

5.1 How can we see ?

During the day time, we can see things clearly. But at night, we cannot see them properly. So, we switch on the lights. Even though there is either sunlight or lights on, if we close our eyes, we are not able to see anything.

So, let us find what factors help proper vision.



Activity 5.1

You will need : A cardboard box with a lid, a one rupee coin, a torch, a small object which can be kept inside the box (a dice, a flower, a key etc).

Method :-

- Cut a hole at the center of the lid similar in size of a 50 cent coin.
- Cut another small hole on one side of the box as shown in the figure.
- Now, keep the small object in the middle of the box and close the lid.
- Then, close the hole on the top of the lid with the one rupee coin.
- First, observe the object through the hole at the side of the box.
- Now, tell one of your friends to identify the object by looking through the same hole.
- Now, take away the coin and direct the light of the torch through the hole.

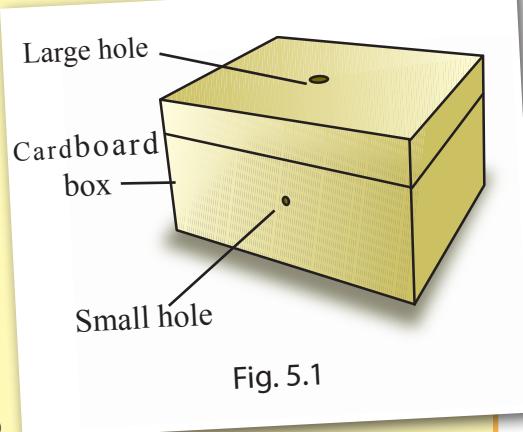


Fig. 5.1

- Then, observe the object through the hole at the side of the box again.
- Tell your friend to do the same thing.
- Ask whether he/ she can identify the object.

Discuss with your friend about the differences of the observations taken down when the hole was closed and when the torch light was directed in.

From the above activity, you can understand that light is needed to see something clearly.

Is only light enough to see an object ? Are there any other needs to be completed to see an object clearly ?



Activity 5.2

- Go to a place with plenty of light.
- Unfold your hand.
- Now, observe the lines on your palm well.
- Then, close your eyes and keep the hand unchanged.
- Can you see the same observations which you had when the eyes were opened?

Even though you close your eyes, the hand still gets light. Then, why didn't you see the lines on the palm which you observed when your eyes were opened? To have a good vision, not only light but also the eye is important. The main factors which are needed to see are a source of light and the eye.

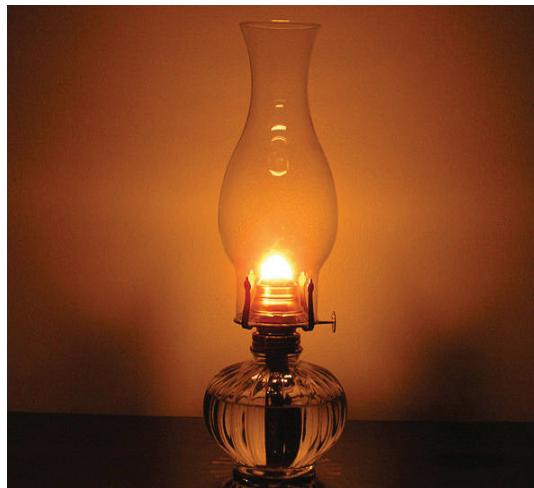
5.2 Sources of Light

The main source which gives us light is the sun. At night, we use bulbs, lamps, candles and other artificial sources to get light because there is no sunlight. Other than that, we get light even from the moon and stars at night.

We get light from these objects because they emit light. Such objects which emit light are known as sources of light.

► Luminous and Non Luminous Objects

We can't see anything when we enter a dark room. But if we light a bulb or a candle we will be able to see the candle and the bulb as well as other objects in the room. The reason is that the light emitted by the candle or the bulb enters our eye. The objects which can produce their own light is called **luminous** objects.



Lighted bulb

Lighted lamp

Fig. 5.2 ► Luminous objects.



Firefly



Light emitting mushrooms

You may have observed organisms like glow-worm and firefly producing their own light. There are also some types of mushrooms which emit light.

Think of the same dark room which was mentioned before. We are able to see not only the bulb but also other things such as bed, chair and table after the bulb was lit. But if the bulb was not lit, we won't be able to see them. The reason for this is that those objects do not emit light.

Such objects which do not emit light are known as **non luminous objects**. To get a vision of such an object, a light ray of a luminous object must fall on it.

We can see the bright moon in the night sky. Because of this you must have thought that it is a luminous object. But the moon does not emit its own light. We see it as a bright object because the rays of light emitted by the sun fall on the surface of the moon. So, we consider it as a non luminous object. Not only the moon but also the planets are non luminous too.

5.3 Transmission of Light through Objects

Glass is used in windows of many houses to get light into the house. But sometimes curtains are used to limit the amount of light fallen in. In some bathrooms decorative glasses are used to get light.

We use the property of light transmission through objects in different ways. Let us investigate further on this.



Activity 5.3

You will need : a piece of cardboard, a candle and the following objects

- a metal sheet
- an oil paper
- a piece of decorative glass
- a small piece of wooden sheet
- a thin piece of glass
- different types of polythene sheets
- a black colour paper
- tissue papers of different colours
- a piece of newspaper

Method :-

- Cut a square of the size $3\text{ cm} \times 3\text{ cm}$ in the middle of the cardboard.
- Then, light the candle.
- Now keep each of the things you have gathered in the middle of the hole to cover it.
- Next, move it towards the flame of the candle and observe the flame through the objects.

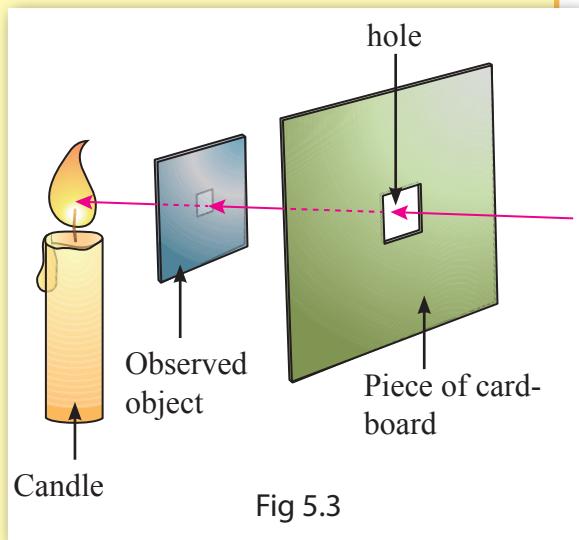


Fig 5.3

Record your observations in the following table.

Table 5.1

Used objects	Observations
1. Black colour paper	Light and the flame of candle cannot be seen.
2. Decorative glass	
3. Thin piece of glass	
4.	
5.	

Now according to the observations, categorize the objects into three groups as follows.

A

Light can be clearly seen when looked through some objects, even the flame of the candle can be clearly seen.

B

Light can be seen but flame cannot be clearly seen.

C

Both the light and the flame of the candle cannot be seen through some objects.

Decide to which group (A,B,C) do the objects used in the above activity belong. Accordingly, fill in the following table with the relevant objects.

Table 5.2

A The objects through which both the light and the flame are clearly seen	B The objects through which the light is seen but the flame is not clearly seen.	C The objects through which both light and the flame cannot be clearly seen
Thin piece of glass	Decorative glass	Black colour paper

We used only solid objects for the above activity. But, the way light transmits through liquids differs from other. Light transmits through air very easily and therefore, we can see the things around us clearly. But, when there is fog in the atmosphere, it is not possible to see things clearly.

On the other hand, we can observe different coloured fish in a tank with clear water. But, if the water is dirty and unclear, we cannot see fish clearly. This happens because light travels in different ways through

water and air. Let us do the following activity to investigate how light travels through liquids.



Activity 5.4

You will need:- Some large transparent glass bottles, a candle, water, honey, used engine oil, soft drinks, kerosene oil

Method:-

- Fill the bottles with the liquids.
- Then light the candle.
- Keep the bottle in front of the candle and observe the flame through the bottle.

Now fill the columns A,B,C of Table 5.2 with relevant objects according to your observations.

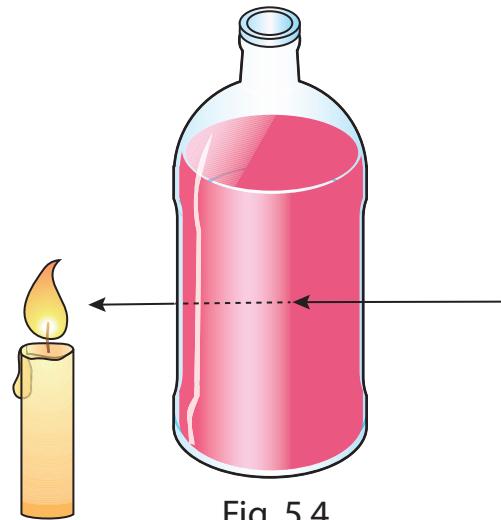


Fig. 5.4

When we look through some liquids, we can see both the object and the light clearly. The reason is that light is transmitted well through such liquids. They are called **transparent objects**. Glass and transparent colourless polythene are examples for transparent objects. When we look through oil papers, unclear water, coloured cellophane papers, although the light can be seen, the objects cannot be clearly seen. Such objects are known as **translucent objects**.

When we look through most of the objects we cannot see either the light or the object. For example, cardboard, wood, metal, paper, tar and etc. They are known as **opaque objects**.

Now you can identify the objects in the table categorized under A, B and C as transparent, translucent and opaque objects respectively.



Assignment 5.1

The following table shows some instances where we use transparent, translucent and opaque objects in daily life. Observe some other instances and add them to the table.

Objects	Whether it is transparent, translucent or opaque	Instances used
01. Glass	Transparent	In a framed photo
02. Tissue papers	Translucent	In a Vesak lantern
03. Cardboard	Opaque	In a shoe box
04.		
05.		

5.4 Light Rays and Light Beams

You may have observed the light filtering through clouds or trees on a foggy morning or light emitting from headlightings of a vehicle on a rainy night. They are known as light beams. Let's do the following activity to learn about light beams.



Activity 5.5

You will need : a candle, some same sized pieces of cardboard, a pair of scissors, a box of matches, a stand, some clay, a needle, a string

Method:

- Make holes in the pieces of cardboard as shown in the figure.
- Then light the candle and fix it.
- As shown in the figure, fix the pieces of cardboard to the stand with clay. You should be able to see the flame through all the

cardboard pieces.

- Take the needle with a string and send it through the holes carefully.
- Fix the string in a straight line and observe the flame through the holes.
- Change the string and observe the flame again through holes.

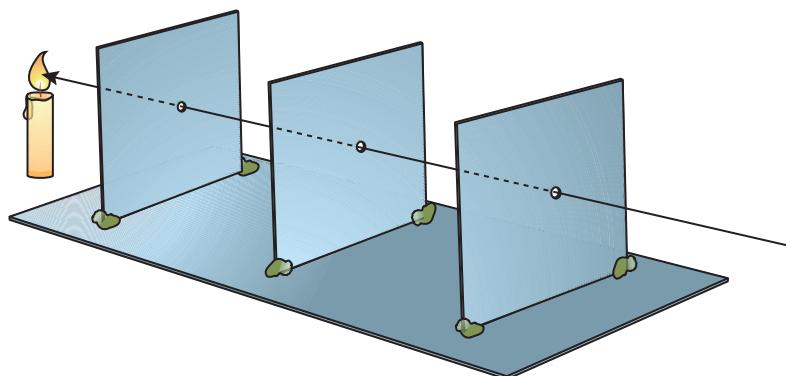


Fig. 5.5

When the string is in a straight line, we can observe the flame. But, when we change its position, we cannot observe the flame through the holes.

Here, you are able to observe the flame because the light travelled from the flame to the eye through the holes. When the holes are in a straight line, the flame could be observed and when they are not in a straight line, flame couldn't be seen. Now, you can understand that light is transmitted only in a straight line.

In the above activity, the string which was put through the holes shows the path of the light ray.

The narrow path in which light is transmitted known as a **light ray**. To show a light ray, we use a straight line with an arrow.

A **light beam** is made up of a collection of light rays. You have seen the light beam which is emitted from a torch when it is switched on. We use several straight lines with arrow heads to show a light beam.



A light ray



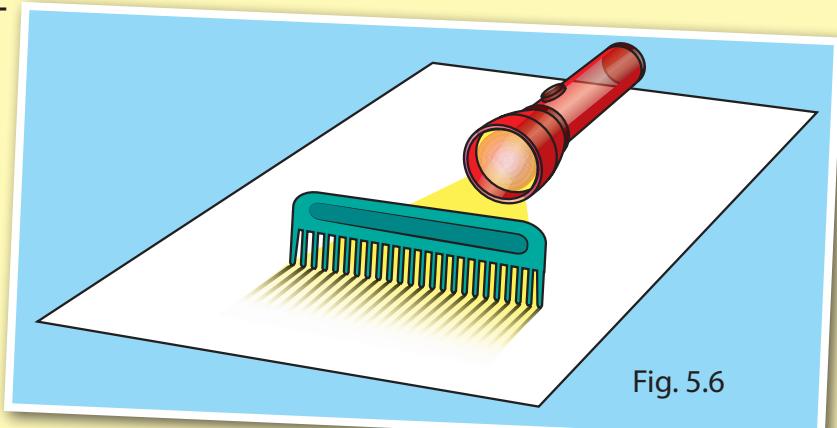
A light beam



Activity 5.6

You will need : a torch, a white colour paper, a comb with thin teeth

Method :-



- Choose a desk kept in a dark place and keep the comb as shown in the figure on the white paper, perpendicular to the desk and the teeth directed downwards.
- Direct the torch towards the comb and light it up.
- You will be able to see the beam of light emitted by the torch and the light rays which travel through the teeth of the comb.
- Mark those rays on the white paper with a pencil.
- You will see that the rays drawn by you are straight lines. They are considered as light rays.



Activity 5.7

You will need : A large transparent glass bottle, some joss sticks, a laser beam torch or a torch covered with a black colour paper with a hole in the middle, a piece of cardboard

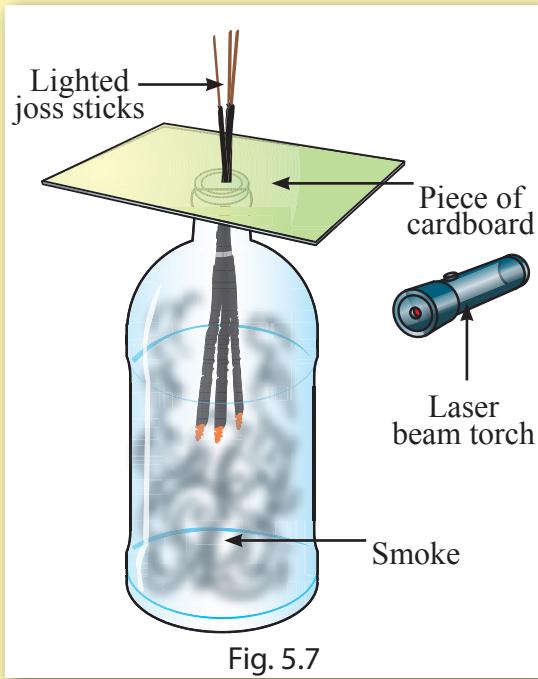


Fig. 5.7

Method :

- First, make a hole in the piece of cardboard and insert the joss sticks through it.
- Then, light the joss sticks.
- Now, as shown in the figure, close the top of the bottle with the piece of cardboard. The lighted end of the joss sticks should be put inside the bottle.
- Let the bottle to fill with smoke and direct the laser beam torch or the torch covered with the black colour paper towards the bottle and light it up.
- Change the direction of the torch and observe the differences. You can observe the path in which light transmits from the torch through the smoke in the bottle.



Activity 5.8

You will need : a large transparent glass bottle, water, a small cake of soap, a laser beam torch or a torch covered with a black colour paper which has a hole in the middle

Method :-

- Take some water and add the cake of soap and stir it well until it dissolves in the water.
- Now, fill the bottle with the soap solution.
- Then, keep the torch near the bottle and light it. Direct it towards the bottle.
- Now, change the direction of the torch and observe the changes.

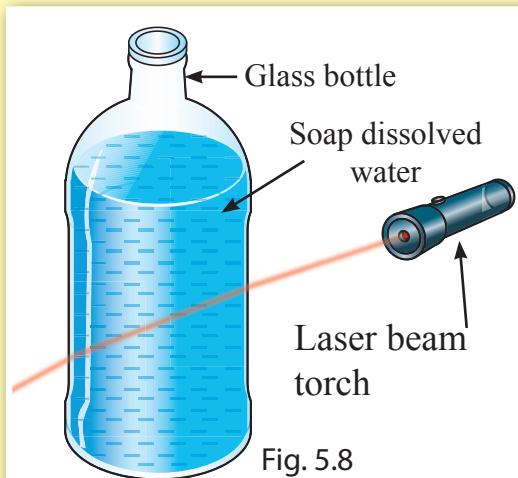


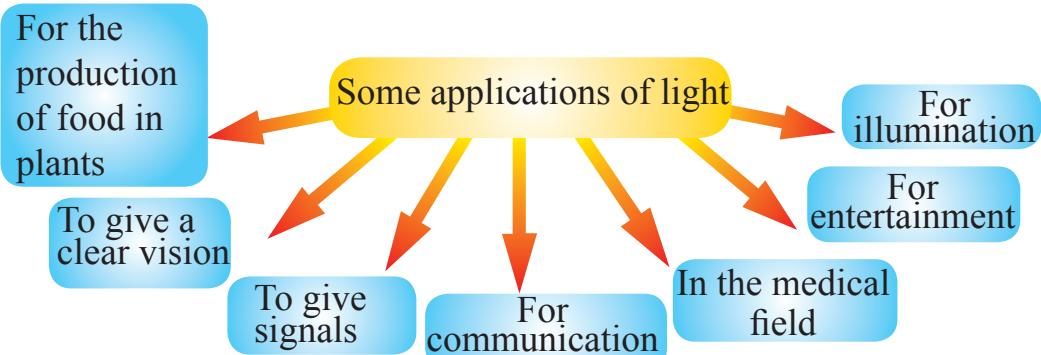
Fig. 5.8

You can see the path of the light ray through the bottle of water.

From Activities in 5.7 and 5.8, we can understand that light rays transmit in a straight line.

5.5 Applications of Light

Light is a major need for proper vision. With the development of technology, we have changed the behaviour of light and obtained many uses.



Let us categorize the applications of light as follows.

► **For the production of food in plants**

Unlike other living organisms, green plants can produce their own food. The energy needed for the process of food production is obtained from the sunlight.

You all know that all other animals directly or indirectly depend on plants for food. Because of this, we consider that production of food in plants is the main advantage of light.

Let us find more instances where we use these advantages of light.

► **To give a clear vision**

Earlier, people received light from natural objects such as the sun, the moon and stars. But after the invention of fire, man was able to produce light from various sources.

With the development of technology, the light bulb was invented to get light. Today there are many types of bulbs in the market.



Fig. 5.9 ► Different types of bulbs

►► Illumination

At present, most of the countries in the world use different coloured and patterned bulbs to illuminate various occasions.

Large light sources are used in market places, populated streets and shopping complexes for advertisements. You must have seen that not only at night but also during the day time, the lights are kept on.



Vesak pandol



Deepavali



Christmas

Fig. 5.10 ► Using lights for different occasions

►► As signals

An instance where light is used to give signals is the light used in light houses. They release a powerful beam of light which gives the signal to the sailors that the land is close.

Red is a colour which shows a danger. In traffic lights, you may have seen the colours red, green and yellow. They individually give a message to the drivers and pedestrians. More attention is gained through the use of light to give such signals.



A light house



Colours in a traffic light

Fig.5.11 ▶ Light signals

► For communication

Communication in the modern world is well developed. For this, different types of light rays are used. Telephone messages are transmitted through optic fibers. Telephone connection networks across the main cities of Sri Lanka have been built using optic fibers. Optic fibers are used to connect computer networks and high standard audio visual equipment. They use optic fibers and laser rays to send telephone messages and to maintain internet connections.

► In the medical field

At present, doctors use laser rays to treat eye patients, in heart operations and to treat wounds in the digestive system. This has increased the efficiency of treatments.

With the use of optic fibers, the interior parts of the body are easily observed. Here, the equipment used to lighten the interior of the body is called the endoscope.



Fig. 5.12 ▶ An Endoscope



Do you know?

In some countries, optic fibers are used to light the rooms in tall buildings during the day time. Here, the sunlight is sent through these fibers and the rooms are lighted up.

►► For entertainment

In musical shows and fairs, light is used in a large scale. They use spot lights of different colours to light up the stage.

Even lights are used, in toys designed for children.



Fig. 5.13 ▶ Light emitting toys

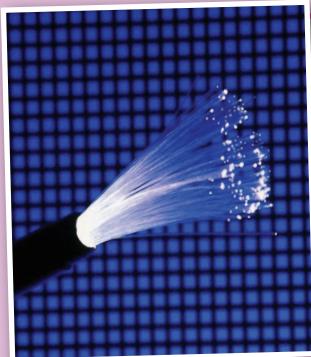
To produce light artificially we have to spend money. Therefore, unnecessary usage of light is a wastage of energy and money. So, we must always be cautious enough to stop the wastage of light and at the same time we must use it without troubling others.



Do you know?

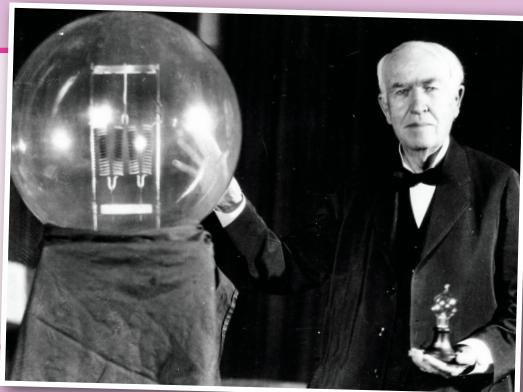
When there is a lot of fog, it is very difficult to travel on roads as we can't see anything. But light beams of headlights could be seen through fog. The reason is that air is transparent on normal foggy conditions but air becomes translucent on foggy conditions. When the humidity is high in air, air becomes translucent.

There is a new type of lamp in modern vehicles as "fog light" to be used when the atmosphere becomes translucent because of the mist.



Optical fibers are a type of flexible fibers which are made up of special type of glass or plastic. An optic tube is called a collection of such fibers. The use of such tubes to transport light is called optic fiber technology.

The first bulb with carbon filaments in the United States of America was invented by Thomas Alva Edison in 1879.





Summary

- The main factors that must be satisfied to have complete vision are light and the eye.
- The objects we use to get light are known as sources of light.
- Objects which emit their own light are known as luminous objects while the ones which cannot emit light are known as non luminous objects.
- The way light transmits through objects differs from object to object. According to that, we categorize them as transparent, translucent and opaque.
- Light transmits in straight lines.
- The combination of light rays is called a light beam.
- There are many applications of light, apart from giving vision.

Exercise

01. Select the correct answer.

i. Choose the correct statement.

- a. The moon is a luminous object.
- b. The sun is a source of light.
- c. Planets are non luminous objects.
 - i. Only a and b
 - ii. Only b and c
 - iii. All are correct
 - iv. All are wrong

ii. The correct statement of the followings is,

- a. Water, glass and decorative glass are transparent.

- b. Water, polythene and oil papers are translucent.
 - c. Oil papers, decorative glass and colourless polythene are transparent.
 - d. Cardboards, metal and papers are opaque.
- iii. Why can we see a light ray travelling through the roof of a kitchen which is filled with smoke?
- a. Because the kitchen becomes translucent when filled with smoke.
 - b. Because the kitchen becomes transparent when filled with smoke.
 - c. Because light transmits through air.
 - d. Because smoke absorbs light.

02. Fill in the blanks with the correct word.

Light is a type of It travels in a
..... Light does not travel through some objects. Such objects are known as..... To indicate the direction in which light transmits, is used. In most of the road signals,..... is used to gain more attention.
(an arrow, energy, sun light, opaque, transparent, straight line, signals, light)

03. Describe the following sentences in one word or two words.

- i. Objects which emit their own light.....
- ii. Objects which do not emit their own light.....
- iii. Objects which allow light to travel through and the object on the other side can be seen clearly.....
- iv. Objects which allow light to travel through but cannot see the object on the other side clearly.....
- v. Collection of light rays.....

Technical Terms

Vision	- பெரிம்	- பார்வை
Ray of light	- ஆலோக கிரனய	- ஒளிக்கதீர்
Illumination	- புகைப்பாடு	- ஒளிர்ப்பு
Opaque	- பாராந்தர்	- ஒளியைண்டுபுகவிடாத பொருள்கள்
Laser torch	- லேசர் வீட்டு பந்தம்	- லேசர் மின்சூள்
Luminous objects	- தீயீத வசேஷ	- ஒளிரும் பொருள்கள்
Beam of light	- ஆலோக கடமிலை	- ஒளிக்கற்றை
Non luminous objects	- அதீயீத வசேஷ	- ஒளிராப் பொருள்கள்
Translucent	- பார்ஹாசக	- ஒளியை கசிய விடும் பொருள்கள்
Transparent	- பார்தாஷா	- ஒளி/ஒளியைண்டுபுகவிடாத பொருள்கள்