

## Measuring the speed of light

Take a few minutes with your partners to brainstorm how you would measure the speed of light. What are the problems? Why would it be hard or easy? Record any ideas you have or list any of the problems with designing a measurement in your notebook.

All electromagnetic waves travel at the same velocity,  $c$ . Would it be easier or harder to measure waves of a different frequency, such as microwaves, radio waves, gamma waves or UV waves? Why or why not?

Look up some of the ways the speed of light has been measured historically. Record and briefly describe one way in your notebook.

Is the speed of light the same in different media? How does the speed of light in a medium compare the speed of light in a vacuum? (Show an equation. Look it up, if you cannot remember.)

What is the index of refraction? Explain.

Snell's Law describes the "bending" of light when a ray travels from a medium of one index of refraction to another. Write down Snell's Law comparing the incident and refracted angles when traveling from one medium to another.

Use Snell's Law to solve the following problems:

- 1) A light beam passes from air,  $n = 1$ , to a medium with  $n = 1.5$ . The beam is incident at  $25^\circ$  from the normal. What is the angle to the normal of the refracted beam? Show your work?
- 2) A light beam passes from a medium with  $n = 1.5$  to air,  $n = 1$ . The beam is incident at  $75^\circ$  from the normal. What is the angle to the normal of the refracted beam? Show your work? If you have a problem solving for the angle, explain why.

Discuss the critical angle and write in an equation for how to solve for it if you know the indices of refraction of the two media.

Why would knowledge of the critical angle be useful for studying the speed of light through an optical fiber? Explain.

Read the manual for the lab set-up we will be using to measure the speed of light. Examine the set-up. Make sure you understand the method, the data you will be taking, and how you will determine the speed of light.