Name: ____________________

Wavey Lab w/ PhET Waves Simulation Minilab

Materials: Slinky String Textbook

Important Formulas: $f = \frac{1}{T}$ $v = \frac{\lambda}{T}$ $v = \lambda f$

Part I: What's a wave?

- With a partner, stretch and hold a slinky spring to about 1.5m on the class table (do not damage the slinky)
- From one end, give the spring a flick (down the spring, at your parner) with your finger.
- What do you see?____
- What happens when both partners flick the spring, from each end, at the same time? ____________________
- What kind of wave is this? ____
- Stretch out the spring a little more (to about 2.0m) and send a pulse down the spring. How is this pulse different than the earlier pulse? ____
- Next, have one partner quickly move the end to one side and back one time.
- What do you see? ____
- What happens when both partners move the spring to the same side at the same time?

____

- What happens when both partners move the spring to the opposite sides at the same time?

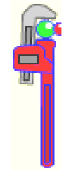
____

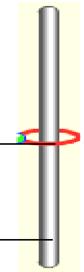
- What kind of wave is this? ____

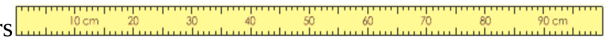
Part II: Reflected Waves:

- With the spring stretched between two lab partners, send a sideways pulse down the slinky (move the slinky quickly to the right)
- Observe how the pulse is reflected.
- Did the pulse come back on the same side, or the opposite side? ____________________
- Hold one end of the slinky between the cover and pages of your textbook (held upward).
- Send a sideways pulse down the slinky (move the slinky quickly to the right)
- Observe how the pulse is reflected away from the book
- Did the pulse come back on the same side, or the opposite side? ____________________
- Attach a ½-meter piece of string to the end of the slinky.
- Have on partner hold the string and another holding the other end of the slinky
- Send a sideways pulse down the slinky (move the slinky quickly to the right)
- Observe how the pulse is reflected.
- Did the pulse come back on the same side, or the opposite side? ____________________
- Do hard materials reflect wave on the same side, or the opposite side? ____________________

Part III: PhET Wave Simulation: PhET Simulations → Play With Sims → Sound and Waves → Wave on a String





- Set *Damping* to 10
- Give the wrench an upward jerk and observed the wave pulse that is created and reflected. Repeat.
- Set the boundary end to *Loose End* and send another pulse down the string.
- Click *Oscillate* and observe the wave created.
- For fun, remove the damping and observe the wave. What happened? ______________________________
- Set *Dampers* to 10 again and play with the *Frequency*.
- What effect did increasing the frequency have? ____
- Check *Rulers* and enable the rulers 

Rulers can be moved!
- Reset and send an oscillating wave down to a fixed boundary.
- Change the frequency of the wave until a *standing wave* is created. A *standing wave* appears to not move (left-right), but be a fixed wave that is reinforced with each new wave pulse. A standing wave will have nodes and antinodes that appear to stay the same distance from the wave source (try to get CLOSE).
    - Frequency of standing wave found: ______________________ s^{-1}
    - Wavelength of standing wave (peak-peak): ______________________ m

  wave speed:

- Change the frequency and look for another standing wave.
    - Frequency of a different standing wave: ______________________ s^{-1}
    - Wavelength of standing wave (peak-peak): ______________________ m

  wave speed:

- Wave speed (m/s) is the product of wavelength (m) and frequency (s^{-1}). What is the wave speed of the two waves above?

Conclusion Questions and Calculations:

1. When a wave strikes a boundary that is **more** dense than the original wave medium, the wave comes back *upright / inverted*.
2. When a wave strikes a boundary that is **less** dense than the original wave medium, the wave comes back *upright / inverted*.
3. Two wave pulses strike each other traveling in opposite directions. If the first pulse has amplitude of +18cm and the second pulse +24 cm, what is the amplitude of the resulting interfered wave? ________________ cm.
4. After the two wave pulses pass each other, the original waves are *enlarged / reduced / unchanged*.
5. A wave with peaks separated by .34 m has a wavelength of ________________m.
6. Imagine standing near the door of a dog house. If a puppy comes running out every three seconds, what would the period of the exiting puppies be? ________________s.
7. Considering the above, how many puppies (or fraction of a puppy) exit every second? ________________s^{-1}.
8. If a certain wave has a new wave crest created every 2.5 seconds, the period is ________________s.
9. What is the frequency of the wave described above in #8? ________________s^{-1}.
10. Using the above formula for wave speed, how fast does a sound wave move that has a frequency of 410 s^{-1} (Hz) and a wavelength of 83 cm? ________________m/s.