Name_____
Class_____Date_____

Waves in Springs

Aim
To observe some properties of waves.

Information
A convenient medium for studying the properties of waves in one dimension is the slinky spring. In this activity, springs will be used to answer some basic questions concerning the motion of a single wave pulse. This practical is meant to be qualitative, not quantitative. This activity does not require a formal report, only the answers to the questions.

Method A:
Lay the slinky on the floor, and extend it so that it is under tension. Do not over-extend it! Produce a single compression pulse down the spring. Move the spring in the opposite direction to produce a rarefaction along the spring.
Answer the following questions by performing the appropriate experiments where necessary.
Results A:
1. Is the velocity of the pulse constant as it travels along the spring?
2. Does the velocity depend on the amplitude of your initial compression or rarefaction?
3. Does the velocity depend on the tension in the spring?
4. Is there energy lost in the pulse as it travels along the spring?
   What observations led you to this conclusion?
   If energy is lost, where does it go?
5. Name this type of pulse.

Method B
Produce a single pulse at right angles to the length of the spring. Practice so that you can produce sine pulses and square pulses.
Answer the following questions by performing the appropriate experiments where necessary.
Results B
6. Does the pulse travel with constant velocity along the spring?
7. Does the velocity depend on:
   amplitude?
   tension?
   pulse shape?
8. Does the amplitude of the pulse decrease as it is propagated?
9. Does the shape of the pulse change as it is propagated?
10. What is the name of this type of pulse?
11. Send two pulses simultaneously from each end. Is there any change in the pulse shapes or amplitude after they have passed through each other?
12. What does this suggest about the resultant of the two pulses as they interact?

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Method C

Fix one end of the slinky so it will not move. Produce a transverse pulse along the spring, and note the nature of the reflected pulse.

Answer the following questions by performing the appropriate experiments where necessary.

Results C

13. Does the reflected pulse differ from the incident pulse in
    speed?
    amplitude?
    shape?
    phase? (ie is the pulse inverted?)

    Repeat this experiment, but this time attach the string to a piece of thread, so it is still stretched, but it is not fixed. The terminating medium is the air.
14. Does the reflected pulse differ from the incident pulse in
    speed?
    amplitude?
    shape?
    phase?

    Repeat this experiment, but join the slinky to a spring with a smaller diameter, and hold each end.
15. Draw diagrams to show what happens when you send a pulse towards the boundary of the two springs:
    a) from the larger diameter spring b) from the smaller diameter spring.
16. What relationship is there between the occurrence of a phase change and the nature of the boundary?