

Educator Introduction

Thank you for using the CERT **Light and Waves** module in your classroom. This module links directly with the science curriculum “Essential Standards and Clarifying Objectives” for 6th grade. Specifically it aligns with the Forces and Motion standard, 6.P.1 and 6.P.3. Details of the standards addressed in this module are listed at the end of this document.

Module Contents

The module you have received contains all of the items necessary to teach the Light and Waves concept. The full module includes the following:

- *CERT Educational Series, Light and Waves, Educator Introduction.pdf* Read first. Introduction to Module.
- *CERT Educational Series, Light and Waves, Educator Preparation.mp4* Instructional video for teacher that explains set-up and classroom preparation
- *CERT Educational Series, Light and Waves, Step-by-Step Set-up Instructions.pdf* In-class delivery instructions.
- *CERT Educational Series, Light and Waves, Basics.mp4* Classroom presentation video for CERT Light and Waves module
- *CERT Educational Series, Light and Waves, Student Lab Sheet.pdf*
- *CERT Educational Series, Light and Waves, Student Lab Sheet Answer Key.pdf*
- *CERT Educational Series, Light and Waves, Quiz Question Bank.pdf*
- *CERT Educational Series, Light and Waves, Quiz Question Bank Answer Key.pdf*
- A kit containing the components for 8 individual experimental set-ups for the classroom (in 2 large storage boxes):

BOX 1:

- 8 lamps
- 1 Large Storage Envelope with following contents:
 - 16 strings with metal ring on one end
 - 35 Rainbow Glasses
 - 16 Emission Line Spectra of Some Elements (reference sheet)
 - 20 “Illumination Recommendations for Activities/Areas” (reference sheet)
 - 10 stacks of white, black, blue cellophane paper, and aluminum foil
- A notebook with all documents (and a memory stick containing all files)

BOX 2:

- 18 light meters (in 2 separate small storage boxes)
- Power box for gas tubes
- neon (Ne), helium (He), mercury (Hg), argon (Ar), or Sulphur (S) gas tubes (3 tubes from this selection will be in each kit)
- 3 power strips
- 4 extension cords
- A portable mouse
- The classroom videos above in .ppt format. These are provided to allow the educator to make variations if desired.
 - *CERT Educational Series, Light and Waves, Basics.pptx* Classroom presentation for CERT Light and Waves module. Used to make video presentation for classroom.

Classroom Module Delivery

You need to view the “Educator Preparation video” that will introduce you to the Light and Waves module and the kit contents. You can then use the “*Step-by-Step Set-up Instructions.pdf*” to assist you with set-up when you use the kit. When you are ready to begin, you start the classroom video: “*CERT Educational Series, Light and Waves, Basics.mp4*”

There are places in the video where you will want to pause the video and have discussion. These places are marked with a “sun icon,” along with a laser sound. When you see and hear these markers, use the mouse to pause the video, and have a discussion with your class. Then resume the video.

Students will be prompted to complete sections of the Student Lab Sheet throughout the module.

Module Feedback

When you have finished using the module we ask you to provide feedback using the following [link](#):

Thank you for using the CERT Educational Series. Visit our website at <http://www.ncat.edu/research/dored-research-centers/cert/> to discover our other energy educational module offerings.

If you have questions please contact us at CERT@ncat.edu or 336-256-2406. We appreciate the opportunity to provide you with our energy education content, and we also look forward to working with you to define other modules for your use.

Dr. Gregory Monty, Dr. Vicki Foust, and Elizabeth Keele
Center for Energy Research and Technology (CERT)

Guilford County School Curriculum Standards

6th Grade– Science as Inquiry

Traditional laboratory experiences provide opportunities to demonstrate how science is constant, historic, probabilistic, and replicable. Although there are no fixed steps that all scientists follow, scientific investigations usually involve collections of relevant evidence, the use of logical reasoning, the application of imagination to devise hypotheses, and explanations to make sense of collected evidence. Student engagement in scientific investigation provides background for understanding the nature of scientific inquiry. In addition, the science process skills necessary for inquiry are acquired through active experience. The process skills support development of reasoning and problem-solving ability and are the core of scientific methodologies.

As students progress through the grade levels, their strategies for finding solutions to questions improve as they gain experience conducting simple investigations and working in small groups. They are capable of asking questions and make predictions that can be tested. Students must be encouraged to make more careful observations and measure things with increasing accuracy. During investigations, students must have opportunity to use more advance tools such as calculators, computers, graduated cylinders, scales and meter sticks to gather data and extend their senses. They must keep accurate records and run enough trials to be confident of their results to test a prediction. They must have experiences that allow them to recognize patterns in data and use data to create reasonable explanations of results of an experiment or investigation. They should be encouraged to employ more sophisticated language, drawings, models, charts, and graphs to communicate results and explanations. Students must always use appropriate safety procedures, including listening skins, when conducting simple investigations.

Essential Standard (6th Grade):

6.P.1 Understand the properties of waves and wavelike property of energy in earthquakes, light, and sound waves.

Clarifying Objective:

- 6.P.1.1 Compare the properties of waves to the wavelike property of energy in earthquakes, light, and sound.
- 6.P.1.2 Explain the relationship among visible light, the electromagnetic spectrum, and sight.

6.P.3 Understand characteristics of energy transfer and interactions of matter and energy.

Clarifying Objective:

- 6.P.3.2 Explain the effects of electromagnetic waves on various materials to include absorption, scattering, and change in temperature.