SECTION 6b

Refraction

Student Pages

SCIENCE LAB BOOK

LIGHT ENERGY

STUDENT NAME

_____

EXPERIMENT LOG

EXPERIMENT TITLE:

DATE:

LAB PARTNERS:

NOTES/QUESTIONS:

RESULTS/CHART/GRAPH

CONCLUSIONS

REFLECTION LOG

LESSON TITLE:

PRE-LESSON

Write two or three questions you hope will be answered.

Write the open-ended question/questions given to you by your instructor.

POST-LESSON

1) What new knowledge did you gain today?

2) List three things from today's lesson that will be most helpful to you?

3) Check your pre-lesson questions. Write the answer those questions that were answered. Ask the other questions during class discussion.

SCIENCE TERMS

Understanding Vocabulary

Term: _____

My Understanding 1 2 3 4 (circle one)

Describe:

_____

_____

_____

_____

Draw

Term: _____

My Understanding 1 2 3 4 (circle one)

Describe:

_____

_____

_____

_____

Draw

Is It Real or an Illusion?

Student Lab Page **Guided Inquiry**

How does light change as it goes from a less dense medium to a denser medium?

Materials

- Clear plastic cup
- Water
- Oil
- Pencil
- Science Lab Book – Reflection log

Procedure

1. Complete the pre-lesson part of the Reflection Log using the question, "How does light change as it goes from a less dense medium to a denser medium?"
2. Fill a clear glass ¾ full of water.
3. Place a pencil into the glass of water.
4. Observe the pencil from the side of the glass.
5. Draw and describe what the pencil looks like **ABOVE**, **BELOW**, and **AT** the water line.
6. Provide reasons for what is going on.
7. Add ½ to 1 inch of oil to the cup of water.
8. Describe what happens.
9. Draw and describe what the pencil looks like **ABOVE**, **BELOW**, and **AT** the water/oil line.
10. Complete the post-lesson part of the Reflection Log.

Lights and Prisms – Rainbows

Student Lab Page **Guided Inquiry**

As light travels through materials colors can be produced when the light scatters. What colors can be produced by scattering white light?

Materials

- Prism box
- Light box
- Science Lab Book – Reflection Log
- White Copy Paper

Procedure

1. Complete the pre-lesson part of the Reflection Log using the question, "What colors can be produced by scattering white light?"
2. Fill the rectangular prism box about ½ full with water.
3. Position the prism box on the white paper so that you can see a beam of light traveling through it.
4. Shine the light so it enters the prism box to get a rainbow.
5. Turn the prism box to get the critical angle (The light stays in the box. Fiber optics is an example).
6. Move the prism box back to get the rainbow.
7. Describe which color bent the most.
8. Draw the prism box; the light; and the rainbow; label all the visible colors of light.
9. Complete the post-lesson part of the Reflection Log.

Lights Prisms: Reversing Rainbows

Student Lab Page Guided Inquiry

How can white light be separated and put back together again?

Materials

- Prism box
- Light box
- White copy paper
- Small round 1" diameter plexi-glass bottle filled with water (lens)
- Un-ruled index cards for screens (Screen 1 - small hole in the center and Screen 2 – without a hole)
- Science Lab Book – Reflection Log

Procedure

1. Complete the pre-lesson part of the Reflection Log using the question, "How can white light be separated and put back together?"
2. Fill the rectangular prism box about ½ full with water.
3. Position the prism box on the white paper so that you can see a beam of light traveling though the prism.
4. Shine the light so the light enters the prism box and produces a rainbow.
5. Place the lens filled with water in the path of the rainbow.
6. Place the lens so colors converge at one point.
7. Place screen where the light comes back together at one point (converges). (Screen 1 in diagram below)
8. Place screen 2 as shown in the diagram below.
9. Notice the colors in the rainbow are reversed on screen 2.
10. Complete the post-lesson part of the Reflection Log.

Lights and Prisms: Angles of Refraction

Student Page **Guided Inquiry**

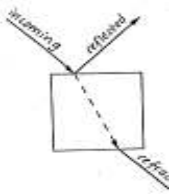
How does the light ray entering a prism compare to light ray leaving the opposite side of the prism?

Materials

- Prism box
- Powdered milk
- Light Box
- Copy paper
- Water
- Pencil
- Science Lab Book – Reflection Log

Procedure

1. Complete the pre-lesson part of the Reflection Log using the question: "How does the light ray entering a prism compare to light ray leaving the opposite side of the prism?"
2. Fill the rectangular prism box about ½ full with water
3. Add a small amount of milk or non-dairy creamer to the water to make it slightly less transparent. This will make it easier to see the light.
4. Position the prism on the white paper so that you can see a beam of light traveling through it.
5. Shine the light so it enters the box on one side and exits on the OPPOSITE side.
6. With the pencil, trace the box, and the three "lines" of light on the paper.
7. Notice the light inside the box as you look down on the top of the box.
8. Does it line up with the light beams you see on the paper underneath it?
9. Remove the box from the paper.
10. Using the pencil, connect the "lines of light where the box used to be.
11. Notice that the light was bent twice, once at each boundary. The light coming out of the far side of the box is parallel to the incoming light.
12. OPTIONAL: Measure the angle of incidence and reflection.
13. Complete the post-lesson part of the Reflection Log



refracted

Blue Sky

Student Lab Page **Guided Inquiry**

You can create a model of a blue sky. Why are the sky blue and the sunset yellow-orange?

Materials

- Clear plastic box (shoebox size or small aquarium)
- Flashlight
- Powdered milk
- White Cardstock
- Science Lab book – Reflection Log

Procedure

1. Complete the pre-lesson part of the Reflection Log using the question, "Why are the sky blue and the sunset yellow-orange.?"
2. Fill the container ¾th full of water.
3. Place the light source so that the beam shines through the container.
4. Add powdered milk – a pinch at a time. Stir until you can clearly see the beam of light.
5. Observe the beam from the side of the container and then from the end of the container.
6. Let the light project onto a white card that you hold at the opposite end of the container from the light source.
7. Describe what the light looks like on the card at the end of the container.
8. Let the project onto a white card that you hold at the side of the container.
9. Describe what the light looks like on the card at the side of the container.
10. Complete the post-lesson part of the Reflection Log.

Glue Stick Sunset

Student Lab Page Guided Inquiry

Why is the sky blue?

Materials

1. Mini-MagLite or penlight (a regular flashlight can also be used, but its larger beam of light doesn't work as well)
2. 4 to 6 glue sticks (must be the clear ones used in glue guns)
3. White background (paper, wall, or cloth)
4. Clear packaging tape
5. Reflection Log page

Procedure

1. Complete the pre-lesson part of the Reflection Log. Use "Why is the sky blue?" as your open-ended question.
2. Shine the Mini-MagLite into one end of a glue stick and hold the other end of the glue stick approximately one centimeter from the white background.
3. Notice that the end of the glue stick closer to the Mini-MagLite is a different color than the end nearer the white background.
4. Notice the color of the circle on the white background.
5. Place two glue sticks end to end, and attach them together with the clear tape.
6. Repeat the investigation with the Mini-MagLite.
7. Notice any difference in the colors along the glue sticks and in the colored circle on the white background.
8. Continue to attach more glue sticks with the clear tape.
9. Notice the changes in color and intensity along the glue sticks and in the colored circle.
10. Complete the post-lesson part of the Reflection Log.

Exploring Refraction with Light box

Student Lab Page **Guided Inquiry**

What can you do with light? Can you bend light around objects? Can you separate white light into colors?

Materials

- Light box
- Set of lenses
- mirrors
- White paper
- Pencil
- Science Lab Book – Reflection Log

Procedure

Use your light box to explore with concave and convex lenses. Answer the following questions by exploring different situations. Add the results of your explorations to your Science Lab Book – Reflection Log.

Questions to Answer

1. Complete the pre-lesson part of the Reflection Log using the questions, "Can you bend light around an object? Can you separate light into colors?"
2. Can you bend light around an object (pencil)? Explain why or why not. If you can bend light explain how.
3. Can you produce colors? If so what colors occur and why.
4. Can mirrors be used to increase the amount of color projected? Explain.
5. Can you place the lenses in combination to diverge and then converge the light source? Explain.
6. Can you change the size of an image using a lens? Explain.
7. Find other objects in the room that can be used as a lens (concave or convex). How do they compare to the lenses provided?
8. Draw diagrams showing what is happening when light travels through different lenses (angles of light rays).
9. What is the measurement of angles that are occurring?
10. Can you change the angles of light rays? What are the smallest and largest angles you can produce and how.
11. Does the angle change with the size or shape of the lens?
12. Complete the post-lesson part of the Reflection Log.