

Lesson Title: Flash, Flash, Lighthouse Flash

Objectives: Students will develop and understanding of how lighthouse beacons flashed prior to the advent of electricity and modern beacons.

Materials:

- 1 Styrofoam craft ring (approx. 9 - 12 inches in diameter).
- 2 magnifying glasses (about 6 inches tall) with straight handles
- 1 thick candle (approx. 2 inches shorter than magnifying glass)
- matches
- Keep the Flash Going student handout
- flashlight
- clock with second hand
- related terms and concepts sheet
- sample Light List
- Beacon Characteristic Activity Sheet

Lesson Procedures:

Introduction:

1. Review related terms and concepts (see attached) prior to lesson and discuss how lighthouses could have a steady (static) light or a blinking (rotating) light prior to beginning activity.
2. Read *Keep the Flash Going* as a group and discuss.

Activity:

1. Distribute materials or select volunteers from class to assist in activity.
2. Place the Styrofoam ring on a flat surface.
3. Press the handle of one magnifying glass into the top of the ring so that it stands straight up on its own.
4. Turn the ring halfway around and stick the other magnifying glass in the ring directly opposite the first magnifying glass.

5. Position the candle in the center of the ring so that the wick is directly in line with the center of each magnifying glass.
6. Light the candle with the matches (adults only) and turn out the lights (cover the windows if necessary to darken the room).
7. Slowly rotate the ring around the candle and watch for the light on the wall. A spot of light should appear to travel along the wall as the ring is slowly rotated. The spot is created by a focused beam of light created by the magnifying lens.
8. Stand by the wall and look back at the candle as the ring is turned. Do you notice how the light gets brighter when the magnifying lens passes between you and the candle flame? This is similar to the flash created by the bulls-eyes in a Fresnel lens. The lighthouse (candle) is on all the time, but it is the "flash" that is noticeable.

Lighthouse Identification:

1. Discuss how the appearance of each lighthouse beacon was different than the beacons of all the others and how this unique characteristic allowed mariners to distinguish one lighthouse from another at night. Ask students why this could be important and respond to answers accordingly.
2. Identify and discuss the three main factors that make up a beacon's unique characteristic:
 - a. **Color:** The color of a beacon's light was often used to communicate important information and/or identify the purpose of the lighthouse
 - i. **White-** used to identify navigational beacons. (W)
 - ii. **Red-** Often used to identify dangerous areas and to warn ships that can see the red light to turn away. Red is also used to identify the starboard (right) side of a channel. (R)
 - iii. **Green-** Often used to identify safe waters. Green is also used to identify the port (left) side of a channel. (G)
 - b. **Flash Pattern:** A beacon may remain steady or possess a unique flash pattern. The most common patterns include:
 - i. **Fixed-** A continuous steady light that does not flash. (F.)
 - ii. **Fixed Flashing-** A beacon that features a single flash. (F. Fl.)
 - iii. **Group Flashing-** A beacon that features a group of flashes over a specific period of time. (Gr. Fl.)
 - c. **Time:** The amount of time it takes for a specific flash pattern to occur varies from one lighthouse to another. Most flash patterns take between 15 and 60 seconds to complete before repeating themselves.

- Discuss how the beacon characteristic of each lighthouse was listed in the Coast Guard's *Light List* and how information describing each lighthouse's unique beacon characteristic was written using the Light List Examples sheet.
- Demonstrate the beacon characteristic of the Ponce Inlet Lighthouse using a flashlight and clock. Turn the light on 6 times within the first 13 seconds and leave off for the following 17 seconds. Repeat pattern once more and discuss how the light flashed 6 times (thus indicating a group flash) during the first 13 seconds and then did not flash for the next 17 seconds (the period without any flashes is known as the eclipse). Repeat activity using the St. Augustine beacon characteristic (one flash at beginning of 30 second cycle followed by a 29 second eclipse).
- Show how the beacon characteristics of the Ponce Inlet and St. Augustine Lighthouses can also be drawn in bar form. The white triangles represent a flash. Black represents an eclipse. The entire bar represents the cycle time.

Examples

Ponce Inlet Lighthouse:

Gp. Fl. W., 30 sec.



Saint Augustine Lighthouse:

F.Fl. W., 30 sec.



- Hand out practice sheet and instruct students to draw a line connecting each beacon characteristic description to its corresponding bar graph in the first section of the worksheet and identify each lighthouse described in the second section of the worksheet using the sample Light List. Review student responses and ask for volunteers to demonstrate each lighthouse beacon characteristic using the flashlight.



Light List Entry Examples

St. Augustine Lighthouse

F. FL. W., 30 sec.

F.Fl. = fixed flashing light

W. = white light

30 sec. = 30 second repeat pattern

Note: A single flash occurred at the beginning of the timed cycle. The Saint Augustine Lighthouse beacon would flash once at the beginning of the cycle with no more flashes for the remaining 29 seconds of its 30 second cycle.

Ponce Inlet Lighthouse

Gp. FL. W., 30 sec.

6 flashes

Gp. Fl. = Grouped Flashing Light

W. = white light

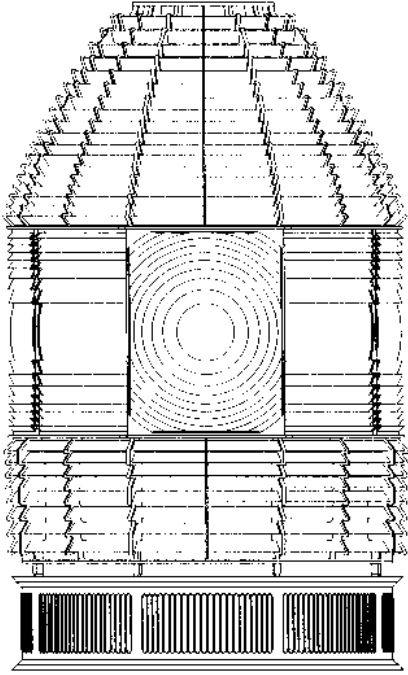
30 sec. = 30 second repeat pattern

6 flashes = 6 flashes in group

Note: Group flashes occurred together and were not evenly spaced through entire timed cycle. For example, the Ponce Inlet Lighthouse beacon would flash 6 times within the first 13 seconds with no flashes during the final 17 seconds of its timed cycle.

Flash, Flash, Lighthouse Flash

Have you ever seen a lighthouse at night? If so, you may have noticed how the light at the top of the lighthouse flashed. The flashing light is produced by a round piece of glass called a bulls-eye lens that is very similar to the lens found in a magnifying glass.



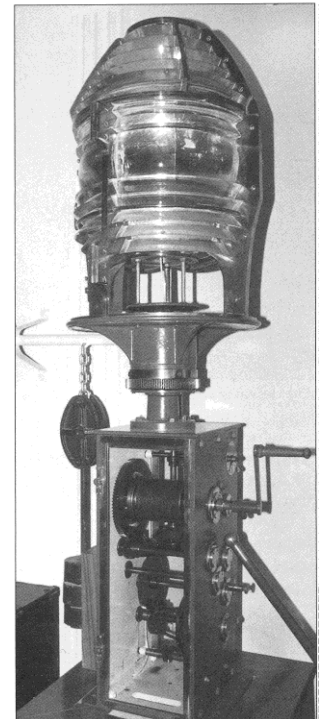
The bulls-eye lens is mounted in a large heavy optic called a Fresnel lens. A Fresnel lens is made of many individual prisms that work together to focus light into a bright beam that can be seen from miles away. Most Fresnel lenses turn and produce a flash every time the bulls-eye lens passes in front of a light located in the center of the Fresnel lens. The number of times a Fresnel lens appears to flash in a given amount of time is called a beacon characteristic.

How did lighthouse keepers turn the heavy lenses to create the individual flash characteristic? Before electricity, an elaborate clockwork mechanism turned the

lens. Much the way a grandfather's clock works today, slowly falling weights provided the propulsion to move the series of gears, which caused the lens to turn.

The weights traveled down the center of the lighthouse tower. When the weights descended as far as they could go, the lighthouse keeper had to wind the clockwork mechanism to raise the weights and start the process all over.

How often the keeper wound the clockwork depended upon how tall the lighthouse was and the lens's characteristic. Some lighthouses had to have the clockwork wound every few hours, all night long.



Student Name: _____

Date: _____

Directions: Match each beacon characteristic description with its correct bar graph picture.

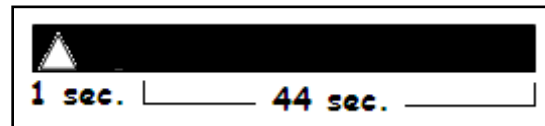
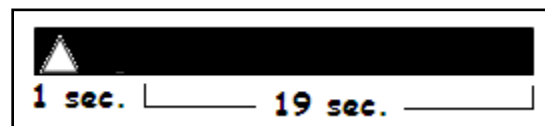
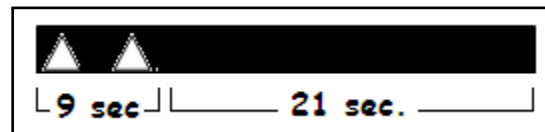
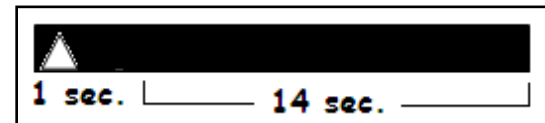
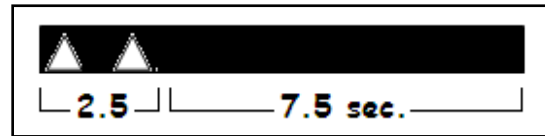
F. FL. W., 15 sec.

Gp. FL. W., 30 sec
2 flashes

F. Fl. W., 20 sec.

F. FL. W., 45 sec.

Gp. Fl. W., 10 sec.
2 flashes



Directions: Read each of the following lighthouse beacon descriptions. Using the Light List handout, identify each lighthouse and write its name in the space provided.

1. I have a white light that flashes twice every 12.5 seconds.

2. I have a white light that flashes once every 20 seconds.

3. I have a red light that flashes once every 10 seconds.

4. I have a white light that flashes once every 45 seconds.

Sample Light List

Use the following light listing of Florida lighthouses to answer questions 1-4 in section 2 of your worksheet. Good Luck!

Saint Augustine Lighthouse:	F. Fl. W., 30 sec.
Cape San Blas Lighthouse	F. Fl. W., 20 sec.
Ponce de Leon Inlet Lighthouse	Gp. Fl. W. 30 sec. 6 flashes
Cape Canaveral Lighthouse	F. Fl. W., 15 sec.
Crooked River Lighthouse	Gp. Fl. W., 12.5 sec. 2 flashes
Sabine Pass Lighthouse	F. FL. W., 45 sec.
Jupiter Inlet Lighthouse	Gp. Fl. W., 30 sec. 2 flashes
Sanibel Island Lighthouse	Gp. Fl. W. 10 sec. 2 flashes
Gasparilla Island Lighthouse	F. Fl. W., 10 sec.
Egmont Key Lighthouse	F. Fl. W., 15 sec.
Oyster Bayou Lighthouse	F. Fl. R., 10 sec.