Name: _____ Date: _____

Rings of Glass in a Lighthouse

Circle group

A lighthouse has a big job. It must send a bright beam far over the sea. Ships need to see it from far away. A lamp alone is not enough. A lamp sends light every way, and most is wasted. A lens can gather the light and bend it into one strong beam.

But a lens big enough would be thick and heavy. About two hundred years ago, a French scientist named Augustin Fresnel found a better way. He made a lens from many rings of glass. Each ring was thin. Each ring was cut at the right angle to bend light forward. Together they worked like a big lens, but they were much lighter.

The lamp sat in the middle of the rings. The lens slowly turned. The beam swept across the water like the hand of a clock. A faraway sailor saw the light flash on and off.

Each lighthouse has its own pattern of flashes. A sailor learns the pattern and knows which lighthouse it is. Then he knows where his ship is.

Questions

1. Why is a lamp alone not enough?

_____

_____

2. What is wrong with a lens that is big enough?

_____

_____

3. How was the new lens made?

_____

_____

4. Where did the lamp sit?

_____

_____

5. Why does the light seem to flash?

_____

_____

6. How does a flash pattern help a sailor?

_____

_____

Words to know

beam: a strong, narrow line of light
lens: a curved piece of glass that bends light
wasted: used in a way that does no good
angle: the shape made where two lines or surfaces meet
pattern: a set of things that repeats in a regular way

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

Name: _____ Date: _____

Rings of Glass in a Lighthouse

Triangle group

A lighthouse has a big job. It must send a bright beam of light far across the sea, so that ships can see it from a long way off. A lamp alone is not enough. A lamp sends light in all directions, and most of it would be wasted. A lens can gather that light and bend it into one strong beam.

The trouble is that a lens big enough to do the job would be very thick and very heavy. Glass that thick would be hard to make and hard to carry up a tall tower. About two hundred years ago, a French scientist named Augustin Fresnel found a better way. He built a lens out of many rings of glass. Each ring was thin, and each was cut at just the right angle to bend the light forward. Together they worked like a huge lens, but they weighed far less.

The lamp sat in the middle of the rings. In many lighthouses, the whole lens slowly turned, so the beam swept across the water like the hand of a clock. To a sailor far away, the light seemed to flash on and off.

Each lighthouse flashes in its own pattern, with its own count of flashes and pauses. A sailor who learns the pattern can tell which lighthouse he is seeing, and so he knows where his ship is.

Questions

1. Why is a lamp alone not enough for a lighthouse?

_____

_____

2. What is the problem with a lens that is big enough?

_____

_____

3. How was the new lens built?

_____

_____

4. Where did the lamp sit?

_____

_____

5. Why does the light seem to flash on and off?

_____

_____

6. How can a flashing pattern help a sailor find his way?

_____

_____

Words to know

beam: a strong, narrow line of light
lens: a curved piece of glass that bends light
wasted: used in a way that does no good
angle: the shape made where two lines or surfaces meet
pattern: a set of things that repeats in a regular way

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

Name: _____ Date: _____

Rings of Glass in a Lighthouse

Square group

A lighthouse has an important job to do. It must send a bright beam of light far across the sea, so that ships can see it from a great distance. A lamp alone is not sufficient, because a lamp sends light in every direction and most of it would be wasted. A lens, however, can gather that light and bend it into a single, powerful beam.

The difficulty is that a lens large enough to do the job would be extremely thick and heavy. Glass of that size would be hard to make and even harder to carry up a tall tower. About two hundred years ago, a French scientist named Augustin Fresnel discovered a much better approach. He constructed a lens out of many rings of glass. Each ring was thin, and each was cut at precisely the right angle to bend the light forward. Together they performed like an enormous lens, yet they weighed far less.

The lamp sat in the center of the rings. In many lighthouses, the whole lens turned slowly, so that the beam swept across the water like the hand of a clock. To a sailor far away, the light appeared to flash on and off.

Every lighthouse flashes in its own pattern, with its own count of flashes and pauses. A sailor who learns the pattern can identify which lighthouse he is looking at, and therefore he can work out where his ship is.

Questions

1. Why is a lamp alone not sufficient for a lighthouse?

_____

_____

2. What is the difficulty with a lens that is large enough?

_____

_____

3. How did Fresnel construct the new lens?

_____

_____

4. Where did the lamp sit?

_____

_____

5. Why does the light appear to flash on and off?

_____

_____

6. How can a flashing pattern help a sailor find his way?

_____

_____

Words to know

beam: a strong, narrow line of light
lens: a curved piece of glass that bends light
wasted: used in a way that does no good
angle: the shape made where two lines or surfaces meet
pattern: a set of things that repeats in a regular way

Talk together (every group has these)

1. Find one fact that every group read. How did your sheet say it?
2. What did your sheet tell you that you think another group's did not? Ask them.
3. What is one question about this topic that none of the sheets answered?

For the teacher: Rings of Glass in a Lighthouse

Each student sheet carries a shape, not a level. The same topic and facts, written three ways.

Circle: Rings of Glass in a Lighthouse

Easier · 176 words · Flesch-Kincaid grade 2.3

1. A lamp sends light every way, so most is wasted.
2. It would be thick and heavy.
3. From many thin rings of glass cut at the right angle.
4. In the middle of the rings.
5. The lens turns, so the beam sweeps past a sailor.
6. Each lighthouse has its own pattern, so he knows which one he sees and where he is.

Triangle: Rings of Glass in a Lighthouse

This passage · 231 words · Flesch-Kincaid grade 4.1

1. A lamp sends light in all directions, so most of it would be wasted.
2. It would be very thick and heavy.
3. Out of many thin rings of glass, each cut at the right angle.
4. In the middle of the rings.
5. The lens turns, so the beam sweeps past a sailor like the hand of a clock.
6. Each lighthouse has its own pattern, so the sailor can tell which one he sees and where his ship is.

Square: Rings of Glass in a Lighthouse

Harder · 241 words · Flesch-Kincaid grade 6.5

1. A lamp sends light in every direction, so most of it would be wasted.
2. It would be extremely thick and heavy.
3. Out of many thin rings of glass, each cut at precisely the right angle.
4. In the center of the rings.
5. The lens turns slowly, so the beam sweeps past a faraway sailor like the hand of a clock.
6. Each lighthouse has its own pattern, so the sailor can identify which one he sees and work out where his ship is.