Physics 100 Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Doppler Speed Measurement

Using a string instrument and the Doppler Effect to determine the speeds of noisy objects that are heard approaching and then departing:

**Velocity in Terms of Frequency Shift**

**Vobject = Vsound \* (fahead of source – fbehind source) / (fahead of source + fbehind source)**

Units for the object velocity are the same as those that you choose for the velocity of sound.

**Vsound = 340m/s = 761mph**

**1m/s = 2.23694mph**

**Velocity in terms of change in pitch**

**Vobject = Vsound \* (2^(∆p/12) -1)/ (2^(∆p/12) +1)**

**∆p = absolute value of the drop in pitch, measured in semitones (half-steps)**

**Practice:**

How fast is a car moving if its frequency drops from 622hz (D#) to 440hz (A)? This is equivalent to its pitch dropping 6 half steps (6 half steps: D# - D – C# - C – B – A# - A).

**Using a string instrument to determine the Speeds of Noisy objects that are approaching and then departing:**

Open the Physics 100 folder on the school drive (M? V? I:drive? I can’t remember). Open sound file A.

Play the sound and then try to match the pitch drop with your instrument. Once you have matched the interval as well as you can, check your interval by using Audacity’s “change pitch” effect. Check the pitch of the approaching and departing object.

Find the velocities of the following sources using the frequencies from your instrument, the formula at the top of this page, and a speed of sound equal to 760mph. **You might save yourself some time by creating a formula in Excel.**

**1. Object A:**

**2. Object B:**

**3. Object C:**

**4. Object D:**

**5. Object E:**

**6. Object F:**