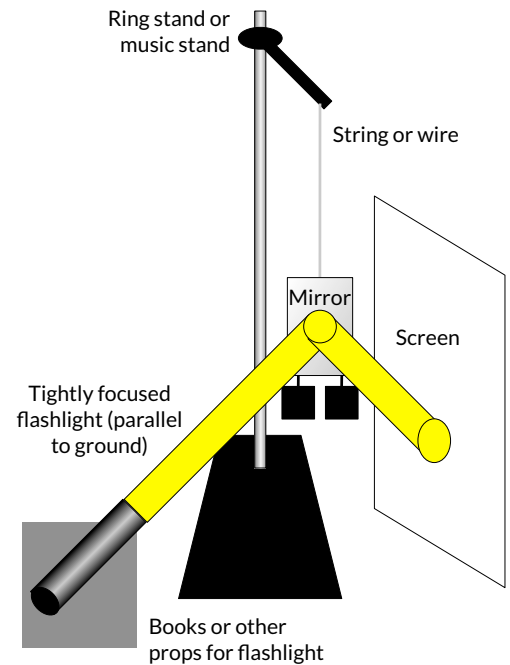


## Wave Detection Activity: Student Guide

1. Set up a ring stand or music stand with an arm or surface sticking out at the top.
2. Tape or tie a string to the arm or surface sticking out at the top of the stand. Tape the bottom of the string to a mirror such that the mirror hangs vertically and is near the table surface but does not drag on the surface.
3. Make a flashlight beam as narrowly focused as possible. Put the flashlight on its side (on books or other props) such that the beam bounces off the mirror at an angle and then shines on a screen, board or white sheet.
4. Using the ruler, approximately how many millimeters does the mirror move from small vibrations, such as a tap on the table?
5. Using the ruler, approximately how far does the light beam on the screen move due to those mirror vibrations?
6. If you have a cellphone, you can use it to make videos of the motions of the mirror and/or light on the screen and play them back in slow motion.
7. Why is the light beam useful for measuring small vibrations?
8. Let the mirror come to a complete rest. Tap the table more lightly than you did the first time, can your system detect that? How sensitive is it?
9. Let the mirror come to a complete rest. If you stomp on the floor, can your system detect that? How sensitive is it?
10. Let the mirror come to a complete rest. If you talk at the mirror at close range, can your system detect that? How sensitive is it?
11. What sorts of vibrations would you like your system to detect?
12. What sorts of stimuli would you like your system not to detect?
13. How can you make your system as sensitive as possible to what you want it to detect, and as resistant as possible to other stimuli? You can:
  - Choose the surface on which your system sits
  - Adjust the length of the string



- Use wires of varying stiffness instead of string
- Try other types of mirrors
- Tape weights to your mirror
- Adjust the angles of the light beam
- Adjust the path lengths of the light beam
- Adjust the surroundings around your system
- Choose something else to modify

14. Explain your design:

15. Explain how well it worked on your selected stimuli:

16. How is your system similar to a gravitational wave detector?

17. How is your system different from a gravitational wave detector?