***Sound Wave Practice Problems 3/27/14*** (20 pts) Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Date\_\_\_\_\_\_\_\_ Per.\_\_

1) [*2 pts*] The speed of sound waves (not surface waves!) in water is much faster than the speed in air. A submarine sends out a sonar “ping” which travels 3.825 km before hitting another submarine 2.50 seconds later.

a) How many meters did the ping travel?

b) What was the speed of the “ping” sound wave?

2) [*3 pts*] The speed of a sound wave is constant in air at a certain temperature. As a speaker cone is oscillated at a higher frequency, what happens to the wavelength of the sound waves in the air?

3) [*1 pt*] When a sound wave hits a barrier (like a wall), it is reflected back and returns to the sender. What is this phenomenon called?

4) [*3 pts*] A student used a 440-Hz tuning fork (“A”) and measured the wavelength of that sound in air as 78 cm (0.78 m). What did he calculate for the speed of sound that day in the lab?

a) Write the formula!!!! What formula relates frequency, wavelength, and speed?

b) Calculate the speed (velocity). Round to the nearest 0.1 m/s.

c) If the actual speed was 339 m/s, what was her percent error?

5) [*3 pts*] Using precise measurements, draw a wave below which has an amplitude of 2.5 cm and a wavelength of 8.0 cm. Draw two full wavelengths.

6) [*2 pts*] Rearrange v = λf to give formulas for **λ =** and **f =**

7) [*3 pts*] Fill in the missing values in the tables below.

|  |  |  |
| --- | --- | --- |
| v (m/s) | f (Hz) | λ (m) |
| 340 |  | 0.22 |
| 340 |  | 0.35 |
| 340 | 620 |  |
| 340 | 450 |  |
| 340 |  | .95 |

|  |  |  |
| --- | --- | --- |
| v (m/s) | f (Hz) | λ (m) |
| 340 | 300 |  |
| 340 |  | 1.50 |
| 340 |  | 1.80 |
| 340 | 140 |  |
| 340 | 120 |  |

8) [*3 pts*] Graph the wavelength and frequency data from the tables above, IN PENCIL!! Draw a smooth curve which runs through as many of the data points as possible.

Bonus [*2 pts*] : Engineers can use sound waves to test the strength of a structure like an airplane frame or a bridge. An engineer sends a 1200.0-Hz sound, with a wavelength of 4.25 m, through a steel bar. The sound gets to the other end of the bar and returns in a total time of 30.0 milliseconds. What is the length of the bar?

(Make a diagram and pay attention to units!)