

Grade 4.

Science and Technology.

5. Force and Energy.

5.2 Energy.

Energy is the capacity or ability to do work.

5.2.2 Light Energy.

Unlike sound light travel in a straight line. The following experiment shows light travels in a straight line.

- Light source (such as a flashlight or a lamp)
- Objects that cast shadows (such as solid objects, cut-out shapes, or your hands)
- Dark room or a space with minimal ambient light

Procedure:

- Set up the light source in the dark room or space, ensuring that it is stable and pointing in a specific direction.
- Position yourself so that you can observe the path of light from the source.
- Place an object or your hand between the light source and a flat surface, creating a shadow.
- Observe the shadow formed by the object on the surface.

Observations: During the experiment, you should notice the following:

- **Straight Shadows:** When the light source is directed towards the object, a well-defined shadow is formed on the surface directly opposite the object. The shadow appears to have sharp edges and maintains the same shape as the object.
- **Lack of Deviation:** As you move the object closer or farther from the light source, you will observe that the shadow follows the movement of the object. The shadow does not deviate or change its shape unless the object itself moves or the light source is obstructed.
- **Shadow Formation:** When the object is removed, the shadow disappears, indicating that the presence of the object is necessary to block the light and create the shadow.

Explanation: This experiment demonstrates that light travels in a straight line, known as rectilinear propagation. When light is emitted from a source, it moves in straight lines in all directions. When an object blocks the path of light, it creates a shadow on the opposite side. The shadow retains the shape of the object because the light rays do not bend or deviate from their straight path.

The straight formation of shadows confirms that light travels in straight lines until it encounters an obstacle or is redirected by reflective or refractive surfaces.

5.2.3 Transmission of Light through Materials.

To demonstrate the concepts of opaque, transparent, and translucent materials, you can conduct a simple experiment using different objects and a light source. Here's how you can set it up:

Materials:

- Light source (such as a flashlight or a lamp)
- Various objects or materials (e.g., a glass, a piece of paper, a plastic container, a wooden block, a piece of fabric)
- Dark room or a space with minimal ambient light

Procedure:

- Set up the light source in the dark room or space, ensuring that it is stable and pointing towards a flat surface.
- Place the first object, which is known to be opaque (e.g., a wooden block), between the light source and the surface.
- Observe the area on the surface where the light falls. Note that no light passes through the object, and there is a well-defined shadow on the surface.
- Remove the opaque object and replace it with a transparent object (e.g., a glass).
- Position the transparent object between the light source and the surface.
- Observe how light passes through the transparent object and reaches the surface, creating a distinct shadow that is less pronounced compared to the opaque object.
- Repeat the process with a translucent object (e.g., a piece of frosted glass or a plastic container).
- Position the translucent object between the light source and the surface.
- Observe how some light passes through the translucent object, but it scatters and diffuses, creating a shadow that appears blurred or less defined compared to the transparent or opaque object.

Observations: During the experiment, you should notice the following:

- **Opaque Material:** The opaque object blocks the light completely, creating a solid shadow without any light passing through.
- **Transparent Material:** The transparent object allows light to pass through it without significant obstruction, creating a distinct shadow with less intensity compared to the opaque object.
- **Translucent Material:** The translucent object allows some light to pass through, but it scatters and diffuses the light, resulting in a shadow that is less defined and appears blurred.

Explanation: This experiment demonstrates the properties of different materials in terms of their interaction with light:

- **Opaque:** Opaque materials do not allow light to pass through them. They block or absorb light, creating a solid shadow on the opposite side. Examples of opaque materials include wood, metal, and certain plastics.
- **Transparent:** Transparent materials allow light to pass through them with little obstruction. They transmit light without significant scattering or diffusion, resulting in a clear shadow. Examples of transparent materials include glass, clear plastics, and certain liquids.
- **Translucent:** Translucent materials allow some light to pass through, but they scatter and diffuse the light, making the shadow less defined. The transmitted light appears blurred or diffused. Examples of translucent materials include frosted glass, wax paper, and certain types of plastics.

