Light

(i) It is a form of energy that enables us to see.

Other uses of light

(ii) It is used by plants for photosynthesis
(iii) It is used in photography; photographs are taken only in light.
(iv) Produces heat for drying of produce and clothes
(v) It is used in decorative lights
(vi) It is used in photography

Sources of light

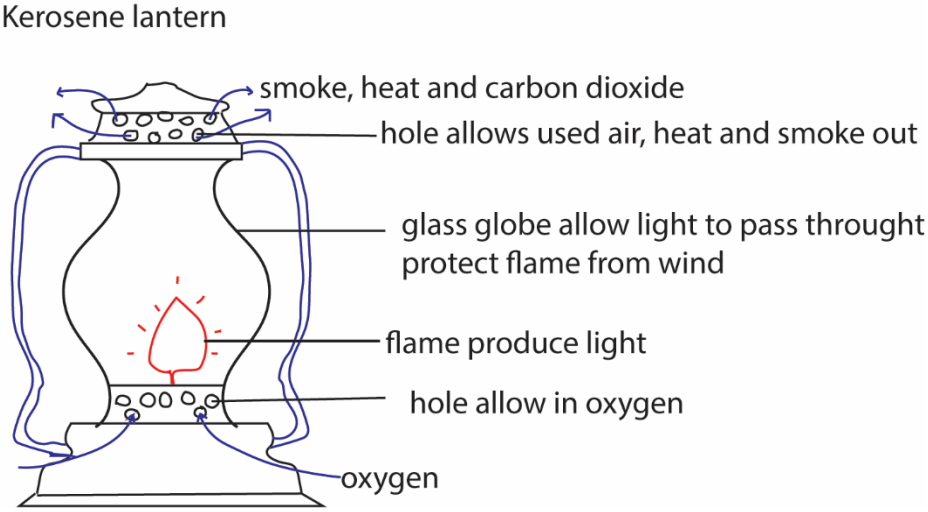
(a) Natural sources of light: sun, stars, fireflies, glow warms
(b) Artificial sources of light: lamps, candles, electricity

NB. Moon is not a source of light because it only reflects light from the sun

Kerosene lamp

This is a type of lighting device that uses kerosene as fuel. Kerosene lamps have a wick or mantle as light source, protected by a glass chimney or globe; lamps may be used on a table, or hand-held lantern may be used for portable lighting.

Kerosene lantern

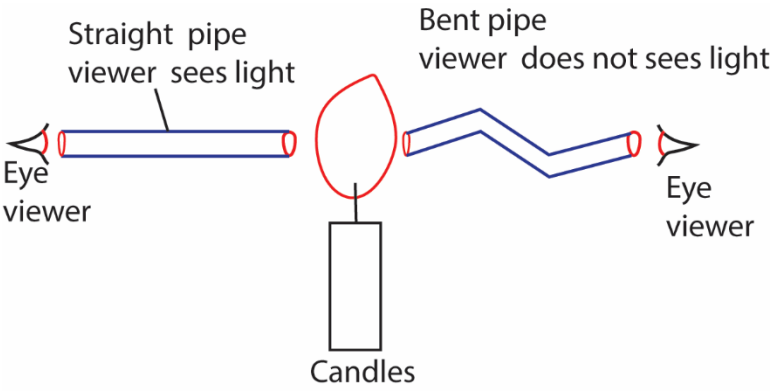


Properties of light

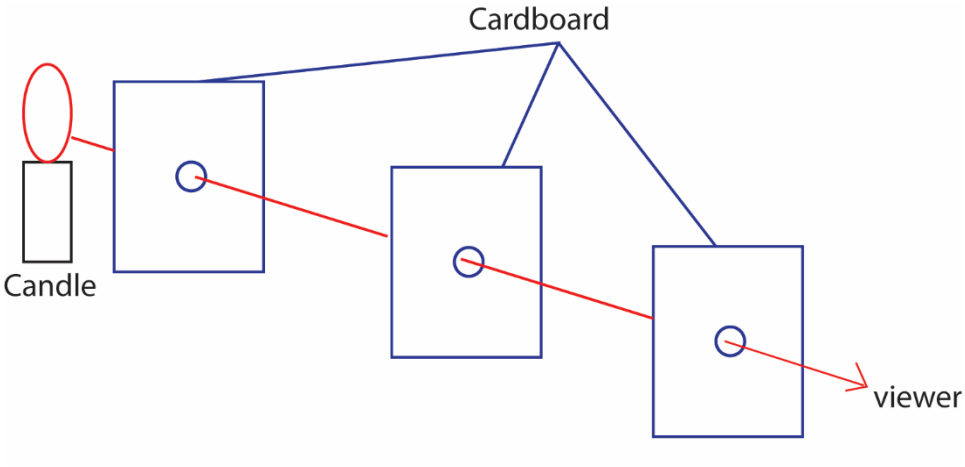
(i) Light travels in a straight line
(ii) Light can be reflected
(iii) Light can be refracted

Experiment to show that light travel in a straight line.

(i) Viewing candle light through a pipe.
With a straight pipe the viewer receives light while with a bent pipe the viewer does not receive light.



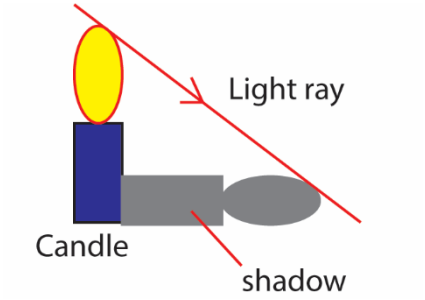
(ii) Using cardboards with holes
When the holes are in a straight line the viewer is able to see light



When one hole is removed from the line, the viewer is unable to see light.

(iii) **Shadows**

A shadow formed when light traveling in straight light is obstructed by an opaque object.



Effect of different materials on light

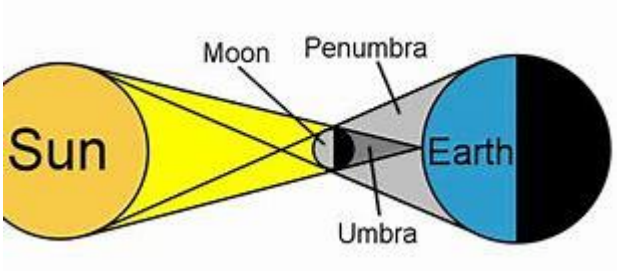
1. Transparent materials allow light to pass through for example clear glass, clear water, clear air.
2. Translucent materials allows some light o pass through for example a patch of oil on paper, translucent glass
3. Opaque materials do not allow light to pass through. Examples are brick wall. Tree, human being, stones.

Eclipses

The sun is a luminous object and thus a source of light. The earth and moon are opaque objects in the universe.

Solar eclipse or eclipse of the sun

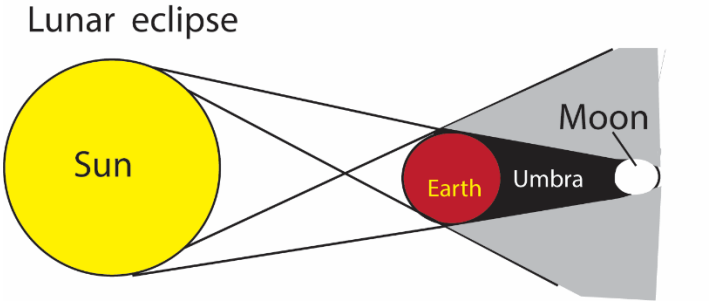
When the moon rotates and comes between the sun and earth, it cast a shadow on the earth. This is also called solar eclipse



The dark shadow is called umbra while the lighter shadow is called penumbra.

Lunar eclipse or Eclipse of the moon

The earth comes between the sun and the moon, casting its shadow on the moon.



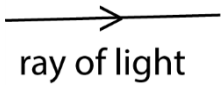
Ways of lighting a house

The house needs to be well lit during the day and at night. We can light our houses in the following ways:

(i) Open the windows during the day to enable sunlight to light the house.
(ii) Use **translucent** roofs. These are roofs made in a special way to allow light to pass through them. This type of roof allows sunlight to get into the house during the day.
(iii)At night, there is no sunlight and therefore artificial lighting may be used. Examples of artificial lighting are: using fire from firewood, a torch, lamp, candle, gas lamp or electricity.

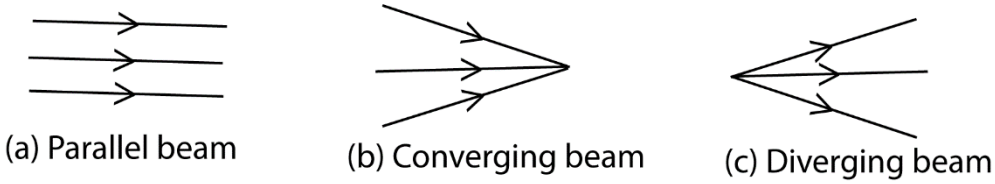
Light rays

The path taken or indicating the direction along which light energy travels is known as a ray of light. A ray is indicated with an arrow.



Beam of light

A group of light is called a beams. There are three types of beams namely

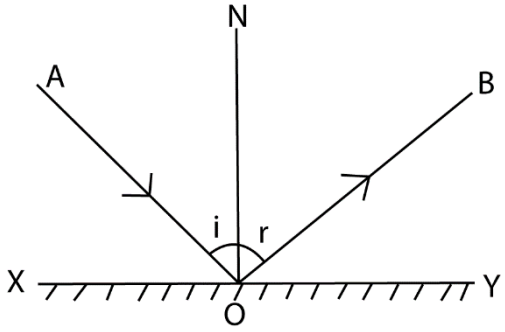


Reflection of light at a plane mirror

Reflection is the bouncing back of light energy when it meets an obstacle

Laws of reflection of light

Consider a ray of light AO incident on a plane surface and then reflected along OB as shown.



O = point of Incidence.
AO = incident ray
OB = reflected ray.
ON = normal to the reflecting surface
∠i = angle of incidence
∠r = angle of reflection

Laws of reflection

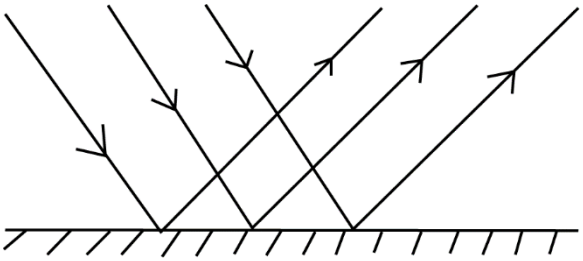
LAW 1:

The incident ray, the reflected ray, and the normal at the point of incidence all lie in the same plane.

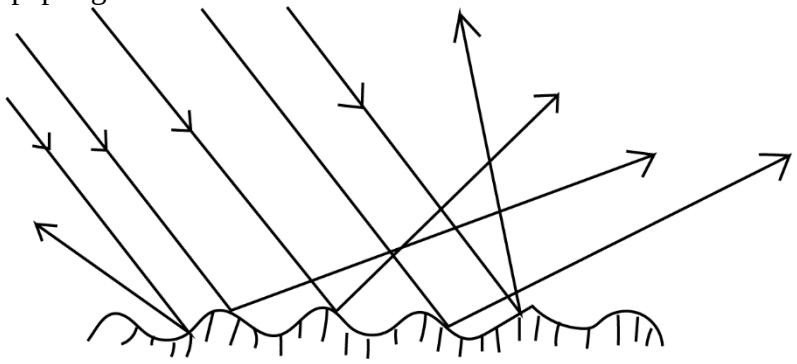
LAW 2:
The angle of incidence is equal to the angle of reflection.

Types of reflection:

(i).REGULAR REFLECTION: This occurs when a parallel beam of light incident on a smooth surface such as a plane mirror gets reflected as a parallel beam as shown.



(ii). DIFFUSE / IRREGULAR REFLECTION: This occurs when a parallel beam of light incident on a rough surface such as a paper gets reflected while scattered in different directions as shown

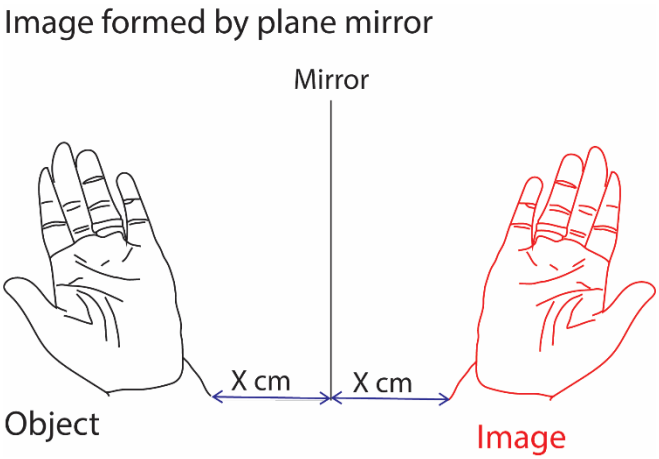


Differences between regular and irregular reflection

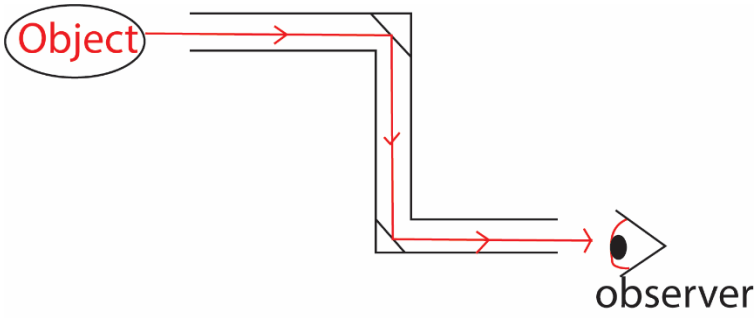
Regular reflection	**Irregular reflection**
Occurs on smooth surface	Occurs on a rough surface
Parallel incident beam is reflected parallel	Parallel incident beam is scattered after reflection
Reflected beam is very bright	Reflected beam is dull

Properties of images formed by a plane mirror

(i) They are upright
(ii) They are the same size as the objects
(iii) They are equal distance from the mirror as the mirror as the object
(iv) They appear behind the mirror
(v) They are laterally inverted.



The periscope



It is an instrument used to observe things around corners. It is commonly used by submarines to see objects on the sea or ocean.

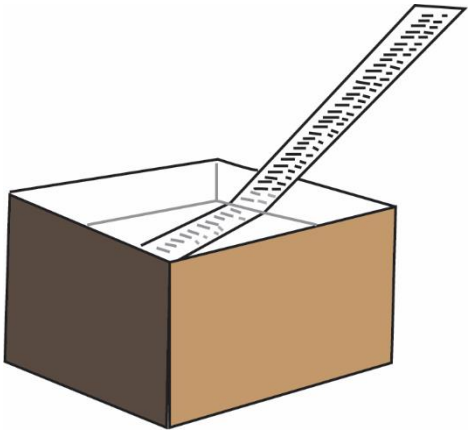
Refraction of light

Refraction is the bending of light rays as it travels from one medium to another. The medium can be water, air glass.

Applications of refraction of light

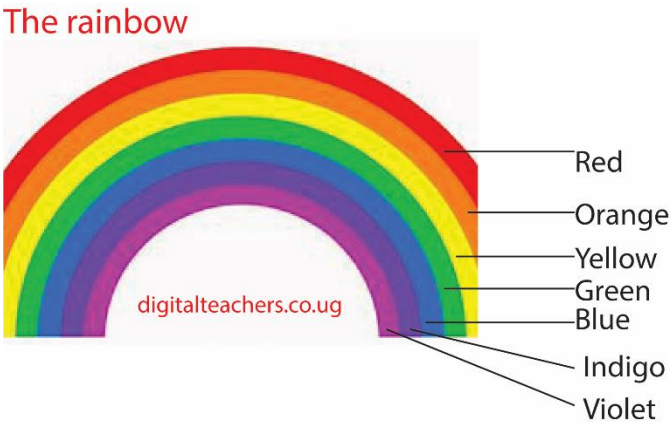
Refraction of light can be observed under the following condition

(a) A ruler placed in water appears bent at the surface of water



(b) Floor of swimming pool appear shallower.
(c) Things appear larger in water
(d) A coin put in water appear raised.

Rainbow



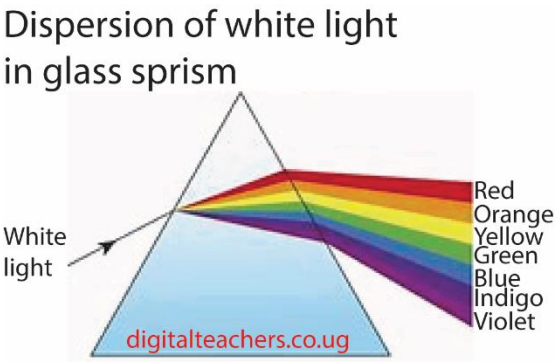
It is formed due to refraction of light that forms when the sun shines while it rains.

The splitting of white light to form a band of seven colors is known as dispersion of white light.

The band of colors is known as a **spectrum**

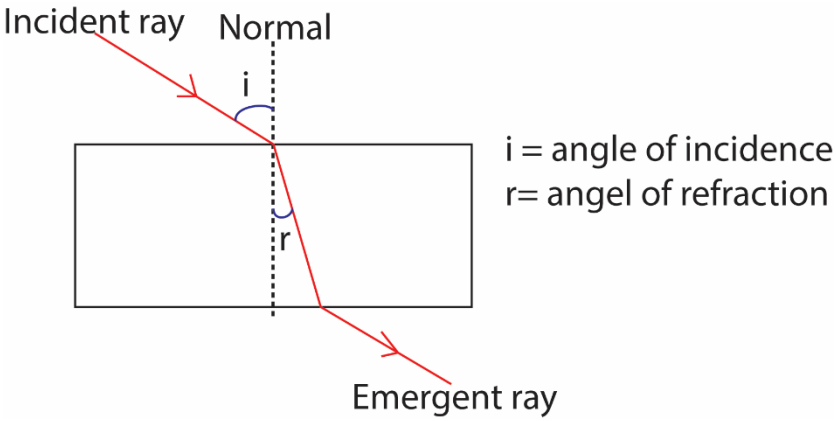
The rainbow spectrum can be remembered from acronym "ROYGBIV" starting with topmost color red.

The same spectrum like that is rainbow obtained by dispersion light through a glass prism



Refraction of light in a glass block

When light travels from a less dense medium e.g. air to a denser medium such glass light rays bend towards the normal as shown below



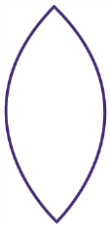
Lenses

Lenses are made of transparent materials.

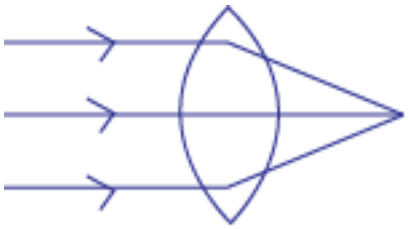
They have curved smooth surfaces that helps them to refract light that passes through them

They are two main types

(a) Convex or converging lens



When light passes through a convex lens, it refracts light in such a way that the rays from the lens meet at one point.



Uses of convex lens

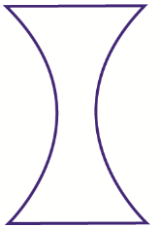
Convex lenses are used in

(i) Correction of long-sightedness

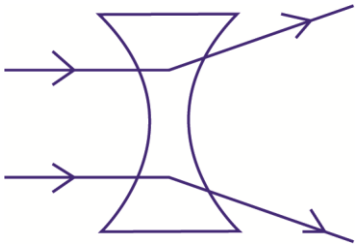
(ii) In lens camera

(iii) binnoculars

(b) Concave or diverging lens



When light passes through a concave lens, it refracts light in such a way that the rays from the lens spread out in all

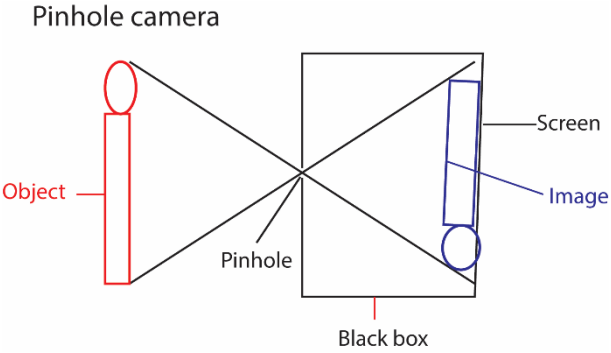


Uses of concave lens

(i) Correct short sightedness

Pinhole camera

It is a dark box or a tin which allows light through a tinny hole made on one side of the box or with a pin. At the end of the box or tin there is a film or a screen

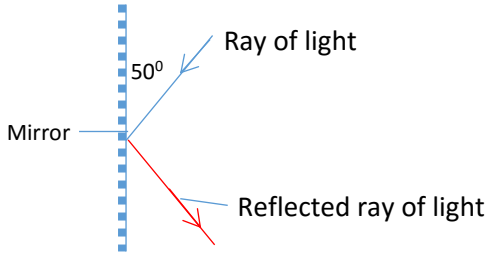


Properties of image formed by a pin hole camera

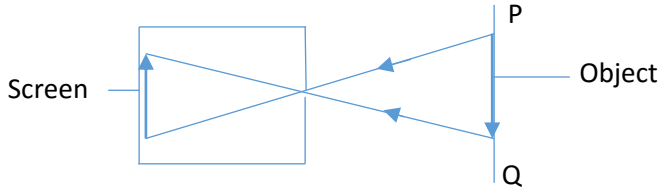
It is real

It is inverted

1. A ray of light meets the surface of the mirror as shown in the diagram below. Draw a reflected ray. (Use of a compass not necessary)

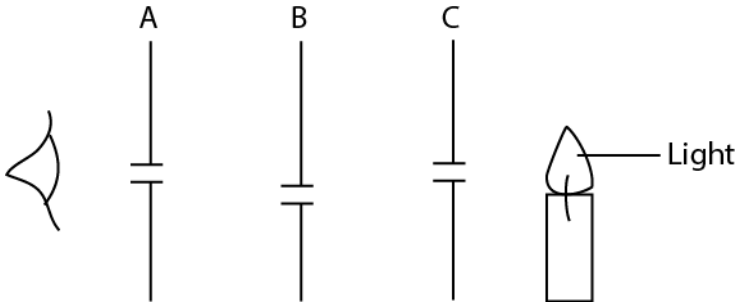


2. Below is a drawing of a pin-hole camera with an image of an object formed on the screen. The object is located along line PQ.



(a) Draw lines to show how the image is formed.
(b) Draw the object
(c) Compare the image and the object.
The image is inverted
Both the image and the object are real

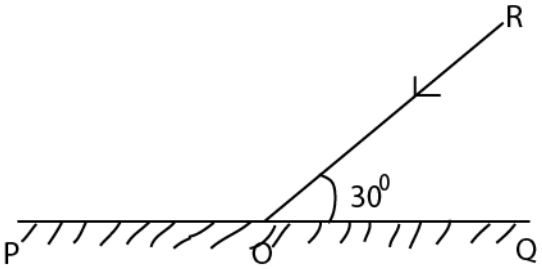
3. In the diagram below, A, B, C, d. are cards with small holes as shown below. Student at E is trying to see the light at A through the holes.



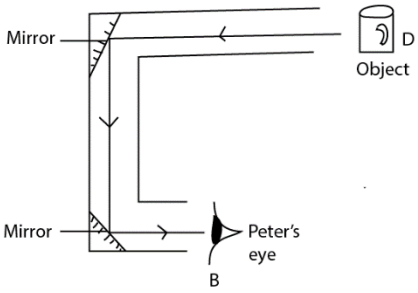
Why can't the light be seen at E?

The holes are not in line to allow light through

The diagram below shows light falling on a plane mirror. PQ. Use it to answer question 32 and



4. Complete the drawing accurately, to see the reflected ray.
5. The diagram below represents an instrument used in science.
   Use it to answer the questions that follow:



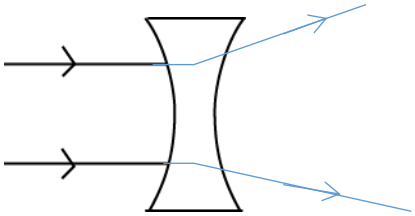
(a) How is peter at position B able to see the object at D?
By reflection through the mirrors

(b) What type of mirrors are used in this instrument?
Plane mirrors

(c) What is the name of this instrument?
Periscope

(d) Give the situation where this instrument is used?
Those objects at the surface of water by people in submarine

6. Complete the rays through the lens in the diagram below.



7. The diagram below shows a lantern lamp. Use it to answer question 42

8. (a) How does paraffin move up through the wick?

   By capillary action

   (b) Name two forms of energy produced by this lantern lamp.
   Light energy
   Heat energy
   (c) What is the use of part marked S.
   Allow in oxygen to support burning

9. How does the lens shown below affect light rays?

   It diverges light rays

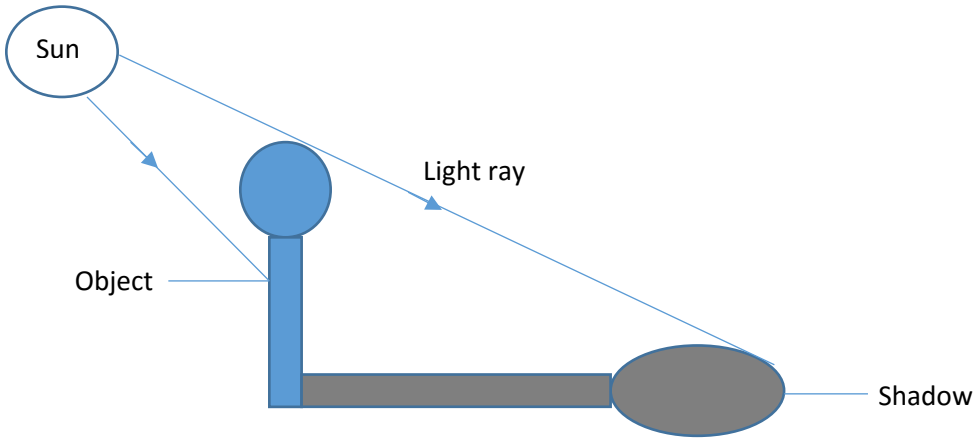
10. Why is the moon not regard as a star?

    Does not give out its own light

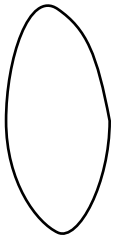
11. 25. Musa sis log –sighted. Draw the type of lens he should use to correct his eye problem.

Convex lens

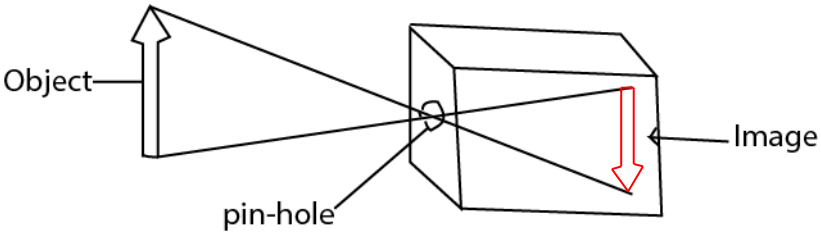
54. Draw a diagram showing how a shadow is formed. Label
Draw a diagram showing how a shadow is formed. Label your diagram correctly



12. In the space provide, draw a convex lens

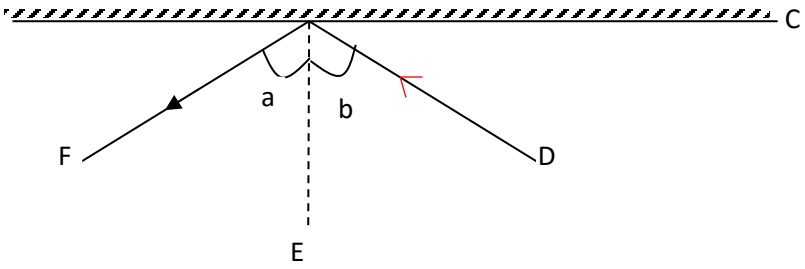


13. The below shows a pin-hole camera with an object. The image been left out. Complete the diagram drawing the image in the pin-hole camera.



14. The diagram below shows a ray of light striking the mirror

Study it and answer question that follow



(a) Name the part marked **C**: mirror

(b) Put an arrow on line D to show the diagram of the ray of light

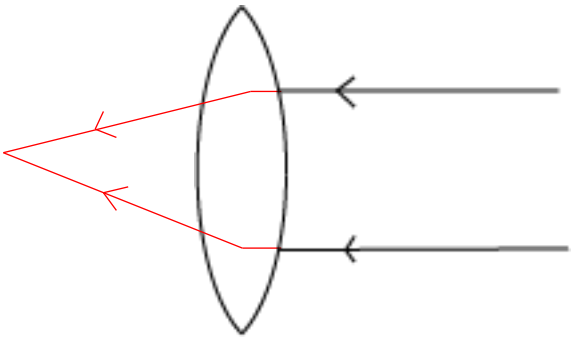
(c) If angle b=40^0, what is the size of angle **a**?

a = 40^0

(d) Give a reason for your answer in (c) above.

Because angle of incidence is equal to angle od reflection

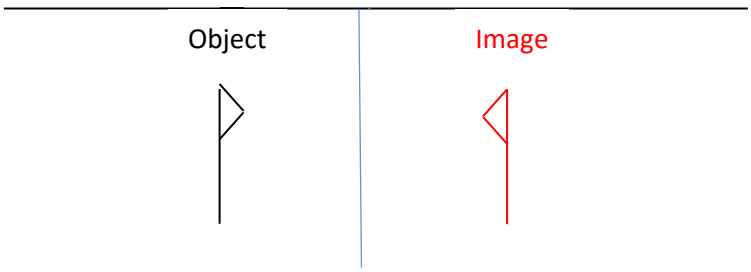
The diagram below shows parallel rays striking a convex lens. Study it and answer question 15 and 16.



15. Complete the diagram to show the path of the rays after passing through the lens
16. What eyes defect does this type of lens correct?

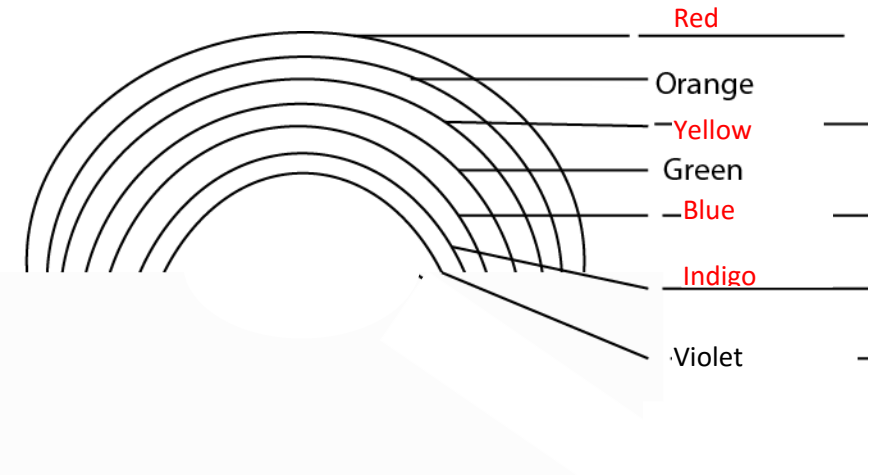
Long sightedness (hypermetropia)

17. The diagram below shows an object 2 metres away from the mirror.



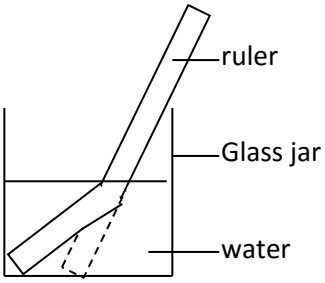
18. The diagram below the even colors of a rainbow

Completer the missing bands in the spaces provided in the diagram below



The diagram below shows a glass with water and a straight ruler in it

Use it to answer question 6



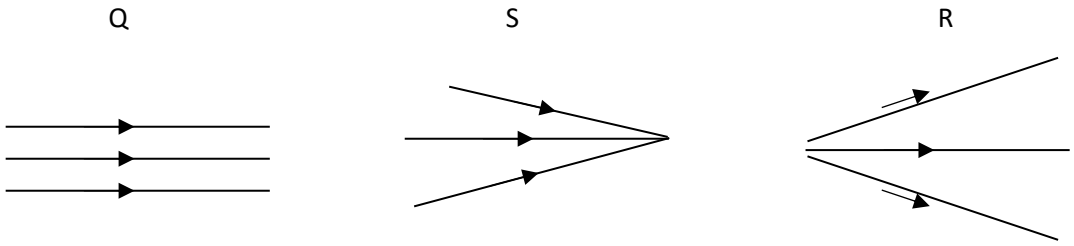
19. What causes the ruler to appear bent?

The ruler appears bent due to refraction of light

20. Give any one reason why white objects are seen easily even at a distance.

They reflect light

21. The illustration below show different types of light rays. Use them to answer questions that follow:



(a) Name the following rays of light.

(i) Q **Parallel rays**

(ii) S **Converging rays**

(b) Suggest the type of lens that can be used to make light rays move as shown is R above.

Concave lens

(c) What eye defect is corrected by a lens which makes rays move as shown in R?

Short sightedness

22. What determines the size of the image in a pinhole camera?

- Distance of the object from the pinhole

- distance of pin hole from the screen

23. (a) Name one natural and artificial source of light.

(i)Natural: sun, star, glow worm, fireflies, lightening, volcanic eruption

(ii)Artificial: electric bulb, candle, lamp, television set, torches

(b) Why is the moon not regarded as a source of light?

The moon doe snot produce but reflex light from the sun

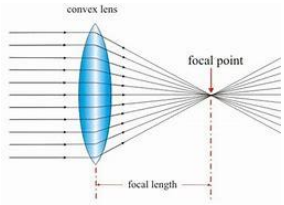
(c) Give one way in which reflection of light is important to man.

- **Enables man to see**
- **Used in periscope**
- **Dressing mirror**
- **Saloons**
- **Side mirror to see rear cars**
- **Supermarket to see thieves**
- **Driving mirror**
- **The diagram below shows a method of making a magnet.**

Study it and use it to answer question 21.

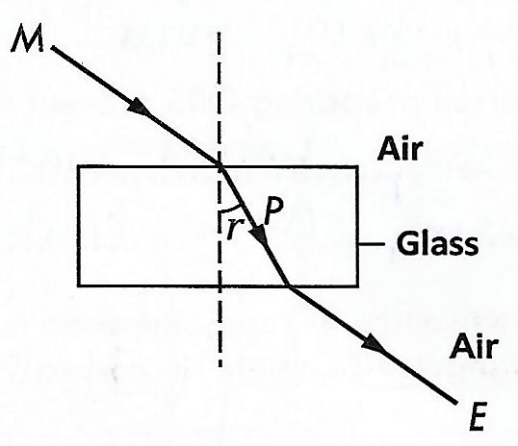
24. Name the type of lens used to correct long sightedness

Convex lens or converging lens



The diagram below shows how light passes through a glass block**.**

Study and use it to answer question 25.



25. (a) Name the rays M and P

(i) M – **incident ray**

(ii) P – **Refracted ray**

(b) Name the angle marked ***P***

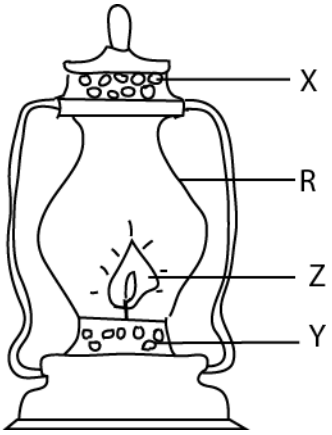
Angle of refraction

(c) Give a reason why ray ***P*** bend as shown in the diagram

Light is moving from less dense medium to a denser medium

26. In the space provided below, draw a lens used to correct short sightless.

27. The diagram below shows a kerosene lamp
Study and use it to answer the questions that follow



(a) Name the part marked with letter Z.

Flame or fire

(b) Why is the part marked R make of glass?
To allow light to pass through

(c) Give the importance of the parts marked X and Y when the lamp is in use.
(i) To let out carbon dioxide, heat and smoke
(ii) To let in fresh air

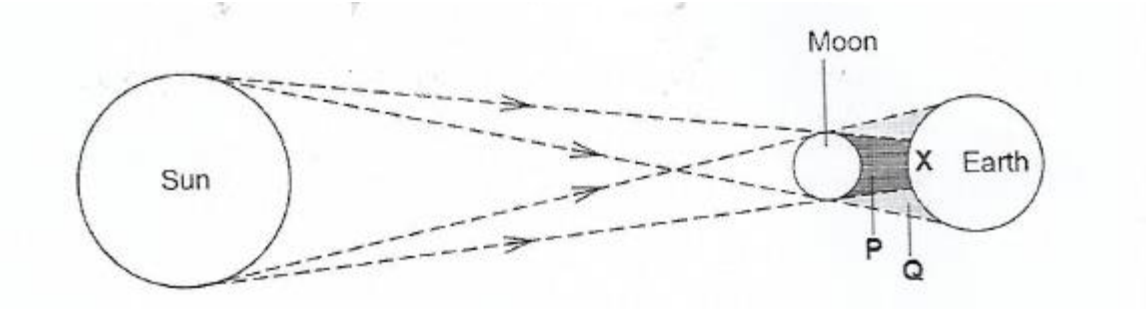
28. The table **below shows part of human eye in A and that of a lens camera in B.**

A	**B**
Iris Pupil Eye lid Retina	Shutter Film Diaphragm Aperture

For each of the parts of the human eye, write the part of the lens camera from B which performs a similar function.

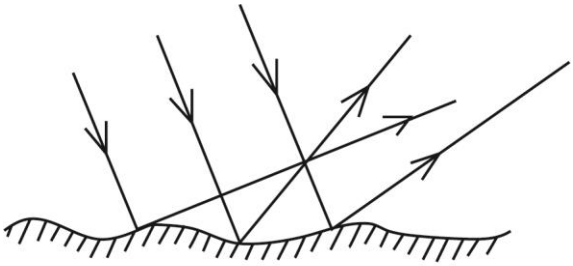
(i) Iris **diaphragm**
(ii) Pupil **aperture**
(iii) Eye lid **shutter**
(iv) Retina **film**

29. What happens to light rays when they meet a convex lens?
    They converge.
30. The diagram below shows a type of eclipse. Study and use it to answer the questions that follow



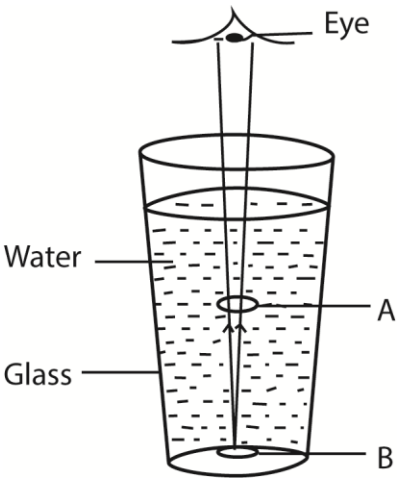
(a) Name the type of eclipse shown in the diagram above
    Eclipse of the sun
(b) Name the shadows marked P and Q
    (i) P - **Umbra**
    (ii) Q - **Penumbra**
(c) What happens to a person who would be in part X during the eclipse?
    Would be in total darkness

The diagram below shows reflection of light. Study and use it to answer question



31. What type of reflection is shown above?
    Diffuse/ irregular reflection
32. Why are the ray reflected as shown in the diagram above?
    It occurs on rough surface

33. The diagram below shows an object in glass of water. Study and use it to answer the question that follows.



Why does the object seem to appear at point A yet it is at point B?

Because of refraction of light