhythm)*

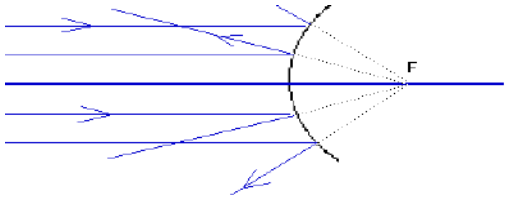
31. **The musical scale includes the following: do, re, me, fa, so, la, te, do. What term would be used to describe the interval between do and do?** ***octave***
32. **What are the three categories of musical instruments?** *wind, percussion, string*
33. **How can you make the pitch of the sound higher in a wind or string instrument?** *make the air column or string vibrating shorter*
34. **What form of energy is light characterized as?** *electromagnetic*
35. **What creates light?** *atoms produce photons when excited; light is made up of a stream of photons*
36. **What is the speed of light in a vacuum?** *300,000 km/sec*
37. **List the types of light on the electromagnetic spectrum from lowest frequency/longest wavelength to highest frequency/shortest wavelength?** ***radio waves, microwaves, RADAR, infrared, visible, ultraviolet, x-ray, gamma ray***
38. **How does visible light appear before it is separated*? white light***
39. **What happens when light enters a prism*? it separates into the visible spectrum (ROYGBIV)***
40. **Of the colors involved in ROYGBIV, which color has the lowest frequency and which color has the highest frequency*? red is lowest, violet is highest***
41. **What are the types of radio waves*? amplitude modification (AM) and frequency modification (FM)***
42. **Which type of light is invisible but can be detected as heat*? infrared***
43. **Which type of light is invisible and can cause skin cancer, but is also important for production of vitamin D?** ***ultraviolet***
44. **Of the forms of electromagnetic radiation, which is the strongest with tremendous penetrating ability?** ***gamma rays***
45. **Define transmission, absorption, and reflection in terms of light.**
    transmission- light can pass through
    absorbed- light is taken into the object
    reflected- light is bounced off of the object
46. **What are two ways to describe objects that transmit light?** ***transparent- light passes through and objects can be seen clearly through it (transparent); translucent-light passes through but objects cannot be seen clearly through it***
47. **How would light be transmitted through an opaque object?** ***it wouldn't, light would only be absorbed or reflected***
48. **Why does an object appear to have a color?** ***that color from the visible spectrum is being reflected while all other colors are being absorbed***
49. **What objects reflect light?** ***mirrors***
50. **What are three types of mirrors?** ***plane (flat), concave and convex***
51. **What are two types of images formed from the reflection and refraction of light?** ***real (can be projected on a screen) and virtual ("not real")***
52. **Which are two types of lenses?** ***concave and convex***
53. **Label the mirrors and lenses below and describe the images they make:**

a.



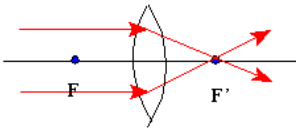
concave mirror, image is real and upside down

b.



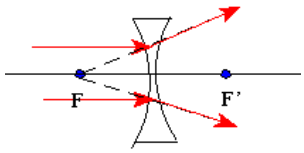
convex mirror, image is virtual and smaller

c.



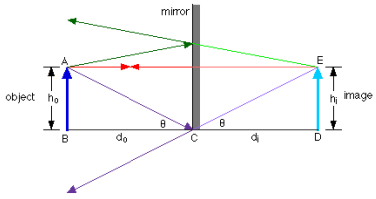
convex lens, image is mostly real

d.



concave lens, image is smaller and virtual

e.



plane mirror, image is same size but virtual

54. **What is the focal point and focal length when determining the image or a lens or mirror?** ***focal point is where reflected rays meet; focal length is the distance between the focal point and the center of the mirror/lens***

55. **What are the two types of reflection?** *regular (smooth object that does not scatter light therefore image is seen) and diffuse (rough object that scatters light so light is reflected but image is not seen).*

56. **How does the lens in the eye affect vision?** *if lens is bending where it is thinner in the middle (concave) the person is nearsighted; if lens is being where it is thicker than normal in the middle (convex lens) the person is farsighted*