EXERCISE-01

Multiple choice questions

1. Which of the following is a luminous body?
(1) The Earth (2) The Moon
(3) The Sun (4) None of these

2. Which of the following is a non-luminous body?
(1) Fire (2) Sun
(3) Stars (4) Earth

3. Which of the following bodies allows only a part of the light to pass through it?
(1) Oiled paper (2) Brick
(3) Wood (4) Air

4. We are able to see Moon because
(1) it emits light.
(2) it absorbs light.
(3) it reflects sunlight.
(4) it is luminous.

5. An artificial source of light
(1) Sun (2) Fire fly
(3) Jelly fish (4) Electric bulb

6. Clear water is
(1) transparent (2) translucent
(3) opaque (4) none of these

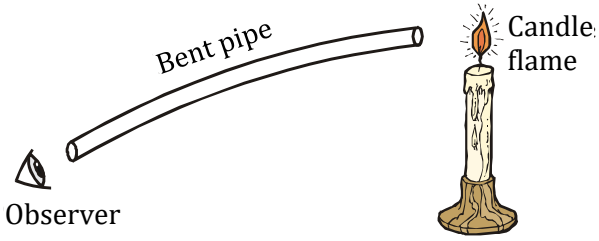
7. Objects which allow light to pass through them but through which objects cannot be seen clearly are
(1) opaque (2) transparent
(3) translucent (4) none of these

8. You can see through a car window because the window glass is
(1) opaque (2) transparent
(3) translucent (4) luminous

9. Air is not visible because it
(1) is nearly a perfectly transparent substance.
(2) neither absorbs nor reflects light.
(3) transmits whole light.
(4) all the above are correct.

10. The speed of light is maximum when it travels through
(1) glass (2) water
(3) air (4) vacuum

11. It is not possible to view a candle flame by using a bent pipe as shown in figure given below because



(1) light gets reflected.
(2) light gets absorbed.
(3) light travels in a straight line.
(4) light is transmitted through the pipe.

12. Which of these conditions is not essential for a shadow to be produced?
(1) The Sun
(2) A light source
(3) An opaque object
(4) A screen/surface

13. The shadow of an object does not show
(1) the shape of the object
(2) the outline of the object
(3) the colour of the object
(4) none of these

14. Which of these materials could produce a shadow?
(1) Clear glass
(2) A clean cellophane paper
(3) Clear water
(4) A piece of wood

15. We cannot get a shadow when there is
(1) an opaque object
(2) a light source
(3) no light source
(4) a screen

16. A heavenly body which does not emits its own light but only reflects light which fall on it is
(1) star (2) planet
(3) pole star (4) sun

17. What happens when you increase the distance between the pinhole and the screen in a pinhole camera?
(1) The size of the image changes.
(2) The brightness of the image changes.
(3) The image remains inverted.
(4) All above options are correct.

18. We can see a reflected image on
(1) a polished surface
(2) a rough surface
(3) a shadow
(4) none of these

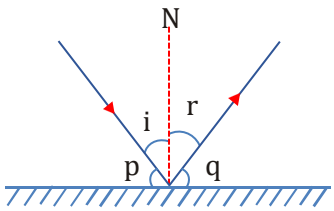
19. Which of the following are the types of mirror?
(1) Concave
(2) Convex
(3) Plane mirror
(4) All of the above

20. A pinhole camera works because
(1) light travels in straight line.
(2) transparent materials allow light to pass through.
(3) opaque objects do not allow light to pass through.
(4) translucent materials form images.

21. If the nature of a transparent medium changes, the speed of light
(1) changes.
(2) remains constant.
(3) speed of light does not depend on medium.
(4) cannot be predicted.

22. Which of the following is the correct image of English alphabet P when seen through a plane mirror?
(1) d (2) q
(3) P (4) b

23. In given figure if angle p = 25° then what will be the angle 'r'?



(1) 25° (2) 90°
(3) 135° (4) 65°

24. Image formed by a plane mirror is
(1) Virtual and erect
(2) Of same size as that of object
(3) Laterally inverted
(4) All of the above

25. The image formed by a pin hole camera is
(1) virtual and erect
(2) of same size as that of object
(3) real and inverted
(4) all of the above

True or false

1. An object which does not emit its own light is a non-luminous body.
2. The moon is a luminous object.
3. The moon is a natural source of light.
4. The television screen is a light source.
5. A translucent object stops light only partially.
6. A ray of light is the path along which light travels.
7. An opaque object stops the light completely, therefore, it casts a dark shadow.
8. Shadows consist of matter.
9. A green object casts a green shadow.
10. The colour of the shadow is black if the colour of the object is white.
11. No shadow is formed when light passes through an object.
12. Shadows are always of the same shape and size as the object.
13. Shadow of an object can be bigger than the object itself.
14. Shadows are long when sun is overhead.
15. The Earth, Moon and other planets do not cast shadow.

1. Match the column

Column-I		Column-II	
(A)	Stars	(i)	3×10^8 m/s
(B)	Allows light to pass through	(ii)	Luminous
(C)	Speed of light	(iii)	Ray of light
(D)	Path along which Light travels in given direction	(iv)	Transparent

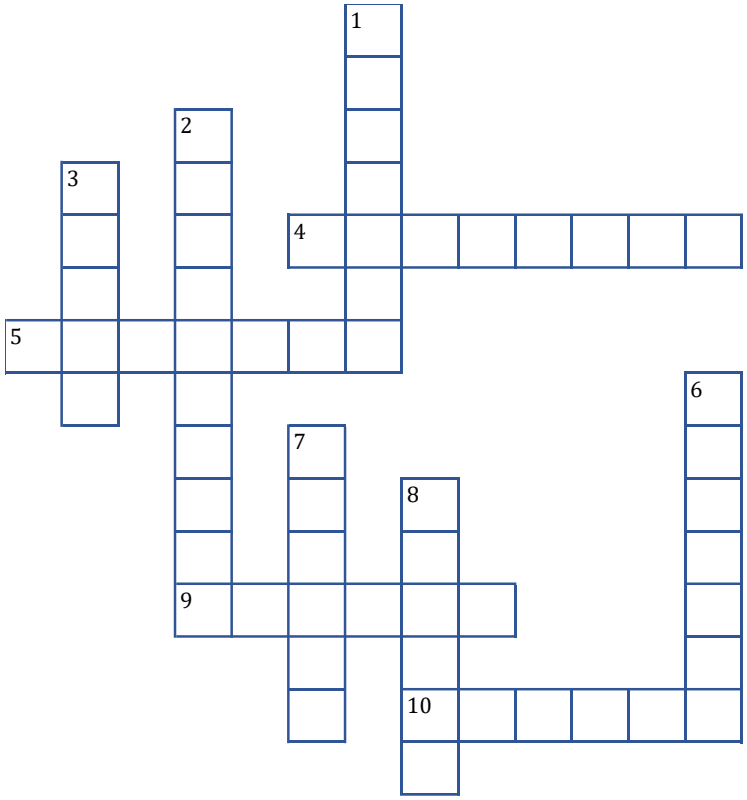
2. Match the column

Column-I		Column-II	
(A)	A body which do not allow light to pass through it	(i)	Virtual image
(B)	An image formed when light rays do not actually meet.	(ii)	Shadow
(C)	Blocking the path of light by an object	(iii)	Real image
(D)	An image formed by actual meeting of rays of light	(iv)	Opaque

Fill in the blanks

1. Light will not pass through a material that is _____.
2. When you increase the size of the hole in a pinhole camera, the image becomes _____.
3. _____ is the bouncing of light rays off the surface of the material.
4. Light travels in a straight line. This property of light is known as _____ propagation of light.
5. When passage of light is obstructed by the opaque objects then _____ is formed.
6. The ray of light which falls on the mirror is called _____ .
7. The image formed by a plane mirror is _____ and _____ .
8. The mirrors in kaleidoscope are kept at an angle of _____ with each other.
9. _____ can be used for observation purposes in the trenches or bunkers.
10. Light travels at a speed of _____.

Crossword puzzle



Across

4. Star is _____ object.

5. Sideways inversion is also called _____ inversion.

9. A _____ is perpendicular to the surface of mirror passing through the point of incidence.

10. Objects which do not allow light to pass through them are called _____ objects.

Down

1. _____ image is formed when the rays appear to meet at a point.

2. _____ occurs when the light rays bounce back of a surface.

3. Angle of incidence is _____ to the angle of reflection.

6. _____ camera forms a real and inverted image of distant object.

7. _____ is an object with a polished surface that forms reflected image.

8. A _____ is formed when light is blocked by an opaque object.

ANSWER KEY

Multiple choice questions

Que.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Ans.	**3**	**4**	**1**	**3**	**4**	**1**	**3**	**2**	**4**	**4**	**3**	**1**	**3**	**4**	**3**
Que.	16	17	18	19	20	21	22	23	24	25					
Ans.	**2**	**4**	**1**	**4**	**1**	**1**	**2**	**4**	**4**	**3**					

True or false

1. True **2.** False **3.** False **4.** True **5.** True
6. True **7.** True **8.** False **9.** False **10.** True
11. True **12.** False **13.** True **14.** False **15.** False

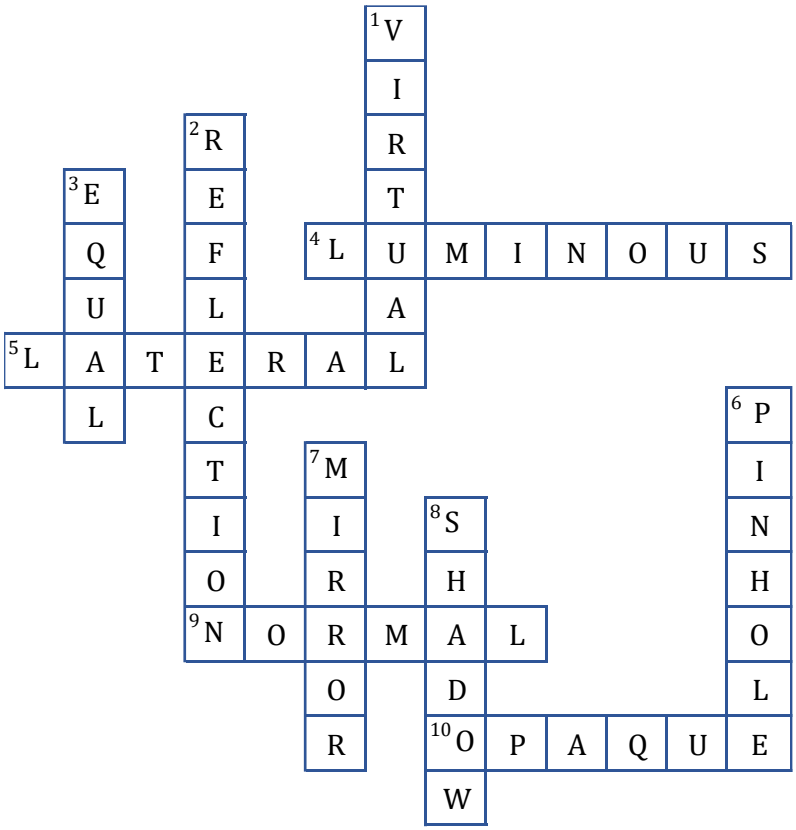
Match the column

1. (A) → (ii), (B) → (iv), (C) → (i), (D) → (iii)
2. (A) → (iv), (B) → (i), (C) → (ii), (D) → (iii)

Fill in the blanks

1. Opaque **2.** Brighter but hazy **3.** Reflection **4.** Rectilinear **5.** Shadow
6. Incident ray **7.** Virtual, erect **8.** 60° **9.** Periscope
10. 3×10^8 m/s

Crossword puzzle



EXERCISE-02

Very short answers type questions

1. Name one natural source and one artificial source of light.
2. A clear glass door is closed, you may not see it and get hurt if you try to pass through it. Why?
3. State three effects of rectilinear propagation of light.
4. Can we see a shadow if there is no light?
5. What is the colour of a shadow?
6. Can an object have more than one shadow?
7. State any two factors that determine the type of shadow formed by a source of light.
8. Can you think of creating a shape that would give a circular shadow if held in one way and a rectangular shadow if held in another way?
9. What happens to the direction of a ray of light after it falls on a plane mirror?
10. What is the law of reflection?
11. What is the nature of image formed by a pin hole camera?
12. What happens to the image when we move the object away from the pin hole of pin hole camera?
13. In a completely dark room, if you hold up a mirror in front of you, will you see a reflection of yourself in the mirror?
14. Name one luminous and non-luminous source of light.
15. On which principle does a periscope works?

Short answer type questions

1. Differentiate between luminous and a non-luminous body. Also give one example of each.
2. What are transparent, translucent and opaque materials? Give examples of each.
3. What are the conditions needed for a shadow to be formed?
4. Write the differences between a shadow and an image.
5. What is the principle underlying the pin hole camera? What are the characteristics of the image formed by it?

Long answer type questions

1. Explain an activity to show reflection of light.
2. Explain how can you show the rectilinear propagation of light.
3. Explain with the help of a diagram to show the formation of image in a plane mirror, also write the properties of image formed in a plane mirror.
4. How will you make your own pin hole camera? Make figures.
5. Explain how can you make your own kaleidoscope.

Numerical problems

1. A light ray strikes a plane mirror such that the angle of incidence is 30°. What is the angle between the incident ray and reflected ray ?

2. In given figure if angle p = 50° then what will be the angle 'r'?

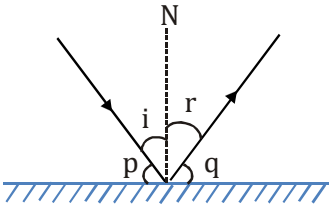
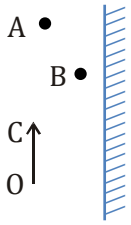
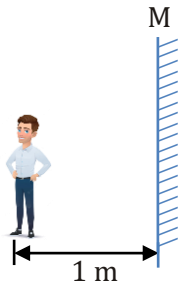


Diagram based questions

1. Mark the correct images as A', B', O'C' of the objects A, B, OC respectively in the plane mirror.



2. In the figure below, mark the distance at which the image will be formed.



3. Write the corresponding alphabets as they would appear in the images formed by plane mirror.

ANSWER KEY

Numerical problems

1. 120°

2. 40°

EXERCISE-01 SOLUTIONS

Multiple choice questions

1. Option (3)
Sun emits its own light and hence it is called a luminous body.

2. Option (4)
Earth doesn't emits its own light but reflects it light of Sun and hence it is called a non-luminous body.

3. Option (1)
It is a translucent object and allows only some part of light to pass through it. Brick and wood are opaque while air is transparent in nature.

4. Option (3)
Moon is non-luminous object and it is visible because it reflects the light incident on it from Sun.

5. Option (4)
It is an artificial source of light as it rely on electricity to produce light.

6. Option (1)
As almost all light striking clean water can pass through it.

7. Option (3)
Translucent objects allows some part of light to pass through them. Some light is absorbed and some is reflected in different directions. Objects appear blur when seen through them.

8. Option (2)
All light falling on window glass is transmitted and hence it is a transparent object.

9. Option (4)
As air is transparent and transmits whole light passing through it.

10. Option (4)
In vacuum speed of light is 3×10^8 m/s.

11. Option (3)
According to rectilinear propagation of light, rays from any source always travel in a straight line path.

12. Option (1)
Shadows can be formed by any light source and not only from the sun.

13. Option (3)
Shadow is always a darker area so it cannot show colour of the object.

14. Option (4)
An opaque object is required to form shadows. Clear glass, cellophane paper and clear water all are transparent objects while wood is opaque.

15. Option (3)
For a shadow to be formed most essential requirement is that there should be a light source.

16. Option (2)
Planet is only non-luminous object among all other options given. The planets reflects the light of the sun which falls on it.

17. Option (4)
When you increase the distance between the pinhole and the screen in a pinhole camera, the size of image is changes (larger image formed), the brightness of the image changes but the image remains inverted only.

18. Option (1)
As reflection of light incident on polished surfaces takes place which leads to creation of image.

19. Option (4)
Concave and convex are spherical mirror and a mirror made by polishing a plane glass from one side is called plane mirror.

20. Option (1)
Light follows a property of rectilinear propagation.

21. **Option (1)**
vacuum > gases > liquid > solid (order of speed of light)
If nature of transparent medium changes, the speed of light also changes in the medium.

22. **Option (2)**
Lateral inversion or left-right inversion of image occurs so letter P will appear as a.

23. **Option (4)**
According to laws of reflection, angle of incidence is equal to angle of reflection.
Also, $p + i = 90°$ [N is normal to the surface]
$\angle i = \angle r$ So, $p + r = 90°$
$\Rightarrow 25° + r = 90°$ [Given $p = 25°$]
$\Rightarrow r = 90° - 25° = 65°$

24. **Option (4)**
Image formed by a plane mirror is virtual, erect, of same size as that of object and laterally inverted.

25. **Option (3)**
Image formed by a pinhole camera is real and inverted as it is formed on a screen.

True or false

1. **True**
Non-luminous body does not emits its own light. While luminous body emits its own light.

2. **False**
Moon reflects the light of the Sun incident on it because of which it shines, so moon does not emit its own light. It is non-luminous object.

3. **False**
Moon is non-luminous object. It is not a source of light. It reflects the light of the Sun incident on it.

4. **True**
As it emits light, television screen can be consider as light source.

5. **True**
Some part of the light get transmitted and some part of light get absorbed and reflected when light strikes to surface of translucent object. That's why we can say that translucent object stops light only partially.

6. **True**
A ray of light is the path along which light travels. It is denoted by

7. **True**
Opaque object only absorbs and reflect light. Light can't pass through an opaque object. So, shadow is formed there.

8. **False**
Shadow is formed when light falls on opaque object and only the outline of object is formed. It doesn't contain shadow is the lack of light any matter.

9. **False**
Shadow is absence of light, so shadows are always dark region and no matter what is the colour of object or light source.

10. **True**
Shadow is always a dark region; no matter the colour of object.

11. **True**
Shadow forms when light rays are blocked by an object. When light rays passes through an object no shadows are formed.

12. **False**
Shadows do not always have same shape as object but the size of shadow depends on relative distance between screen, light source and object.

13. **True**
If the distance between light source and object decreases the size of shadow increases hence we can get bigger shadow than object itself.

14. **False**
Shadow is shortest when sun is overhead. Example at noon.

15. **False**
Earth, moon and planets are opaque objects and they also cast shadow. Reason behind eclipse is the formation of shadows by celestial objects.

EXERCISE-02 SOLUTIONS

Very short answer type questions

1. Natural sources – Sun, Stars and Artificial sources – Tube light, Candle

2. A clear glass is transparent in nature and it allows all light to pass through it because of which you see object behind it not the glass door, but when you try to pass through it, you may get hurt.

3. The three effects of rectilinear propagation of light are : (any three)
1. Shadow (or eclipses)
2. Image formation by reflection (like image in the mirror)
3. Pinhole camera image formation
4. Periscope working (reflection phenomena)

4. No, we can't see a shadow if there is no light, as shadow is formed only when light rays are blocked by an opaque object, but if there is no light there can't be a shadow.

5. Shadow is a dark area formed when light rays are blocked by an opaque object. As shadow is absence of light it always appears dark in colour.

6. Yes. When there are more than one sources of light present at different sides of the opaque object, more than one shadow is formed.

7. Types of shadow formed by a source of light are determined by : (any two)
(i) The size of, light source
(ii) The size of object
(iii)The distance between object, light source and screen.

8. A cylindrical object can form a rectangular as well as a circular shadow. When circular part of cylinder directly faces light source, the shadow will form in circular shape while when the cylinder is held in vertical position, shadow will form in rectangular shape.

9. When a ray of light falls on a plane mirror, it will reflect back with the same angle which incident ray will form with the perpendicular (or normal) to mirror surface.

10. (i) The angle between an incoming light ray and Normal is equal to the angle between the reflected light ray and the Normal. Angle of incidence is equal to angle of reflection.
(ii) The incident ray, normal and reflected ray; all three lie in the same plane.

11. Pinhole camera makes real and inverted image. The size of the image depends upon the distance between pinhole, screen and object.

12. When we move away the object from pinhole camera, size of image decreases.

13. No, as there is no light source in room, there will be no light rays, so the reflection will not occur and hence we can't see any image in the mirror.

14. Luminous object: - Sun, stars, CFLs, etc.
Non-luminous object: - Table, chair, moon, planets, etc.

15. Periscope works on the principle of multiple reflection of light.

Short answer type questions

1.

	Luminous	Non-luminous
1	The objects which emit their own light are called ''luminous object"	The objects which do not emit their own light but only reflect the light which falls on them are called ''non-luminous" objects
2	Sun, stars, candle emits their own light, so they are luminous object.	Moon, table, planet do not emit their own light and only reflect the light which falls on them so they are ''non-luminous" objects

2. Transparent object which transmits almost all the light striking on them.

E.g. Glass, clear water etc.

Opaque: - An opaque object only absorbs and reflects, no light can pass through it. You cannot see through opaque material.

E.g. metal, human body etc.

Translucent: - Object or material that allows small portion of light to pass through them is described as translucent object. The objects will not be clearly visible through a translucent object. E.g. oily paper, hazy window glasses etc.

3. Shadow is formed when light rays are blocked by an opaque object. To form a shadow we need a light source, an opaque object and a screen to project that shadow.

4.

	Shadow	Image
1	A shadow does not show the details of the object	An image shows the exact details of the object.
2	A shadow is formed due to blocking of light by an opaque object	Image is formed due to reflection from an opaque, smooth and shiny surface.
3	A shadow is always dark	Image shows true colour of the object

5. A pinhole camera works on the principle of rectilinear propagation of light i.e. light travels in a straight line. It forms an image of the object when rays coming from object passes through pinhole and are incident on its screen. Image formed by pinhole is real and inverted, size of the image formed depends upon distance between object, pinhole camera and screen.

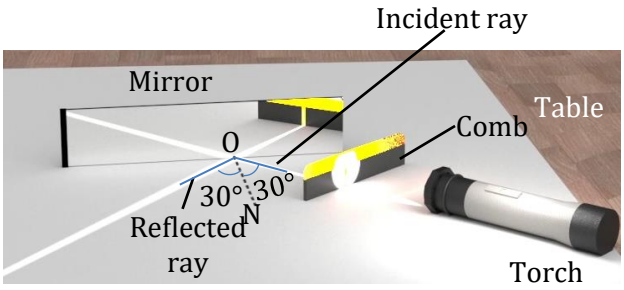
Long answer type questions

1. (i) Fix a white sheet of paper on a drawing board or a table. Take a comb and close all its openings using a black paper sheet except one in the middle. Hold the comb perpendicular to the sheet of paper.

(ii) Mark a point O at middle of bottom edge of the mirror (see figure). Then use the protractor and the ruler to draw a line on the paper perpendicular to the mirror from the mark. Label this line N. This line is called 'normal'. Draw a line on the paper from O at a particular angle say 30° to line N.

(iii) Turn on the flashlight (torch) and place it so that beam is along the 30° line. This is the angle of incidence. Measure and record the angle that the reflected beam makes with line N. This is the angle of reflection.

(iv) Now, measure the angle of reflection (r). You will find that the angle of reflection is 30°. Repeat this activity, by making other angles such as 45°, 60° with the line N. In each case you will note that the, 'angle of incidence is equal to the angle of reflection'. (see figure)

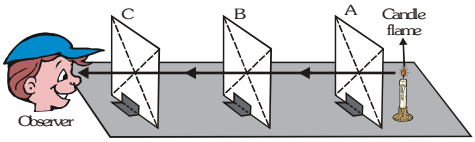


2. (i) Take three rectangular cardboard sheets of equal size and make a tiny hole using a pin in the center of each. The center of the cardboard can be located by drawing the diagonals of the rectangular sheets. The point of intersection of the diagonals is the center of the cardboard sheet.

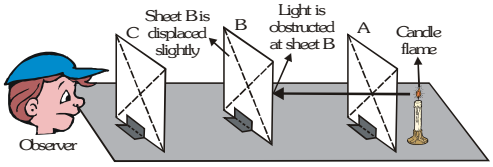
(ii) Now, fix each cardboard sheet in vertical position by simply pasting them on a wooden or cardboard base using an adhesive (glue) so that their centers are in the same horizontal line [see fig.(a)]. Let us mark these sheets as A, B and C.

(iii) Place a burning candle in front of the sheet A and look through the pin hole in sheet C. You will see the candle clearly.

(iv) Now remove the sheet B from its position and paste it again at small distance away from its original position [see fig.(b)]. Again look through pin hole C. This time you will not be able to see the candle. From this activity we conclude that light travels in a straight line. When pin holes on the cardboard sheets are in straight line, the light passes through them. When pin holes on the cardboard sheet are not in the straight line, light fails to pass through them.



(a) Candle flame can be seen as all three sheets are in a straight line

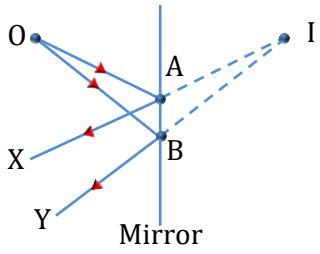


(b) Candle flame cannot be seen as all three sheets are not in a straight line

3. **Formation of image in a plane mirror**

Let us take a point (small) object O placed in front of a plane mirror M (see figure). To find the image I formed in the mirror, we take two light rays OA and OB incident at points A and B on the mirror. The reflected rays for incident rays OA and OB are AX and BY respectively. The reflected rays AX and BY are diverging that is, they are moving away from each other.

When we produce the reflected rays AX and BY backwards, they meet at a point I behind the mirror. This point I is the image of the object O formed by the plane mirror.



The properties of image formed by a plane mirrors are,

(1) The image is virtual and erect.

(2) The distance of image from mirror is equal to distance of object from mirror.

(3) The size of image is exactly equal to the size of object.

(4) The image is laterally inverted.

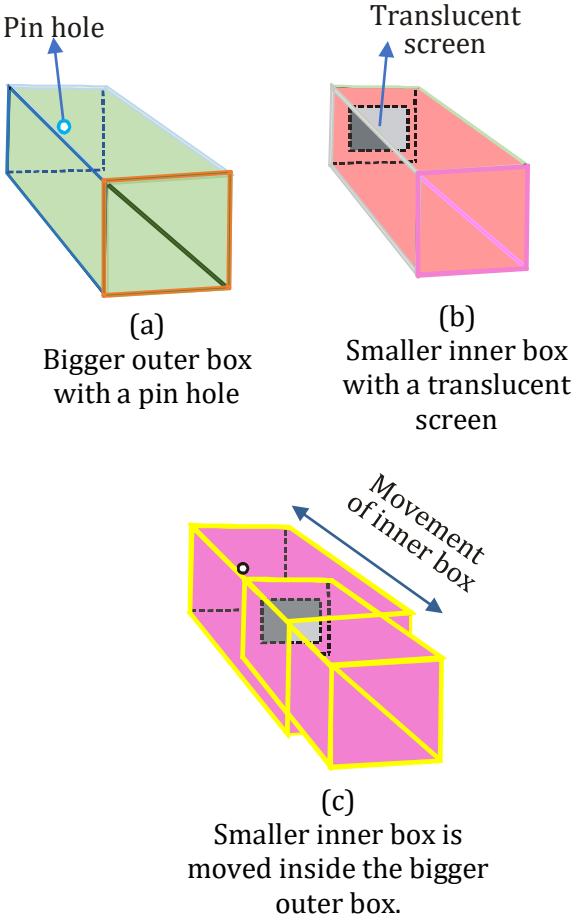
4. Material required : Two shoeboxes, a piece of translucent plastic or oily paper or butter paper, a pair of strong scissors, Stainley knife, pencil, ruler, stapler, glue for cardboard.

Construction: A pin hole camera consists of a rectangular box made of wood, cardboard or metal. Its one surface is replaced with a translucent material like ground glass etc. (see figure). This surface serves as the screen on which the image is formed. A tiny (pin hole) hole is made on the side opposite to the ground glass. This allows light from the object to enter the box.

Take two boxes so that one can slide into another with no gap in between them. Cut open one side of each box. On the opposite face of the larger box, make a small hole in the middle.

In the smaller box, cut out from the middle a square with a side of about 5 to 6 cm. Cover this open square in the box with a tracing paper i.e. a translucent screen.

Slide the smaller box inside the larger one with the hole, in such a way that the side with the tracing paper is inside. Your pin hole camera is ready.



(a) Bigger outer box with a pin hole

(b) Smaller inner box with a translucent screen

(c) Smaller inner box is moved inside the bigger outer box.

Pin hole camera

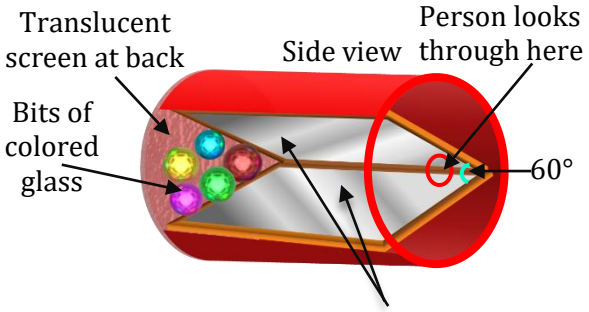
5. **Material required :** 3 pieces of mirror strip, a cardboard tube or thick chart paper, cardboard disc, coloured see through plastic, coloured glass pieces of bangles, ground glass plate

Construction : Take three rectangular mirror strips. Join them to form a triangular prism using adhesive glue or tape. Fix them in a circular cardboard tube or tube of a thick chart paper.

Take a cardboard disc having a hole in the center, through which we can see and fix it on one end of the tube. At the other end, touching the mirror, fix a circular plane glass with broken pieces of coloured bangles.

Close this end of the tube by a ground glass plate.

Kaleidoscope is ready now. Now we can see through the hole, we can see a variety of patterns in the tube.



Mirrors placed at 60° to each other

End of tube view

This child's toy is a visual delight of changing colours as the toy is rotated. The effects are produced by multi-coloured glass pieces that tumble around when the toy is turned (see figure). Here, two (or three) mirrors are positioned 60° to each other and five images of the object are produced for this orientation.

Numerical Problems

1. $\angle i = 30°$ and $\angle r = 30°$

So, total angle between incident and reflected ray = $180° - (\angle i + \angle r) = 180° - (30° + 30°) = 120°$

2. $\angle p + \angle i = 90°$,

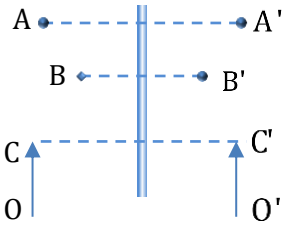
$\therefore \quad 50° + \angle i = 90°$

$\Rightarrow \quad \angle i = 90° - 50° = 40°$

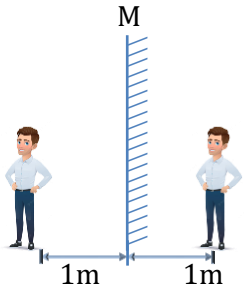
$\angle r = 40°$

Diagram based questions

1.



2.



3.