Name: _____

Date: _____Period:.

Guided Reading: Sound

Start on page 390, §26.1 "The Origin of Sound" and answer the following questions as you read:

1. All sounds are produced by the **vibrating** of material objects.
2. In a piano, violin, or guitar, a **sound** wave is produced by vibrating **strings**; in a saxophone, by a vibrating **reed**; in a flute, by a **fluttering** column of air at the mouthpiece.
3. Your voice results from the vibration of your **Vocal cords.**
4. We describe our subjective impression about the frequency of sound by the word **pitch**.
5. A high-pitched sound like that from a **piccolo** has a high vibration frequency, while a low-pitched sound like that from a **Fog horn** has a low vibration frequency.
6. A young person can normally hear pitches with frequencies from about **20** to **20,000** hertz. As we grow older our hearing range **Shrinks**, especially at the **high**-frequency end.
7. Sound waves with frequencies below 20 hertz are called **infrasonic**, and those with frequencies above 20,000 hertz are called **ultrasonic**.

Continue to page 391, §26.2 "Sound in Air" and answer the following questions as you read:

8. Clap your hands and you produce a pulse that goes out in **all directions.**
9. Each particle moves **back** and **forth** along the direction of motion of the expanding wave.
10. Refer to Figure 26.4, when you quickly open a door, a pulse of **compressed** air has moved from the door to the curtain. This pulse of compressed air is called a **compression**.
11. When you quickly close the door, the moving air molecules leave a zone of lower **pressure** behind them. This time the disturbance is a **rarefaction**.
12. For all wave motion, it is not the medium that travels across the room, but a **pulse** that travels.

Continue to page 392, §26.3 "Media That Transmit Sound" and answer the following questions as you read:

13. Most sounds you hear are transmitted through the **air**. But sound also travels in **solids** and **liquids**.
14. Solids and liquids are generally good **conductors** of sound – much better than **air**.
15. The speed of sound **differs** in different materials. In general, sound is transmitted **faster** in liquids than in gases, and still **faster** in solids.
16. Sound cannot travel in a **vacuum** (Figure 26.6). The transmission of sound requires a **Medium**.

17. If there is nothing to **Compress** and **expand**, there can be no sound. There may still be **vibrations**, but without a medium there is no sound.

Continue to page 393, §26.4 "Speed of Sound" and answer the following questions as you read:

18. You hear thunder **after** you see a flash of lightning (unless you're at the source). This, and other experiences, are evidence that **sound** is much slower than **light**.

19. The speed of sound in dry air at 0°C is about **330** meters per second, or about 1200 kilometers per hour, about one-**millionth** the speed of light.

20. In air at a normal room temperature of about 20°C, sound travels at about **340** m/s.

21. The speed of sound in a material depends not on the materials **density**, but on its **elasticity**.

22. Elasticity is the ability of a material to change **shape** in response to an applied **force**, and then resume its initial shape once the distorting force is removed.

23. Steel is very **elastic**; putty is **inelastic**.

24. In elastic materials, the **atoms** are relatively close together and respond quickly to each other's motions, transmitting **energy** with little loss.

25. Sound travels about **15** times faster in steel than in air, and about **4** times faster in water than in air.

Continue to page 393, §26.5 "Loudness" and answer the following questions as you read:

26. The **intensity** of a sound is proportional to the square of the **amplitude**.

27. Sound intensity is **objective** and is measured by instruments such as the oscilloscope shown in Figure 26.7.

28. loudness, on the other hand, is a physiological sensation sensed in the brain. It differs for different people. Loudness is **subjective** but is related to sound intensity.

29. The unit of intensity for sound is the decibel (**dB**), after Alexander Graham Bell, inventor of the telephone.

30. Starting with zero at the threshold of hearing for a normal ear, an increase of each **10** dB is **10** times as intense as a sound of 0 dB; 20 dB is not twice but **10** times as intense as 10 dB, or **100** times as intense as the threshold of hearing. A 60-dB sound is **100** times as intense as a 40-dB sound.
31. Refer to Table 26.1, what is the decibel level of Normal speech? **60** What is the decibel level of Loud rock music? **115** What is the decibel level of the Threshold of pain? **120**

Continue to page 397, §26.9 "Interference" and answer the following questions as you read:

32. Sound waves, like any waves, can be made to **interfere**.

33. When the **crest** of one wave overlap the crests of another wave, there is **constructive** interference and an **increased** in amplitude.

34. Or when the crests of one wave overlap the **trough** of another wave, there is **destructive** interference and a **decrease** in amplitude.

35. For sound, the crest of a wave corresponds to a **compression**, and the trough of a wave corresponds to a **compression**.

36. Interference occurs for both **transverse** and **longitudinal** waves.

Continue to page 398, §26.10 "Beats" and answer the following questions as you read:

37. An interesting and special case of **interference** occurs when two tones of slightly different **frequency** are sounded together.

38. Refer to Figure 26.16, what does the caption read?
two sound sources interfering making beats.

39. A fluctuation in the **loudness** of the combined sounds is heard; the sound is **heard**, then **faint**, then loud, then faint, and so on.

40. This periodic variation in the loudness of sound is called **beats**.

41. Beats can be heard when two slightly mismatched **tuning forks** are sounded together. Because one fork vibrates at a frequency different from the other, the vibrations of the forks will be momentarily **in step**, the **out of step**, then in again, and so on.

42. When the combined waves reach your ears **in step** – say when a **compression** from one fork overlaps a compression from the other – the sound is a **maximum**.

43. A moment later, when the forks are **out of step**, a compression from one fork is met with a **rarefaction** from the other, resulting in a **minimum**.

44. When one fork vibrates **264** times per second, and the other fork vibrates **262** times per second, they are in step twice each second. A **beat** frequency of **2** hertz is heard.

45. **minimum amplitude** can occur with any kind of wave and are a practical way to compare **frequencies**.