

Reading Notes: Waves and Superposition (15.4 - 16.2)

Fill out this worksheet as you read the corresponding sections in the text. Submit an electronic copy of the worksheet in Canvas for extra credit points, and bring your completed worksheet to class to use as a reference for in-class activities.

1. Regarding a sound wave, what is a **compression** and what is a **rarefaction**? What example mechanism is discussed for creating these, and how does it create them?

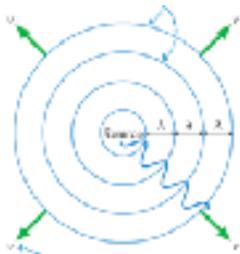
2. What is the normal frequency range for human hearing?

3. Define the term **ultrasound**.

4. What is the range of wavelengths for visible light?

5. How would you define the **power** of a wave?

6. The following figure could be used to describe either a **circular wave** or a **spherical wave**. What is the difference between the two? What do the circles represent in each case? Describe the direction of wave travel from the source for both cases.



7. How are the **power** and the **intensity** of a sound wave related?

8. Write down what the following equation is describing, and define the components of the equation.

$$I = \frac{P_{source}}{4\pi r^2} \quad \text{describe equation:}$$

P_{source} : r :

What is the significance of the term $4\pi r^2$ in this equation?

9. How would you describe the relationship between the actual **intensity** of a sound and how we perceive the “loudness” of the sound?

10. Write down what the following equation is describing, and define the components of the equation.

$$\beta = (10dB)\log_{10}\left(\frac{I}{I_0}\right) \quad \text{describe equation:}$$

β : I :

I_0 :

11. If a source is moving toward you as it is emitting sound, how will the wavelength of the sound that you perceive differ from the wavelength of the sound when it was emitted from the source?

12. Write down what the following equation is describing (It looks slightly different than in the text.), and define the components of the equation.

$$f = \frac{f_s}{1 \mp v_s/v} \quad \text{describe equation:}$$

f : f_s :

v_s : v :

In the denominator, when is the minus sign used vs. the plus sign?

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13. Write down what the following equation is describing (It looks slightly different than in the text.), and define the components of the equation.

$$f = (1 \pm \frac{v_0}{v})f_s$$

describe equation:

f :

v_0 :

v :

f_s :

In the equation, when is the plus sign used vs. the minus sign?

14. For light waves, what do **blueshift** and **redshift** refer to?

15. What overlaps in order to produce a **shock wave**?

16. What is the **principle of superposition**?

17. What is the difference between **constructive** and **destructive interference**?

18. What is a **standing wave**, and how is it created?

19. For a standing wave on a string, are all points of the string in motion? Explain your answer.

20. For a standing sound wave, where is the intensity at a maximum, and where is the intensity zero? Explain your answer including the terms **nodes** and **antinodes** and explain what these mean.