6th – Light: Shadow and Reflection I

Light:

• Light is a form of energy which helps us to see the things around us. Light is, therefore, a form of energy.

• It is essential for life on earth. Also, during photosynthesis oxygen is given off. We breathe in this oxygen.

• When we burn wood for cooking or for warming ourselves, we actually utilize the energy of sunlight that is locked up in plants. Infact the energy of all fossil fuels, such as petroleum, coal and natural gas has also been derived from the light energy.

How fast does light travel?

• Galileo once tried to measure the speed of light by trying to measure the time it takes to travel from one hill to another, but he could not. This is because light travels very fast- its speed is about 3, 00,000 km per second in air.

• It will travel the distance of approximately 2000 km between Delhi and Chennai in just 1/150th of a second. No object can travel as fast as light. The distance from the sun to the earth is 1485 lakh kilometers.

• Light travels from the sun to the earth in $8^{1/4}$ minutes. That means you see the sun rising minutes after it has already risen. It takes light several years to travel from the stars to the earth.

Sources of light

• Any object that gives out light is called a source of light. Sources of light can be natural or artificial (man made).

• Examples of natural sources of light are the sun and insects like the firefly. Some artificial sources of light are candle, electric bulb, and laser.

Luminous objects: Objects that give out light are called luminous objects.

Non luminous objects: Objects that do not give out light are called non luminous objects.

• Transparent, translucent and opaque materials.

Different types of materials transmit light differently.

Transparent material: Materials that allow light to pass through significant scattering or absorption are called transparent materials. Examples clear air, clear glass, clean water, cellophane paper.

Translucent materials: Materials that allow light to pass through them, but scatter or diffuse the light as it passes through i.e. a parallel beam of light comes through in all directions are called translucent materials. Examples butter paper, a frosted glass; paper smeared with oil and smoked glass.

Opaque material: Materials that completely block light are called opaque materials. Examples mud, cement, coal and wood.

Propagation of light: Light travel in straight line when it travels in a uniform transparent medium or in vacuum. This is called rectilinear propagation of light.

We want to represent a propagation of light with a diagram. We represent it with the help of rays and beams.

Ray: A ray is a line with an arrow that shows the direction of propagation of light, and such a diagram is called a ray diagram.

Beam: A group of light rays moving in an organized manner is called a beam of light.

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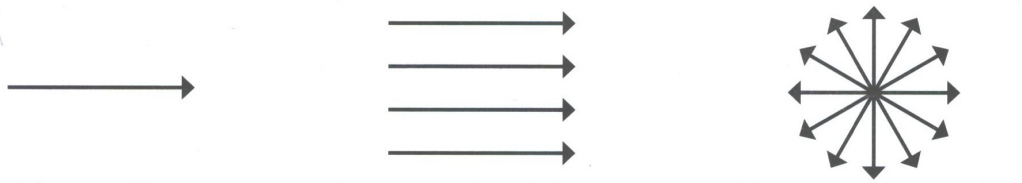
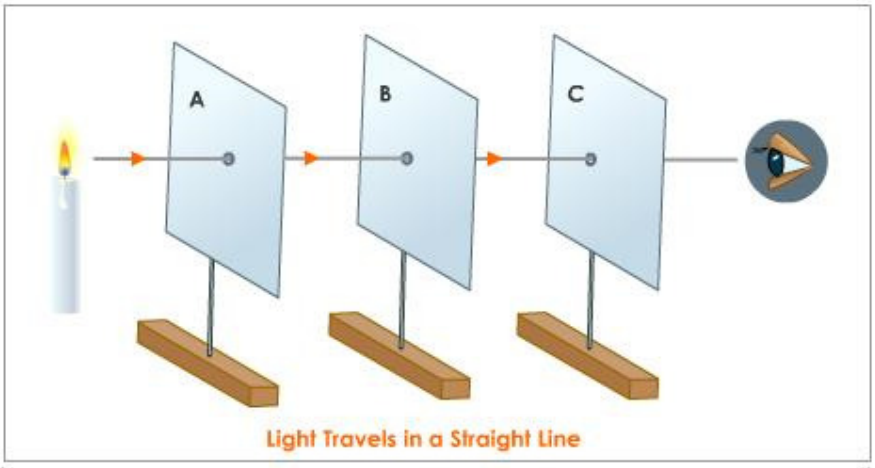


(a) A ray of light (b) A beam of parallel rays (c) A beam of rays coming from a point source of light.

Experimental investigation:

Take three rectangular pieces of cardboard. Make holes in them at exactly the same level. Make them stand straight on a table using wooden supports. Keep a burning candle on the table with its flame at the level of the holes. Now adjust the cardboards so that you can see the candle flame through the holes.



Light Travels in a Straight Line

This experiment shows that lights travel in straight lines.

Shadows:

An area of darkness formed by an opaque object obstructing light is called a shadow.

The following three things are required for a shadow to form.

- A source of light
- An opaque object
- A screen or surface behind the object

A shadow will not form if any of these is absent. This explains why we cannot see a shadow in the dark. It is only when light rays are obstructed by an opaque object that we get a shadow of the object.

Characteristic of a shadow:

A shadow has the following three characteristics:

1. It is always black, regardless of the colour of the object used to make the shadow.
2. It only shows shape or outline of the object and not the details.
3. The size of a shadow varies depending on the distance between the object and the source of light, and the distance between the object and the screen.