

Physics 111

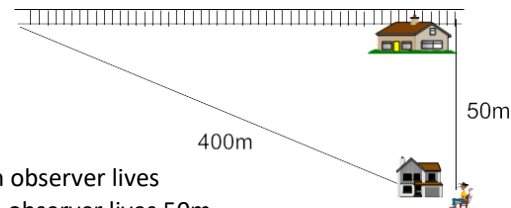
Assignment # 6 - Waves

Due Thursday, December 19th, 2019

Multiple Choice - Schoology

Problems (Show your work)

1. You are sitting on a dock watching some waves as they roll in. You do a rough estimate and say that the waves are about 4m apart and they hit the dock every 12 seconds. a) What is the frequency? b) What is the velocity of the wave? c) If the waves kept coming at the same rate how many would hit the dock in an hour – show your work?
2. Robert is standing outside his apartment building when Olga drives by in her car at 72km/h. (There was one of those signs that tell you how fast you are going, in front of his building). It appears that Olga is texting. Soon after, she runs into a car parked at a stopped sign. The sign is 160m away from Robert and the time it takes for her to drive by him, hit the car and the sound to come back is 8.5 seconds. Was Robert likely wearing a winter jacket or just a T-shirt at the time of the accident. Justify your answer.
3. The train usually sounds its horn as it passes through the crossing in Norton. An observer lives 400m away from the spot where the train blasts his horn but at a diagonal. The observer lives 50m perpendicular to the tracks. The train horn is 500Hz but at the instant it is blasted it is heard as 523Hz. How long will it be before the observer sees the train if he is looking straight across? Temp is 20°C
4. You are swimming underwater and hear a jet ski start up, you surface immediately and hear the **SAME** motor start 4.5 seconds later above the water. How far away was the Jet Ski. If the speed of sound in water is 1400m/s and the air temperature is 31°C



Practice Problems

1. A pendulum on a grandfather completes 63 cycles in 2 minutes. a) What is the period? b) What is the frequency? (1.90s, 0.525Hz)
2. You set off a firecracker exactly 75.0 m from the side of a building, and hear the echo of the firecracker 0.46 s later. What is the air temperature? (-8.18°C)
3. The 3rd harmonic of a standing wave has a frequency of 19.5Hz. What is the frequency of the 8th overtone? (58.5Hz)
4. Determine the wavelength of a wave that travels at 150 m/s and has a frequency of 35 Hz. How far does the wave travel in 1 hour? (4.29m, 540km)
5. A man is standing in a valley, with parallel walls, when he fires a rifle, the echo from one wall is heard after 4.2 s and the echo from the other wall is heard after 6.0 s, if the air temperature is 25.0 ° C, what is the width of the valley? (1.76km)
6. How long will it take sound to travel 10.0 km, when the air temperature is 20° C? (29.15s)
7. A tuning fork has produces a sound with a wavelength of 2.05 m and a frequency of 170 Hz, what is the air temperature? (29.17°C)
8. A lightning flash is seen and 5 s later the thunder is heard. Find the distance to the lightning if the air temperature is 15° C. (1.7km)
9. A train with a 150Hz horn is moving at 35.0m/s on a day when the speed of sound is 340m/s. What frequencies are observed by a stationary person standing at the side of the tracks as the train approaches and after it passes?
10. At an air show a jet flies directly toward the stands at a speed of 1200km/h, emitting a frequency of 3500Hz, on a day when the speed of sound is 342m/s. What frequency is received by the observers? What frequency do they receive as the plane flies directly away from them? (138kHz, 1.77x10³Hz)
11. The ordinary human ear hears two sounds as being distinct if they occur at least 0.10 s apart. How far away must a reflecting surface be from your ear in order to hear an echo, if the air temperature is -15° C
12. Billy Joe puts his ear to a railway track and watches as his friend Trey hits it with a hammer. He hears the hammer hit the rail through the metal. He immediately lifts his head and hears the hammer hit the track 3 seconds later. If the temperature of the air is 20 C and the steel has a speed of sound of 5960m/s, how far away is his friend Trey?(1.09km)
13. If the fundamental frequency, of a wave vibrates with a wavelength of 1m determine the wavelength of the standing wave with 5 nodes. Include a sketch (0.25m)

14. Bert is standing 343m away from a building on Sesame Street. Ernie is standing 343m behind him further back. Bert whistles to get Oscar's attention. If the temperature is 20°C how long after he whistles does Bert hear his whistle? How long after Ernie hears the whistle will he hear the echo of the whistle? (2 seconds, 2 seconds)
15. What is the main difference between a transverse wave and a longitudinal wave? Give an example of each type.
16. What is the difference between mechanical waves and electromagnetic waves?
17. A wheel is rotating with a frequency of 40Hz. In words explain briefly what this means.
18. How are waves at boundaries different from constructive interference?