Mr. Miller Physics Name: _____ Date: _____

Speed of Sound – Echo Method

Problem: What is the speed of sound, as determined by the echo method?

Materials: meter stick
stopwatch
source of sound

Procedure:

1. Measure a distance (over 100 meters) from the wall of the school.
2. Make a short, loud sound.
3. Listen for the echo.
4. Measure the time from when the sound was created to when you heard the echo.
5. Record three trials at this distance.
6. Record all results in Table 1.
7. Repeat experiment at 3 other distances.

Table 1

	Distance (m)	Time of echo (sec)	Time to wall (sec)	Speed of sound (m/s)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				

Average Speed of Sound from all 12 trials: _____

Temperature in the Air: _____

Sample Calculations:

Speed of sound determined by echo method:

Speed of sound by using temperature:

Drawing of lab setup:

Questions:

1. How does temperature affect the speed of sound? Why?

_____

_____

_____

_____

_____

_____

2. Why did we make a short loud sound for the experiment instead of a long loud sound?

_____

_____

_____

_____

_____

_____

3. Is the sound of the echo the same loudness as the initial sound? Why or why not?

_____

_____

_____

_____

_____

_____

4. If the speed of sound determined by temperature is the ACTUAL speed of sound and the speed of sound determined by echo method is the EXPERIMENTAL speed of sound, what is the percent difference between the two?

$$percent\ difference = \left| \frac{actual - experimental}{actual} \right| \times 100$$

5. Knowing the speed of sound in air, how might you determine the distance between your point of observation and a granite cliff some distance away?

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_____

_____

_____

6. A woman makes a sound and 3.5 seconds later an echo returns from a nearby wall. How far away is the woman from the wall if the speed of sound is 350 m/s?