Chapter 10 Light and Reflection

Materials

Please see the teaching notes for each activity for a list of the materials required. Please see page TR-31 for a summary of the materials required in this chapter and other chapters.

Advance Preparation

- Inspect and repair flashlights and lamps with various bulbs.
- Collect a class set of metal spoons, flashlights, putty, ray boxes, protractors, Miras (optional), and mirrors (convex, concave, and plane with stands).
- Purchase glue gel, glow-in-the-dark paint powder, borax, resealable plastic bags (optional), and large white cardboard (or screens).
- Reserve a television or other remote activated device and "obstacles" for Activity 10-2.
- Students can preview the Key Terms in Chapter 10 using **BLM 10-3 Chapter 10 Key Terms.**

In this chapter, students learn about the characteristics and sources of light as well as investigating how it is reflected in different mirror shapes. They relate the characteristics of images formed in different types of mirrors to potential applications.

Using the Chapter Opener (Student textbook pages 401 and 402)

- Survey the class for personal experiences with phosphorescence such as glow-in-the-dark makeup, star stickers, lightning bugs, or the algae described in the textbook. Ask why this quality is useful and where else it could be used.
- Ask "What is light? Where does it come from? How does it influence our experience of the world?"

Alternative Context

Ask students how many stars they can see at night. Are there places they go where they can see more stars than at home? Light pollution (stray light from light bulbs) creates a dull glow in the night sky, blocking the view of the stars. This makes astronomy difficult, wastes a lot of electricity (and money), and creates problems for migrating birds and the natural night/day rhythms of all living things. In small groups, have students brainstorm solutions to light pollution. Encourage them to draw upon their existing understanding of the directionality of light rays. As they proceed through the chapter, have students add ideas about how the principles explored could help reduce light pollution.

Activity 10-1 Glowing Slime (Student textbook page 401)

Pedagogical Purpose

This activity shows students one way to generate light without heat, leading into the concept of different light sources later in this chapter.

Planning		
Materials	Two 500 mL measuring cups 15 mL glue gel (white glue) 1 mL glow-in-the-dark paint powder 10 mL 4% (saturated) borax solution Resealable plastic bag	Measuring spoons 45 mL warm water Flashlight Spoon
	1 or 2 days before, gather materials. You may wish to have students bring a flashlight from home. Make the borax solution by dissolving 4 g of borax in 100 mL of water.	
Time	15 min	
Safety	Remind students to never eat or drink anything in science class. Caution students to keep their faces away from the paint powder and avoid inhaling it. You may wish to take the extra precaution of having students wear dust masks during this activity. Remind students to wear goggles, gloves, and an apron. The paint may stain clothing and irritate skin and eyes.	

Background Knowledge

This form of glow-in-the-dark material operates because of fluorescence. Light generation is related to chemistry. Recall that electrons in atoms occupy one of a number of energy levels. Each of these energy levels has its own energy. If an electron jumps to a higher energy level, it must absorb a certain amount of energy. When the electron drops back to its natural level, it releases energy in the form of a photon. This photon will have a wavelength related to its energy. The longer the wavelength, the less energy is in the photon.

Activity Notes and Troubleshooting

- You may wish to pre-measure the materials for a cooking-show style to save time. In this case, pre-measure the glue, paint, borax, and water into individual small containers to be assembled more quickly.
- To increase the "real science" feel, you may wish to substitute graduated cylinders, beakers, and scales for the measuring spoons and cups in this activity. The resealable plastic bag may be omitted, shining the light instead onto the slime in the measuring cup.
- Have students work in groups of three or four, each taking on a role such as scribe, observer, etc.

Additional Support

- DI This is an excellent activity for bodily-kinesthetic and interpersonal learners.
- Extension—Have students evaluate whether different light sources have different results such as a longer or brighter light emission. Is "cool" light from an LED bulb more or less effective than light from an incandescent bulb?

Answers

1. The slime glowed in the dark.
2. When the glow-in-the-dark paint absorbs light, some electrons become excited and reach a higher energy level. When these electrons return to their original energy level, the excess energy is emitted as light.

Study Toolkit

Strategy	Page Reference	Additional Support
Interpreting Diagrams	As students view Figure 10.5 on page 405, have them identify the meaning of the "e" and "Hg" coloured balls as well as the meaning of the arrows. Look in the caption and the narrative for clues. Encourage students to refer to notes from the chemistry unit.	Refer students to the Study Toolkit Overview, in particular the Reading Graphic Text section on page 560 of the student textbook.
Comparing and Contrasting	Before reading sections 10.3 and 10.4, have student prepare a Venn diagram or T-chart in which to compare the qualities and equations relating to concave and convex mirrors.	Refer students to Study Toolkit 4, in particular the section on Venn diagrams on page 566 of the student textbook. They may also find **BLM G-46 T-chart** or **BLM G-47 Venn Diagram** helpful.
Base Words	Have students consider the base for the term *curvature* as they read page 422. Does the meaning of *curve* help them form an understanding?	Refer students to Study Toolkit 3 on page 564 of the student textbook. Students may find **BLM G-40 Word Study** helpful.