Study Guide: Waves, Light, and Sound Test

1. A form of matter that waves move through is called a(n) medium.
2. In a transverse wave, the disturbance moves perpendicular/at a 90° angle to the direction of the wave.
3. What are the two names for the type of wave where the disturbance moves parallel to the direction of the wave? Longitudinal or compression
4. We call the distance between two adjacent crests or two adjacent troughs the wavelength.
5. We call the height of a wave above (crest) or below (trough) the rest position the amplitude.
6. Why can electromagnetic waves travel through a vacuum (outer space), but mechanical waves can’t? Because electromagnetic waves don’t need a medium to travel. Mechanical waves have to have a medium.
7. As frequency increases, wavelength decreases.
8. The energy of a wave is directly related to its amplitude.
9. In the box below, label the TYPE of wave and then label the rest position, a crest, trough, the wavelength, and the amplitude.

What kind of wave is shown in the box? Transverse

What kind of wave is shown in the box? Longitudinal/Compression

10. How many crests are there in Box #1? You could say 2, 2.5, or 3. There is a partial crest.
11. How many troughs are there in Box #1? 3
12. In the box below, label the TYPE of wave and then label a compression and a rarefaction.

What kind of wave is shown in the box? Longitudinal/Compression

13. How many compressions are there in Box #2? 3
14. How many rarefactions are there in Box #2? 2
15. When the compressions are more spaced out, a longitudinal wave has (GREATER or LESS) wavelength.
16. Draw two transverse waves in the boxes below, one with a large wavelength and one with a small wavelength.
17. **Frequency** is the number of waves passing a fixed point in a certain period of time; how “often” a wave occurs. It’s measured in Hertz.

18. As frequency of a wave gets higher, the wavelength of the wave gets **shorter**.

19. What process do lenses use to focus light? **CHOOSE ONE**:
   - A. Reflection  
   - B. Refraction  
   - C. Diffraction

20. What process involves the BENDING of light?
   - A. Refraction  
   - B. Reflection  
   - C. Diffraction

21. Which of the following is an example of reflection?
   - A. When you hold your legs into a pool it looks like your legs are not attached at the knees where they meet the water.  
   - B. You can see your image in a shiny, flat surface because light waves bounce directly back at you and your eyes.  
   - C. A light ray bends as it passes from air into water at an angle

22. Which answer choice(s) from question 21 could be an example of refraction? **A and C**

23. You can observe the color of a flower because
   - A. The flower produces light waves  
   - B. Light is reflected off of the flower

24. The color black (**ABSORBS** or **REFLECTS**) all wavelengths of visible light. The color white (**ABSORBS** or **REFLECTS**) all wavelengths of visible light.

25. Why do leaves appear green? **They absorb all other wavelengths of light, but reflect green to our eyes.**

26. Circle all of the objects that would **REFRACT** light
   - Mirror  
   - Magnifying glass  
   - Prism  
   - Lens

27. **TRUE/FALSE**: Diffraction occurs when light waves change direction as they pass through openings in a barrier or around the edges of an object.

28. Label each of the pictures with the correct process.
   ```
<table>
<thead>
<tr>
<th>Reflection</th>
<th>Refraction</th>
<th>Absorption</th>
<th>Diffraction</th>
</tr>
</thead>
</table>
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29. When light rays hit a reflective surface, like a mirror or the back of a spoon, they bounce off of it. If they hit the surface at an angle, they angle they hit the surface with will be equal to the angle of reflection. If a light ray hits a spoon at an angle of 45°, at what angle will the light ray reflect off of the spoon? **45°**
30. Which of the following images correctly illustrates light reflecting off of a plane (flat) mirror?

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
<td>C</td>
</tr>
</tbody>
</table>

31. What determines the color of a light wave?
   A. The speed of the wave
   B. The wavelength of the wave
   C. The temperature of the wave

32. How many different frequencies of visible light (ROYGBIV) are found on the EM spectrum? Z

33. Fire can produce sound, smoke, light, and water vapor. Which of these is released in the form of electromagnetic waves? light

34. Light travels FASTEST through (SOLIDS / LIQUIDS / GASES) while sound travels FASTEST through (SOLIDS / LIQUIDS / GASES).

35. What happens when you shine a flashlight DIRECTLY at the center of a mirror on a wall.
   A. The light will be reflected by the mirror, and the reflected light will travel far to the right of the flashlight.
   B. The light will be reflected by the mirror, and the reflected light will travel directly back to the flashlight.

36. Lightning and thunder happen at the exact same time. Why do we SEE lightning before we hear the thunder? Because light waves travel MUCH faster than sound waves.

37. Draw the following:

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Convex Lens</td>
<td>Concave Lens</td>
</tr>
</tbody>
</table>


39. When you’re at the beach the waves are sometimes higher than usual. The height of a wave is called amplitude.

40. Which of the following has an effect on the SPEED of sound?
   A. Frequency of the sound wave
   B. The type of medium that the sound wave is traveling in
   C. Amplitude of the sound wave

41. The volume of a sound is controlled by the amplitude of the sound wave.

42. The pitch of a sound is determined by the frequency of the sound wave. A high frequency wave would have a (HIGHER or LOWER?) pitch.

43. An echo is caused by the (REFRACTION/REFLECTION/DIFFRACTION) of sound waves.

44. You place a ringing alarm into a jar and remove all of the air. What happens to the sound of the ringing alarm? It stops. Why does this happen? There is no longer a medium (air) to travel on. Sound waves cannot travel in a vacuum.

45. You are sitting at the gas station when a truck speeds by while playing loud music. As the truck was approaching you, the music got higher pitched. Once the truck passed and moved away, the pitch of the music got lower. What is this phenomenon called? Doppler Effect. As the truck approaches the pitch (frequency) and volume (amplitude) seem higher. Once it passes the frequency and amplitude seem to go down and make a quieter and lower pitched sound.
46. When two waves come together and combine and form an even bigger wave. What is this called? **Constructive interference**

47. What kind of wave is sound?
   - A. Mechanical, longitudinal
   - B. Mechanical, transverse
   - C. Electromagnetic, longitudinal
   - D. Electromagnetic, transverse

48. Wavelength __________ as frequency increases.
   - A. Increases
   - B. Decreases

49. Pitch is to highness/lowness of a sound as **intensity** is to loudness of a sound.

50. The higher the amplitude the higher the intensity.

51. Intensity and amplitude have a __________ relationship.
   - A. Direct
   - B. Indirect

52. Which wave has a smaller wavelength? 
   **Wave A**

53. How do you know? **Because the distance from one crest to the next crest is smaller on Wave A than Wave B.**

54. Which wave shows a sound that has a higher pitch? **Wave A.**

55. How do you know? **Sound waves with higher frequency will have a higher pitch.**

56. Which wave has higher amplitude? 
   **Neither** Explain why: **Both Wave A and Wave B have the same amplitude because they are the same height above the rest position.**

57. Which wave shows a louder sound? **Same volume. Volume is directly related to amplitude.**

58. Which of the following describes the sound in Wave A?
   - A. A high-pitched, loud sound
   - B. A low-pitched, quiet sound
   - C. A low-pitched, loud sound
   - D. A high pitched, quiet sound

59. Which of the following describes the sound in **Wave B**?
   - A. A high-pitched, loud sound
   - B. A low-pitched, quiet sound
   - C. A low-pitched, loud sound
   - D. A high pitched, quiet sound

60. The image shows an audio animation of a song. What part of the song is the **LOUDEST?** 

61. What part of the song is the **QUIetest?** 

62. Which two parts have almost the same volume? 
   **A and B**