Important Concepts . . .

Preview Review

Science *Grade 8* *TEACHER KEY*

W3 - Lesson 2: Reflection and Refraction of Light

V5-07

Important Concepts of Grade 8 Science

W1 - Lesson 1 ..... Mass, Volume, and Density
W1 - Lesson 2 ..... Solubility and Saturation Points
W1 - Lesson 3A..... Viscosity, Flow Rate, and Buoyancy
W1 - Lesson 3B..... Simple Machines
W1 - Lesson 4 .....Gears, Mechanical Advantage, Speed Ratios, and Efficiency
W1 - Lesson 5 .....Hydraulics and Pneumatics
W1- Quiz
W2 - Lesson 1 ....The Role of Cells within Living Things, Cells-Tissue-Organ System
W2 - Lesson 2 ..... The Microscope
W2 - Lesson 3 ..... Body Systems Part 1
W2 - Lesson 4 ..... Body Systems Part 2
W2 - Lesson 5 .....Problems Associated with Body Systems
W2 - Quiz
W3 - Lesson 1 .....Transmission and Absorption of Light
W3 - Lesson 2 ..... Reflection and Refraction of Light
W3 - Lesson 3A.....Vision and Lenses
W3 - Lesson 3B.. Water in its Various States Affects Earth's Landforms and Climate
W3 - Lesson 4 ..... Adaptations to Aquatic Ecosystems
W3 - Lesson 5 ..... Water Quality
W3 - Quiz .....

Materials Required

Textbook:
Science in Action 8

Science Grade 8
Version 5
Preview/Review W3 - Lesson 2 TEACHER KEY

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Preview/Review Concepts for Grade Eight Science

TEACHER KEY

W3 - Lesson 2:
Reflection and Refraction of Light

OBJECTIVES

By the end of this lesson, you should

- define and work with the law of reflection
- define refraction
- explain how refraction can be increased or decreased
- explain how to separate the colours of the spectrum

GLOSSARY

law of reflection - the angle of incidence (angle that light hits a surface) equals the angle of reflection

reflection - bouncing light off a surface

refraction - the bending of light as it passes from one medium to another

visible spectrum - the range of wavelengths that produce visible light

W3 - Lesson 2: Reflection and Refraction of Light

Welcome to W3 - Lesson 2. This lesson is designed to teach you the difference between **light reflection** and **light refraction**. It should take about 1.5 hours to complete.

Light can be reflected or refracted if it hits the right material or surface. This lesson discusses some of the principles involved with these properties of light.

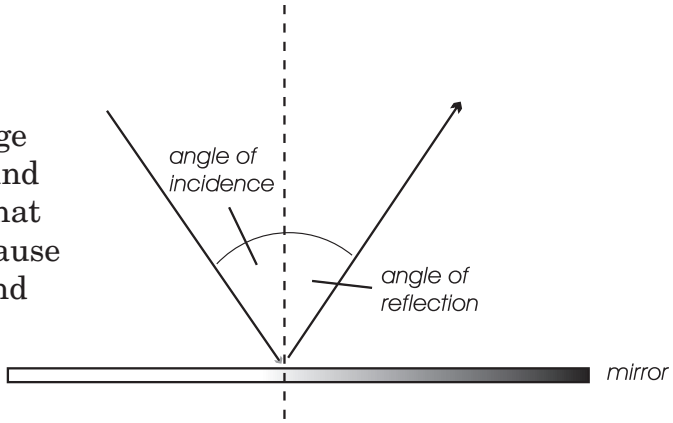
Reflection of Light

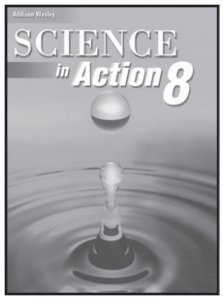
Reflection occurs when light hits an object and bounces off it, much like when you bounce a ball. When the ball hits the floor or wall, it bounces off it. When light strikes a surface, whether smooth or rough, it can bounce back. Many objects such as a mirror reflect light. In fact, you see because of reflected light. Everything around you that you can see is reflecting light.

If you see the colour of an object, the object is absorbing all the light in the visible light range of the spectrum except the colour that you can see; that colour is being reflected.

The **law of reflection** states that if a light ray hits an object at a certain angle, it will bounce off the object at the same opposite angle. A more scientific way of saying this is "the angle of incidence equals the angle of reflection".

Mirrors are common reflecting surfaces. A mirror with a smooth surface creates an image that appears to be behind the mirror. We know that this is not possible because the mirror is opaque and no light can pass through it.





Activity 1

Read and understand pages 193, 194, and 196 in *Science in Action 8*. Then, answer the following questions.

1. Why would you want to wear reflective clothing if you were walking home on a dark night beside a busy highway ?

   You would want to wear reflective clothing so that the light from the headlights of cars would reflect off the clothing. Therefore, the oncoming traffic would be able to see you.

2. Describe regular reflection.

   Regular reflection occurs when light rays hit a smooth surface. The incoming rays travel parallel to one another. When these rays strike a smooth surface, they all bounce in the same direction and at the same angle; the reflected rays stay parallel to one another.

3. Describe diffuse reflection.

Diffuse reflection occurs when light rays strike a rough or uneven surface. The rays reflect, but due to the rough surface, each ray is reflected at a different angle. The reflected rays do not remain parallel.

4. How does a two-way mirror work?

These are specially designed to reflect 50 percent of the light and transmit the other 50 percent. On one side of the mirror, people see a reflection similar to that in an ordinary mirror. However, people on the other side can see right through. This works only if the room on the reflective side is brighter than the viewing room.

5. What kind of mirrors provide the clearest reflections?

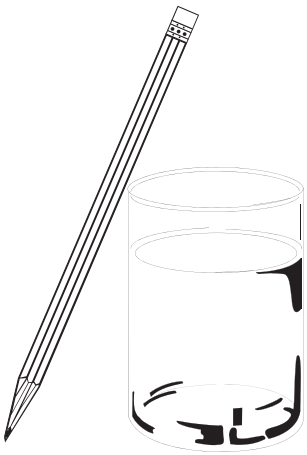
Plane mirrors (flat mirrors), made of shiny material.

6. Define the angle of reflection.

It is the angle between the reflected ray and the normal.

Refraction of Light

Light does not bend as it travels through a medium. It travels in straight lines. However, when light passes **from** one medium to another, for example, air to water, light bends and its speed changes. This is called **refraction**.



A pencil in a glass of water appears broken because the light, as it enters the water, has refracted to make the pencil appear out of shape. When you look at the bottom of a lake, objects in the water appear to be in different locations than their actual location. The more dense the material that light enters, the greater the refraction.

You have learned that the visible spectrum has a range of wavelengths. White light is made of the entire visible spectrum combined. As white light passes from air into another medium, its speed changes and it refracts. Each wavelength in the spectrum refracts at a slightly different angle, so the colors are separated, and a rainbow is produced.

For example, as the light enters a **prism** and as it leaves the change of speed causes the light waves to refract and the colors to separate, giving us a rainbow.

Activity 2

Read and understand pages 201 and 203 in *Science in Action 8*. Then, answer the following questions.

1. What is refraction and how does it occur?

It is where light is bent. Refraction is due to changes in the speed of light. In space, light travels at about 300 000 km/s. Space is a vacuum with no particles to get in the way of light and slow it. When particles get in the way, the light suddenly slows. If light strikes a medium of different density at an angle, it refracts. The beam of light will bend.

2. How does refraction change in substances with different densities?

The denser the new medium, the more the light slows and so the more it refracts.

You should now be able to meet all of the objectives listed at the beginning of the lesson. Go through the list to see if there is anything you need to spend more time on.

If you have some time remaining start Lesson 3A because there is much material that must be covered.

Extended Activity (Homework)

Have you ever seen a **mirage**? In your own words, explain how this optical illusion occurs. You may have to use another source of information.

Mirages occur mostly in the summer time when different heating and cooling of air occurs at great distances on a clear day. Because hot air has a lower density than cool air, objects are seen at a great distance (10 km or more). The light refracts because the air is at different temperatures (uneven heating of the earth's surface). Therefore, as a result, a grove of trees in the distance may appear larger or taller, or a small town's water tower may appear distorted, bigger, or taller. Flat prairie or desert may actually give the appearance of a grove of trees in the distance. This is all due to the different densities of air and the reflected light traveling through these different air masses and refracting.