Teacher Reference

Introduction:
This experiment allows the students to verify that the path difference between two waves that cancel each other equals an odd multiple of half the wavelength.

Experimental goals:
After completing this experiment, students will be able to describe why destructive interference occurs at certain locations.

Equipment:
The basic ripple tank setup, ruler, large sheets of paper (butcher paper or ledger paper is ideal).
For setup instructions, see the Basic Setup handout.

Keywords:
Wavelength, Constructive interference, Destructive interference

Notes:
The initial setup is very important to successful completion of this lab. If the waves aren’t straight to start with, it will be very difficult to get good angles in the lab.

Answers:
1. The picture should show a crest meeting a crest and adding to double the height. The picture should also show a trough and a trough meeting and adding to double the height (amplitude in the negative direction). Trough to trough is still considered a maximum because we form a maximum amplitude.

2. The picture should show a crest meeting a trough and cancellation occurs. This is a minimum because the amplitude is minimum (zero).

3. The path difference from each point of origination at any location along the center maximum should be zero. This does not tell us any information until the second maximum (the maximum between the first and second minima) is determined. The central maximum should be 0\(\lambda\), second should be 1\(\lambda\), therefore the third should 2\(\lambda\). This pattern is whole number integers for two point sources in phase.

4. The path difference from each point of origination at any location along the center of the minimum adjacent to the center maximum should be 1/2\(\lambda\), the second minimum should be 3/2\(\lambda\), therefore the third minimum should be 5/2\(\lambda\), and so on.

5. The student results should reflect these patterns, but keep in mind that some of the measurements will be rather rough. If they get within ~15% of 1.5 (1.3-1.7), their work should be considered a success. This is a challenging lab, which should provide meaningful answers to the last question concerning possible sources of experimental error.