Light

- **Synposis**
- Light itself is not visible, but in the presence of light other objects become visible A.
- Light is defined as the external physical cause that affects the eye to produce the sensation of vision.
- Two types of sources of light are:
  (1) Natural sources such as sun, stars andjugnu.
  (2) Artificial sources such as fire, electric lamp, electric tube light, a burning candle, a kerosene lamps heated bodies, etc.
- The bodies which themselves emit light are called luminous bodies. Examples: torch, electric lamps electric tube light, burning candle, kerosene lamp, sun, stars. Jugnu etc.
- The bodies which do not emit light by their own, but they become visible because of the light falling on them from a luminous body, are called non-luminous bodies. Examples: moon, earth, table, book, chair etc.
- A medium which allows the passage of light through it easily, is called a transparent medium. Examples: glass, air, water etc.
- A medium which allows only a small amount oflight to pass through it, is called a translucent medium. Examples: ground glass, tracing paper etc.
- A medium which does not allow anydight to pass tough it, is called an opaque medium. Examples: wood, metals etc.
- Light travels in a straight line path. This is called the rectilinear propagation of light.
- The pin hole camera is a simple application of the rectilinear propa – gation of light.
- The image (or picture) formed in a pin hole camera is upside down (i.e. inverted). On increasing the distance of screen from the pin hole, the size of image increases.
- The shadow of an opaque object is the dark patch obtained on the screen when that opaque object is placed in the path of light.
- Shadow is formed because light travels in a straight line path.
- The shadow is similar to the shape of the object.
- The part of the shadow where no light reaches from the source is completely dark and is called the umbra.
- The part of the shadow where light reaches from only a portion of the source is partially dark and is called the penumbra.
- There is only umbra in the shadow of an opaque object due to a point source. The umbra is bigger in size than that of the obj ect. The umbra increases in size if the screen is moved away from the object.
- The shadow of an object due to a light source smaller than the object contains an umbra surrounded by a penumbra. The umbra is bigger in size than that of the object. Both the umbra and penum¬bra increase in size as the screen is moved away from the source.
- The shadow of an opaque object due to a light source bigger than the object contains an umbra (which is much smaller in size than the object) surrounded by a

penumbra. The umbra diminishes while the penumbra increases in size if the screen is moved away from the object.

- Lunar and solar eclipses are the examples of formation of shadows in nature.
- A lunar eclipse is caused on a certain full moon night when the earth comes in between the sun and the moon so that the earth casts its shadow on the moon.
- A solar eclipse is caused on a certain new moon's day when the moon comes in between the sun and the earth so that the moon casts its shadow

Test yourself

A. Short Answer Questions

1. Write true or false for each statement

(a) The moon is a natural source of light.
Answer. False

(b) The moon is self luminous.
Answer. False

(c) We can see an object through an opaque medium.
Answer. False

(d) Light passes through glass.
Answer. True

(e) Light travels in a straight line path. .
Answer. True

(f) Image formed in a pin hole camera is real.
Answer. True

(g) The image in a pin hole camera gets blurred if the hole is made bigger.
Answer. True

(h) A shadow is formed because light travels in a straight line path.
Answer. True

(i) Solar eclipse occurs when the sun comes in between the earth and the moon.
Answer. False

(j) If the shadow of earth falls on the moon, the eclipse is called the lunar eclipse.
Answer. True

2. Fill in the blanks

(a) Light gives us the sensation of **vision.**
(b) The sun is a **natural** source of light.
(c) A medium through which light cannot pass is called the **opaque medium.**
(d) A medium which allows light to pass through it easily is called the **transparent medium.**
(e) Moon is a **non-luminous** body.
(f) Light travels in a **straight line** path.
(g) In a pin hole camera, the image formed is **inverted and real.**
(h) The darkest portion of a shadow is called the **umbra.**
(i) The less dark portion of a shadow is called the **penumbra.**
(j) Lunar eclipse occurs when the **earth** comes in between the **moon** and the sun.

3. Match the following columns

Column A	**Column B**
(a) Wooden block	**(i) new moon's day**
(b) Sun	**(ii) rectilinear propagation of light**
(c) Umbra	**(iii) opaque body**
(d) Eclipse	**(iv) luminous body**
(e) Solar eclipse	**(v) complete dark part**

Ans.

Column A	**Column B**
(a) Wooden block	(iii) opaque body
(b) Sun	(iv) luminous body
(c) Umbra	(v) complete dark part
(d) Eclipse	(ii) rectilinear propagation of light
(e) Solar eclipse	(i) new moon's day

4. Select the correct alternative

(i) The natural source of light is

1. candle flame

2. electric lamp
3. **sun**
4. kerosene lamp

(ii) The formation of inverted image in a pin hole camera shows that

1. light enables us to see
2. **light travels in a straight line path**
3. light can pass through the pin hole
4. light does not pass through the pin hole

(iii) The luminous body is

1. **a lighted bulb**
2. earth
3. noon
4. table

(iv) Umbra is a region of

1. **complete darkness**
2. partial darkness
3. complete brightness
4. partial brightness

(v) Penumbra is a region of

1. complete darkness
2. complete brightness
3. **partial brightness**
4. none of the above

(vi) Solar eclipse occurs on

1. every new moon's day
2. **certain new moon's day**
3. every full moon's day
4. certain full moon's day

(vii) Lunar eclipse occurs on

1. every full moon's night
2. **certain full moon's night**
3. every new moon's day

4. certain new moon's day

B. Short/Long Answer Questions

Question 1.
What is light ? Define it.
Answer:
Light is a form of Energy i. e. The external physical cause that affects our eye to produce the sensation of vision.

Question 2.
How does light make an object visible ?
Answer:
An object becomes visible to us when the light after striking the object reaches our eyes. Light itself is not visible, but light makes objects visible to us.

Question 3.
Name two natural sources of light.
Answer:
Sun, stars,jugnu, firefly.

Question 4.
List two artificial sources of light.
Answer:
Electric bulb, torch, an oil lamp, fluorescent tube, candle.

Question 5.
Differentiate between the luminous and non-luminous bodies. Give two examples of each.
Answer:
Difference Between
Luminous
The bodies which have light of their own e.g. sun stars, bulb, candle, oil lamp, torch, a lantern.
Non-Luminous
The bodies-which do not have their own light.e.g. moon, chair, table. When light falls on them, they become visible.

Question 6.
Is the moon a luminous object ?
Answer:
Moon is not a luminous body, it is nbn-luminous body. It has no light of its own.

Question 7.
What do we call a body that shmes on its own ?
Answer:
The bodies that shines on its ownor which them selves emit their own light are called the luminous bodies.

Question 8.
What do we call an electric bulb producing light ?
Answer:
Luminous object.

Question 9.
What is a transparent medium ? Give two examples.
Answer:
Amedium which allows the passage of light through it easily, is called a transparent medium.
Examples: glass, air, water etc.

Question 10.
Explain the difference between a transparent, a translucent and an opaque medium. Give two examples of each.
Answer:

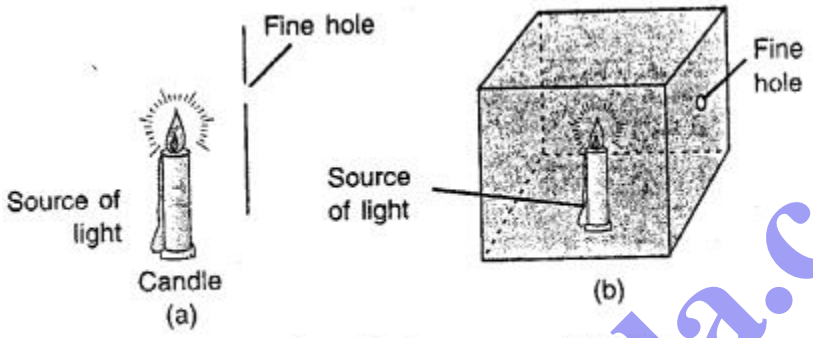
1. **Transparent objects** — Those objects through which light can pass easily are called transparent obj ects. e.g. Water, glass, air.
2. **Translucent object**— The obj ect through which light can pass partially are called translucent object, e.g. tracing paper, waxed paper.
3. **Opaque object**— The objects which do not allow the light to pass through are called opaque objects, e.g. wood.

Question 11.
What do we call a substance through which we cannot see light ? Give an example of such a substance.
Answer:
A substance through which we cannot see light is called an opaque medium.
Examples: Wood, metals, butter paper and black paper etc.

Question 12.
What do we call a substance through which light passes ? Give an example of such a substance.
Answer:
A substance through which light passes is called a transparent substance.
Examples: glass, air, water etc.

Question 13.
Can a transparent medium form an image ? Explain your answer.
Answer:
No, a transparent medium cannot form image. All the light that passes through a transparent medium completely pass through the substance. For the formation of image it is must that the light rays get reflected through the surface.

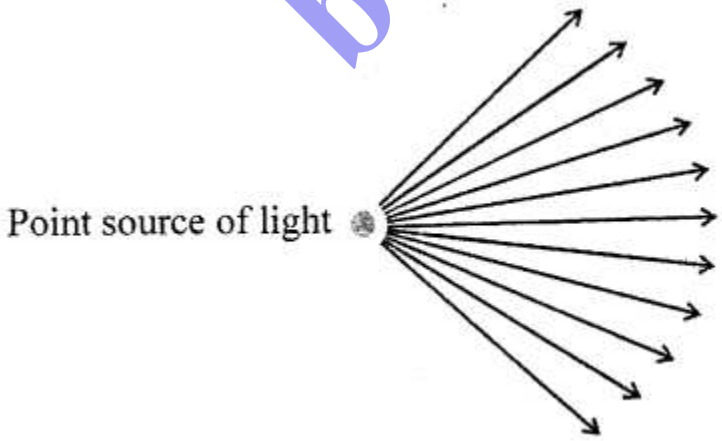
Question 14.
How can you obtain a point source of light ?
Answer:
A point source of light is obtained either by placing a screen having a fine hole, in front of die luminous body or by placing the luminous body inside a box having a fine hole on one of its side.



A point source of light

Question 15.
Define the terms : a ray of lightand a beam of light.
Answer:
The light travelling in any one direction in a straight line is called a ray of light.

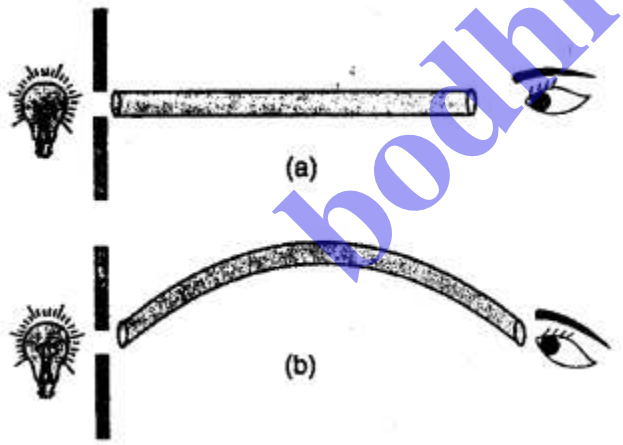
A group of light rays given out from a source is called a beam of light



Question 16.
What do you mean by 'rectilinear propagation of light' ?
Answer:
Light travels in a straight line path. This is called the rectilinear propagation of light.

Question 17.
Describe an experiment to show that light travels in a straight line path.
Answer:
Take three cardboards A, B and C each about 25 cm square. Take a pin and make a small hole in each cardboard at the same height. Suspend the cardboard pieces by separate threads vertically from a support such that each hole is at the same height, as shown. Pass a string through the holes and pull it taut. This makes the three holes in a straight line. Now take out the string.
Place a lighted candle near one of the cardboards (say A). Look at the candle flame from the other side of the cardboard C. The candle flame is clearly seen.
Now slightly displace one of the cardboards (say B) so that the holes no longer remain in a straight line. Again look at the candle flame from the other side of the cardboard C. You do not see the candle flame. The reason is that light travels in a straight line and now the holes in the cardboards A, B and C are not in a straight line.
Conclusion: Light travels in a straight line path called the rectilinear propagation of light.

Question 18.
In which of the following two arrangements (a) and (b) shown in the diagram, you can see the light of the bulb ? Explain Your answer

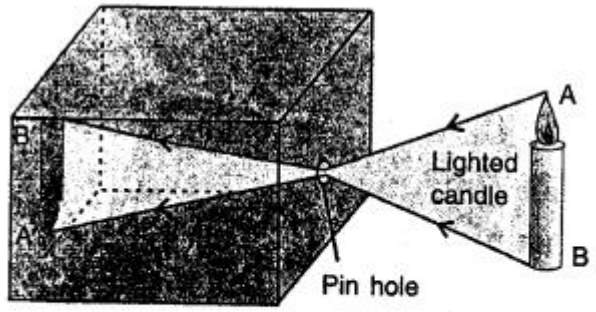


Answer:
We can see the light of the bulb in the arrangement (a).
This is so because in arrangement 'a' the rod is straight and light travels in a straight line path.
Whereas in arrangement 'b' the rod is bent. So the light cannot pass through it.

Question 19.
Name a simple application of the rectilinear propagation of light

Answer:
The simple applications of rectilinear propagation of light are pin hole camera, formation of shadows and elipses.

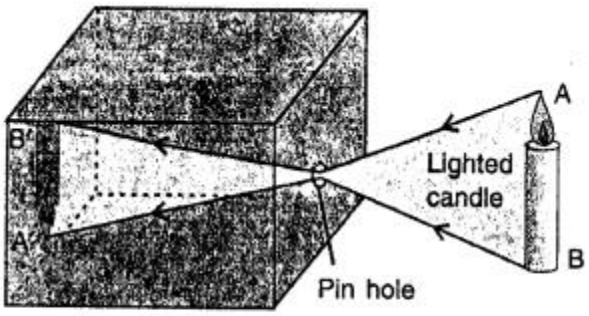
Question 20.
What is a pin hole camera ? Draw a neat and labelled diagram to show the formation of image of a lighted candle by it.
Answer:
The pin hole camera is a simple application of the rectilinear propagation of light.



Ray diagram for formation of image in a pinhole camera

Question 21.
Explain the formation of image of a luminous object in a pin hole camera with the aid of a neat diagram.
Answer:
When a luminous object AB, such as a lighted candle, is placed in front of the pin hole, an inverted picture A' B' of the candle is
obtained on the tracing paper. This picture A' B' is called the image. The image obtained is upside down (i. e. inverted). The reason is that the light travels in a straight line path. Hence light from the upper point A of the candle passes through the pin hole and strikes
the tracing paper at A'. Similarly, light from the lower point B of the candle passes through the pin hole and strikes the tracing paper
(or screen) at B'. Light from all the other points between A and B, on passing through the pin hole strikes the tracing paper in between
A' and B'. As a result, an inverted image of the candle is seen on the tracing paper Fig

shows the simple ray diagram for die formation of image.



Ray diagram for formation of image in a pinhole camera

Question 22.
State two factors which affect the size of image formed in a pin hole camera.
Answer:
Factors affecting the size of the image :
The size of image depends on the following two factors:

1. The distance of screen (i.e. tracing paper) from the pin hole, and
2. The distance of obj ect (i.e. candle) in front of the pin hole.

Question 23.
Is the image obtained in a pin hole camera erect or inverted ? Give reason for your answer.
Answer:
Image obtained in a pin hole camera is inverted.
The reason is that the light travels in a straight line path. Hence light from the upper point of the candle passes through the pin hole and strikes the tracing paper in the lower point. Similarly light from the lower point of the candle passes through the pin hole and strikes the tracing paper at the upper point.

Question 24.
How is the image affected in a pin hole camera when another fine hole is made near the first pin hole ?
Answer:
If another pin hole is made near the first pin hole, two images are formed on the screen, one due to each of the two pin holes. If the holes are very close, the two images tend to overlap each other. As a result, a blurred image will be seen.

Question 25.
State the effect on the image in a pin hole camera if

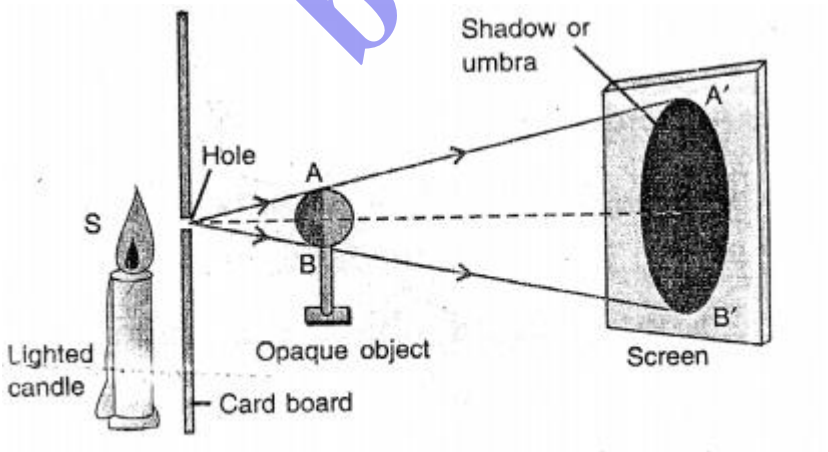
1. The hole is made bigger.
2. The luminous object is moved towards the pin hole.
3. The length of the pin hole camera is increased (Ie. the screen is moved away from the pin hole).

Answer:

1. If the hole is bigger than a pin hole, again a blurred image in seen. The reason is that a bigger hole is equivalent to a large number of pinholes. Each pin hole produces one image. These images overlap each other resulting in a blurred image.
2. If the object is moved towards the pin hole the size of the image increases. The size of image / The size of object = Distance of screen from pin hole / Distance of object from pin hole
3. When the length of the pin hole camera is increased. C is the screen is moved away from the pinhole, the size of image also increases.

Question 26.
What is a shadow ? Give a reason for its formation.
Answer:
Shadow : When light falls on an opaque object, light is obstructed and a dark patch on a screen kept behind is called shadow. This is because light propagates in straight line. If distance between obj ect and screen is less, the shad o w will be (umbra) dark and smaller.
If the distance is increased shadow will be dim and larger.

Question 27.
Draw a ray diagram to show the formation of shadow of an opaque object by a point source of light. How is the size of shadow affected if the screen is moved away from the object?
Answer:



Shadow (or umbra) due to a point source

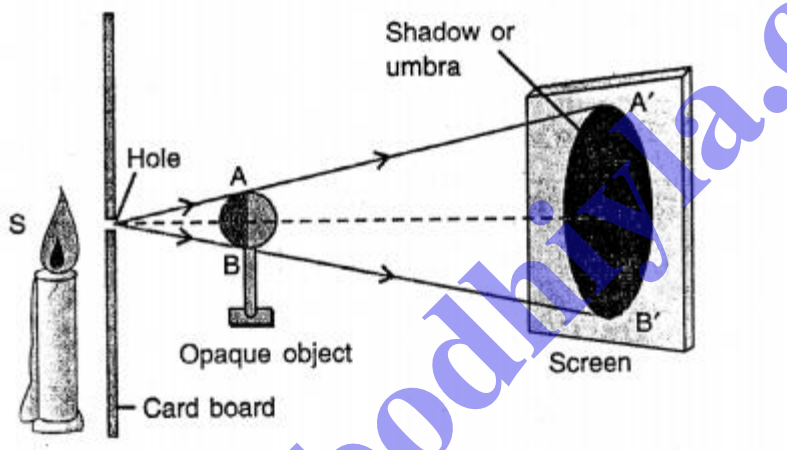
If we move the screen away from the object, the shadow increases in size.

Question 28.
State two differences between an umbra and a penumbra.
Answer:
Umbra

1. It is the portion of shadow where no light reaches from the source of light due to the opaque object.
2. It is completely dark.

Penumbra
It is the portion of shadow where a portion of light from the source of light reaches the shadow even in the presence of the opaque object in between them.
It is not completely dark, but is dim (or less bright).

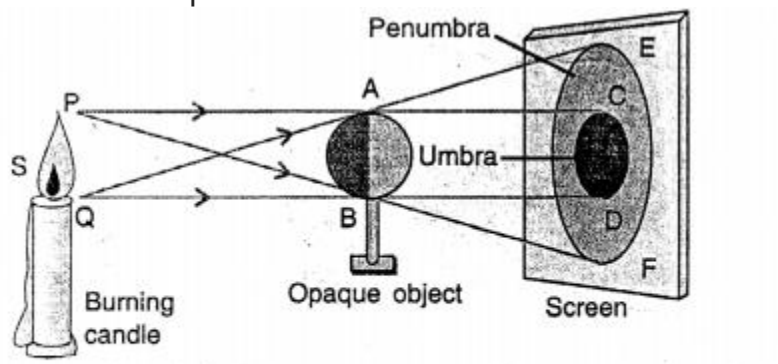
Question 29.
Draw a ray diagram to show the formation of umbra alone.
Answer:
Formation of umbra alone.



Shadow (or umbra) due to a point source

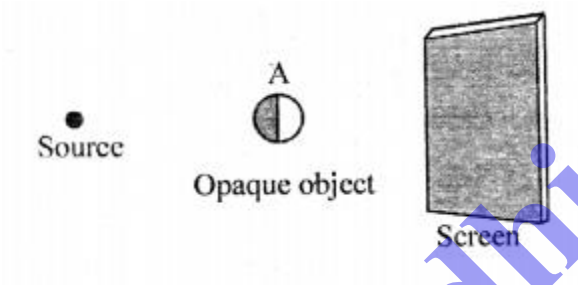
Question 30.
Draw a ray diagam to show the formation of umbra and penumbra both. Label the parts umbra and penumbra in your diagram.
Answer:
If your move the screen away from the object, the shadow increases in size. Formation

of umbra and penumbra both.

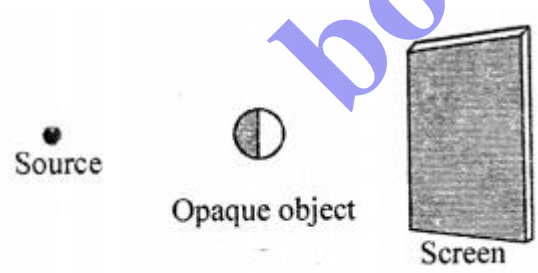


Shadow (umbra and penumbra both) due to an extended source of light

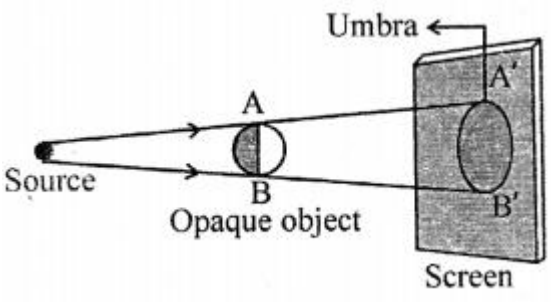
Question 31.
In each of the following diagrams, draw rays to form umbra and penumbra on the screen.
(a)



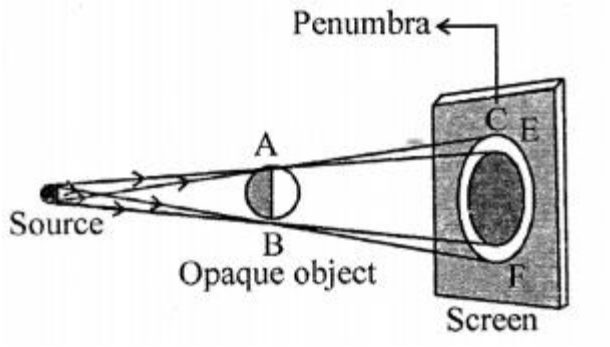
(b)



Answer:
(a)A'B'—umbra
Umbra alone is obtained on the screen when the opaque object is illuminated by a point source of light.



(b)



EF is Penumbra CD is umbra.

Question 32.
State the conditions when only the penumbra of an opaque object is obtained on the screen.
Answer:
If the size of source of light is bigger than the size of the opaque object, the size of umbra is very small. If the screen is moved away from the obj ect, the umbra vanishes and only the penumbra remains.

Question 33.
Why is it that the birds flying in the sky do not cast their shadow on the earth ?
Answer:
We do not see the shadow of a bird flying high up in air because in their shadow, the umbra is absent and the penumbra is too large and too faint that it is not visible as the distance of screen (i.e. earth) is very large from the object (i.e. bird).

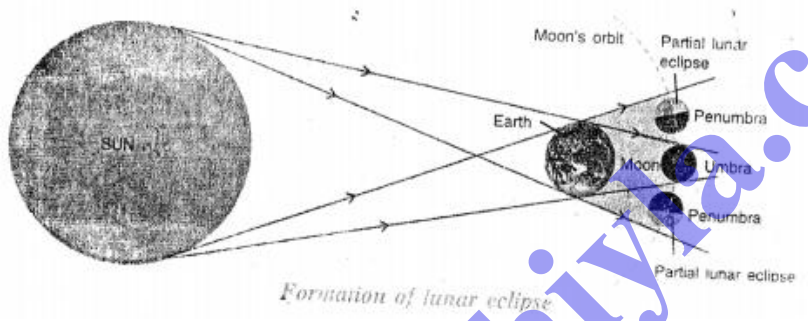
Question 34.
Why are shadows at noon shorter than in the morning or in the evening ?
Answer:
At noon the sun is directly overhead. So, the sun rays fall vertically on the body. Hence the shadow is very short. In the morning and evenings, the sun rays fall in an inclined position. So, the shadows are long.

Question 35.
What is an eclipse ? Name the two types of eclipses.

Answer:
Eclipses are the examples of formation of shadows in nature. There are two kinds of eclipses:

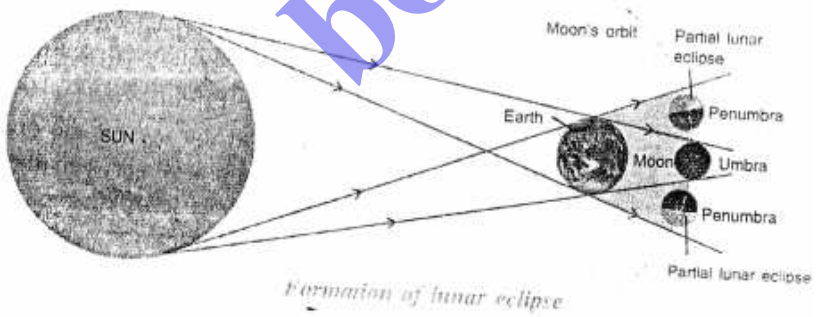
1. Lunar eclipse (the eclipse of the moon), and
2. Solar eclipse (the eclipse of the sun).
   Lunar eclipse is due to the formation of shadow of earth on moon and solar eclipse is due to the formation of shadow of moon on earth.

Question 36.
When does a lunar eclipse take place ? Does it occur on every full moon's night ?
Answer:
A lunar eclipse occurs when the earth comes in between the sun and moon and casts its shadow on moon. On a full moon night, the moon rises in the east after sun sets in the west. On such a night, the sun and moon are on the opposite sides of the earth. The shadow of the earth falls on the surface of the moon therefore moonis not visible to us. This is lunar eclipse as shown in the figure.



Formation of lunar eclipse

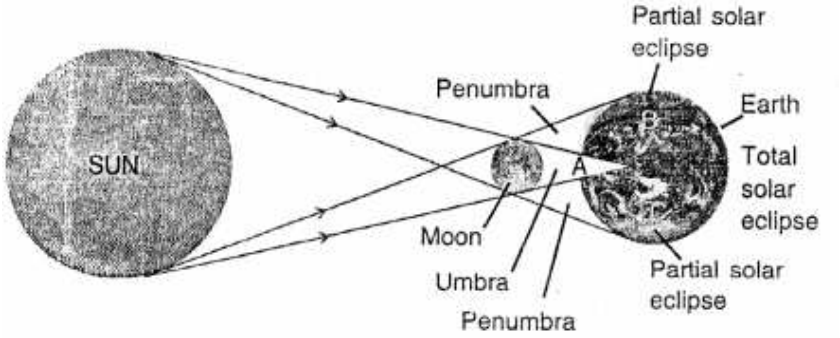
Question 37.
Draw a diagram to show the formation of lunar eclipse.
Answer:



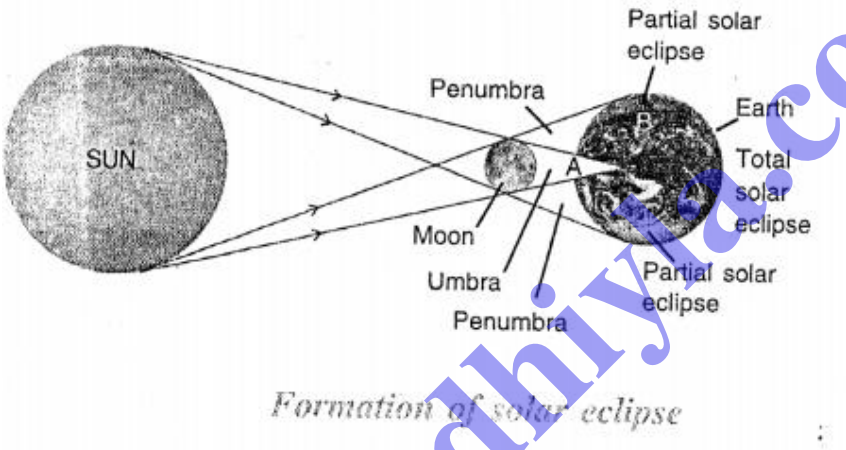
Formation of lunar eclipse

Question 38.
When does a solar eclipse take place ? Does it occur on even' new moon's day ?
Answer:
Solar eclipse— On a certain moon's day the moon, happens to come in between the

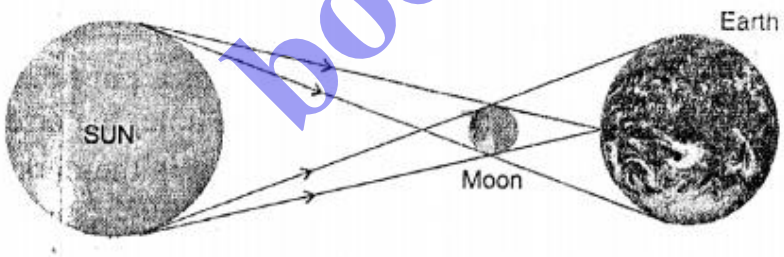
sun and the earth. They come in a straight line. In such a situation, the moon being smaller in size casts its shadow only on a limited region on the earth. In these regions of the earth, the solar eclipse occurs.



Question 39.
Draw a diagram to show the formation of solar eclipse.
Answer:



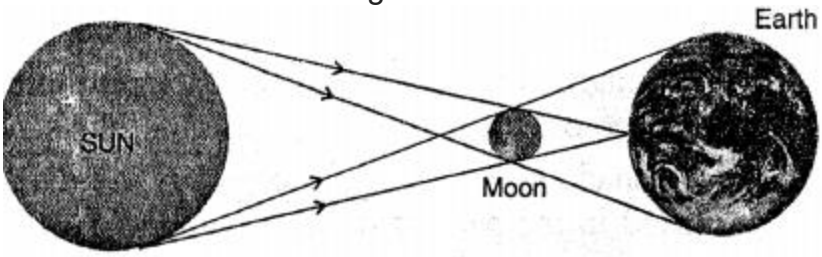
Formation of solar eclipse



Formation of annular solar eclipse

Question 40.
What is annular solar eclipse ? Draw a labelled diagram to show its formation.
Answer:
An annular solar eclipse occurs when only the tip of the umbra of the moon falls on the earth. From the point D, the sun will appear to be completely obstructed by the moon,

only the outer rim of the sun, called corona, is then visible for a very short time which is known as the diamond ring. The formati on of annular solar eclipse is shown below.



Formation of annular solar esclpse

ADDITIONAL QUESTIONS

INTEXT QUESTIONS 1

Question 1.
Name any four man made sources of light.
Answer:

1. An electric bulb
2. Candle
3. An oil lamp
4. A torch

Question 2.
Why do objects in a room become visible even if sunlight does not enter it?
Answer:
When light làlls on an object, it scatters even if the sunlight does not enter a room. due to scattered light., the object become visible.

Question 3.
Does the flame of a gas stove emit light?
Answer:
Any burning thing emit light. The intensity of light may not be same. A llame ofa gas stove emit light.

Question 4.
Name few living things which emit light.
Answer:
Jugnu and firefly.

INTEXT QUESTIONS 2

Question 1.
From among the following objects, list out the opaque, translucent and transparent bodies in the space provided below:
A glass strip, an ordinary paper, greased paper, tracing paper, polythene sheet, wooden piece, steel plate, glycerine, kerosene oil, mustard oil, grounded glass, stone, book, water and milk.
Opaque Transparent Translucent
Answer:

Opaque	Transparent	Translucent
an ordinary paper	A glass strip	greased paper
wooden piece	kerosene oil	tracing paper
steel plate	water	polythene sheet
stone		glycerine
book		mustard oil
milk		grounded glass

INTEXT QUESTIONS 3

Question 1.
Write the names of some transparent objects.
Answer:
Glass, water, air etc.

Question 2.
What happens in a solar eclipse ?
Answer:
A solar eclipse occurs when the moon comes in between the Sun and the Earth and casts its shadow on the earth. In such a case, the moon being smaller in size casts its shadow only on a limited region on the earth.

Question 3.
What do you understand by candle power ?
Answer:
Candle power — To measure the brightness of light in comparison with the brightness of a candle. The unit of candle power is used.

Question 4.
Write the names of some cold light emitting objects.
Answer:
Jugnu, firefly.

EXERCISE

A. Tick the correct answer

1. Light causes

1. Sensation of heat
2. **Sensation of vision**
3. Sensation of sound
4. None of these

2. Light is a fonn of

1. Work
2. **Energy**
3. Power
4. None of these

3. The natural source of light is

1. **Sun**
2. Electric lamp
3. Candle flame
4. Kerosene lamp

4. A tubelight is a

1. **Hot source**
2. Cold source
3. Incandescent source
4. None of these

5. Glass is

1. Opaque
2. Luminous
3. **Transparent**
4. None of these

6. Substance which don't allow light to pass through them,

1. Transparent substance
2. **Opaque substance**

3. Translucent substances
4. Non-luminous substance

7. The image formed in a pinhole camera is

1. **inverted**
2. upright
3. always enlarged
4. always diminished

8. Shadow forms on the

1. **Opposite side of the object**
2. Same side of the object
3. On the same plane of the object
4. None of these

9. When the moon comes in between the sun and the earth, and all three are in a straight line, then it is

1. Solar eclipse
2. Lunar eclipse
3. Either solar eclipse or lunar eclipse
4. **No eclipse**

10. Umbra is a region of

1. Partial darkness
2. Partial brightness
3. Complete brightness
4. **Complete darkness**

B. Fill in the blanks

1. The **Sun** and **moon** are the natural sources of light.
2. There are **natural** and man-made **sources** of light.
3. The brightness of light is measured in .**candle power**
4. Shadows are formed when **objects** blocks **light**
5. Eclipses are the formation of **shadows** in nature.
6. A lunar eclipse is formed on **full moon** day.
7. A **shadow** is formed when the path of light is obstructed by an **object**
8. Light consists of **seven** colours.
9. Pinhole camera is based on the **principle** propagation of light.

10. A solar eclipse occurs only on a **New Moons Day.**
11. Speed of light in vacuum is **300000 km/sec**

C. Match the following

	1.	**Transparent object**	**(a) Football**
	2.	**Eclipses**	**(b) Glass**
	3.	**Translucent object**	**(c) Fluorescent tube**
	4.	**Luminous object**	**(d) Tracing paper**
	5.	**Non-luminous object**	**(e) Shadows**
Ans.	1.	Transparent object	(b) Glass
	2.	Eclipses	(e) Shadows
	3.	Translucent object	(d) Tracing paper
	4.	Luminous object	(c) Fluorescent tube
	5.	Non-luminous object	(a) Football

D. Write true or false

1. The moon has its own light.
Answer. False

2. The earth has its own light.
Answer. False

3. The stars have no light.
Answer. False

4. Opaque objects do not allow light to pass through them.
Answer. True

5. Image formed in a pinhole camera is erect.
Answer. False

E. Answer the following

Question 1.
What is light ?
Answer:
Light is a form of Energy i.e. The external physical cause that affects our eye to produce the sensation of vision.

Question 2.
List four natural sources of light.
Answer:
Sun, stars,jugnu, firefly.

Question 3.
Write down five man-made sources of light.
Answer:
Electric bulb, torch, an oil lamp, fluorescent tube, candle.

Question 4.
What is meant by luminous intensity ? What is one lumen ?
Answer:
Luminous Intensity— The measurement of brightness of light is called luminous intensity.
One lumen is considered to 1 / 1256 th of a candle power.

Question 5.
Distinguish between transparent, translucent and opaque objects.
Answer:

1. **Transparent objects** — Those objects through which light can pass easily are called transparent objects, e.g. Water, glass, air.
2. **Translucent object**— The object through which light can pass partially are called translucent object, e.g. tracing paper, waxed paper.
3. **Opaque object**— The objects which do not allow the light to pass through are called opaque objects, e.g. wood.

Question 6.
List two transparent objects.
Answer:
Water, glass.

Question 7.
Name some sources of light that are not hot.
Answer:
Moon, jugnu.

Question 8.
How is a shadow formed ? Write the conditions required for a shadow to form.
Answer:
Shadow: When light fall son an opaque object, light is obstructed and a dark patch on a screen kept behind is called shadow. This is because light propagates in straight line.
If distance between object and screen is less, the shadow will be (umbra) dark and

smaller.
If the distance is increased shadow will be dim and larger. Conditions Required for a shadow to form are:

1. There should be a source of light.
2. An opaque object.
3. A screen.
4. The opaque object is placed between the source of light and the screen.

Question 9.
Differentiate between luminous and non-luminous objects.
Answer:
Difference Between
Luminous
The bodies which have light of their own e.g. sun stars, bulb, candle, oil lamp, torch, a lantern.
Non-Luminous
The bodies-which do not have their own light. E.g. moon, chair, table. When light falls on them, they become visible.

Question 10.
How can you see the solar eclipse safely ?
Answer:
To see the Solar Eclipse Safely:
Take a cardboard or X-Ray film and make a small hole in it. Place it in front of a wall. Through the hole, the image of the Sun will be formed on the wall. This image we can see with a eye. We are not looking at the Sun directly, so there will be no harm to the eyes.