Grade : VII

Chapter – 15. Light

Basic concepts – A Flow Chart

LIGHT

It is natural agent that stimulates sight and makes things visible.

Properties of light

Rectilinear Propagation of Light

- It is the property of light to travel in a straight line in any direction.
- The direction of path in which light make a ray.

Reflection of Light

- It is the bouncing back of light after striking the surface for an object.
- Shiny smooth surfaces reflect almost all the light.

Dispersion

- It is the phenomenon of splitting of white light into its seven colours.
- White light is mixture of violet, indigo, Blue, Green, Yellow. Orange and Red (VIBGYOR) colours

Reflecting Surface

Plane Mirror

Lateral inversion

- It is the phenomenon due to which the image is laterally inverted.
- This is because the image of object of formed as far behind the mirror as the object is front of it.

Curved Mirror

Types

Concave Mirror

- It is the mirror that curves in the reflecting surface is concave.
- If object is close to mirror, image formed is virtural, upright and magnified.

Convex Mirror

- It is the mirror that curves out; the reflecting surface is convex.
- Image formed is virtual, upright and diminished.

Image

Types

Real

- The image that is formed on a screen.
- It is formed by light rays that actually pass through the screen.

Virtual

- The image that cannot be obtained on a screen.
- It is formed by light rays that seem to pass through the screen.

Lenses

Lens has two opposite surfaces either both curved or one curved and one plane.

Types

Convex Lens

- It is thicker at the centre than at the edges.
- It is a converging lens.
- If the object is close to the lens, image is virtual, upright and magnified.
- If the object is distant, image is real, inverted and diminished,

Concav Lens

- It is thinner at the centre than at the edges.
- It is a diverging lens.
- Image formed is virtual, erect and diminished.

Know the Terms

- **Concave mirror** : If the reflecting surface is on the inside, the mirror is called concave mirror.
- **Convex mirror** : If the reflecting surface is on the outside, the mirror is called a convex mirror.
- **Focal length** : The distance between the optical centre and the focus of a lens is called the focal length of the lens.
- **Lens** : A transparent medium bounded by two surfaces of which at least one is spherical is called a lens.
- **Real image** : It can be formed on a screen.
- **Spectrum** : The bands of colours seen when white light is separated into its different colours.
- **Virtual image** : An image which cannot be formed on a screen is called a virtual image.

Objective Type Questions

(1 Mark each)

I. Multiple choice questions

1. A virtual image is always:

a. Erect b. Magnified c. Smaller d. Diminished

2. The power of lens is measured in;

a. Dioptre b. Watt c. Dyne d. cm

3. The image formed in a convex mirror is always;

a. Smaller b. larger

c. of same length d. depends on distance of object

4. The ratio of size of image to the size of object is called.

a. Power of glass b magnification c. Transformation d. Deviation

5. The splitting of white light into seven colours is called;

a. Reflection b. Dispersion c. Deviation d. Polarization

6. Which one does not utilize spherical mirrors?

a. car headlights b. Looking glass c. Spectacles d. Mirrors

7. Which one of the glasses shows lateral inversion?

a. Plane mirror b. convex mirror c. concave mirror d. All of these

8. Image formed by a plane mirror is always;

a. Virtual, erect b. Real, erect c. Virtual, inverted d. Real, inverted

9. Which one of the following is used as a rear view mirror in car and scooters?

a. Concave Mirror b. convex mirror c. Plane Mirror d. None of these

10. When the object is placed very close to the lens, the image formed is virtual, erect and magnified the lens is :

a. Convex lens b. Concave mirror c. Biconcave lens d. All of these

11. Boojho and paheli were given one mirror each by their teacher. Boojho found his image to be erect and of the same size whereas. Paheli found her image erect and smaller in size. This means that the mirrors of boojho and paheli are respectively.

a. Plane mirror and concave mirror b. Concave mirror and convex mirror

c. concave mirror and convex mirror d. convex mirror and plane mirror

12. Which of the following can be used to form a real image ?

a. Concave mirror only b. plane mirror only

c. Convex mirror only d. Both concave and convex mirrors

13. If an object I placed at a distance of 0.5 m in front of a plane mirror, the distance between the object and the image formed by the mirror will be.

a. 2 b. 1 m c. 0.5 m d. 0.25

14. You are provided with a concave mirror, a convex mirror, a concave lens and a convex lens. To obtain an enlarge of an object you can use either:

a. concave mirror or convex mirror b. concave mirror or convex lens

c. concave mirror or concave lens d. concave lens or convex lens

15. A rainbow can be seen in the sky;

a. When the sun is infront of you b. When the sun is behind you

c. When the sun is overhead d. Only at the time of sun raise

16. An erect and enlarged image can be formed by;

a. only a convex mirror b. only a concave mirror

c. only a plane mirror d. both convex and concave mirrors

17. You are provided with a convex mirror, a concave mirror, a convex nanny a concave mirror, a convex lens and a concave lens. You can get an inverted image form:

a. both concave lens and convex lens b. both concave mirror and convex mirror

c. both concave mirror and convex lens d. both convex mirror and concave lens

18. An image formed by a lens is erect, such an image could be formed by a:

a. convex lens provided the image is smaller than object

b. Concave lens provided the image is smaller than object

c. Concave lens provided the image is larger than object

d. Concave lens provided the image is of the same size.

1.a	2. a	3. a	4. b	5. b	6. c
7. a	8.a	9.a	10 a	11. c	12. a
13. b	14. b	15. b	16. b	17. c	18. b

II. Multiple choice questions

1. Which one shows lateral inversion?

a) Plane mirror b) concave mirror c) convex mirror d) None of these

2. A concave lens forms:

a) Erect, virtual and magnified image b) erect, virtual and smaller image

c) Erect, real and smaller image d) Inverted, virtual and smaller image

3.The image which can be obtained on screen is called.

a) Erect b) Real c) Virtual d) inverted

4. White light is composed of :

a) seven colours b) Five colours c) Three colours d) only one colour

5. Which of the following is used as a side view mirror?

a) Plane mirror b) concave mirror c) convex mirror d) None of these

1) a	2) b	3) b	4) a	5) c

I. Fill in the blanks

1. Light is a form of _____.

2. _____ usually appear when sun is low in the sky after rains.

3. A _____ image cannot be obtained on screen.

4. Changing of right side to the left sided is called _____.

5. Spherical mirrors obey law of _____.

6. The image formed in a convex mirror is always _____.

7. Shaving mirrors are _____mirrors.

8. A virtual image is always _____.

9. The inner surface of a steel spoon acts as a mirror.

10. The outer surface of a flat steel plate acts as a _____ mirror.

11. The outer shining surface of a round bottom steel bowl acts as a _____ mirror.

12. The inner surface of the reflector of a torch acts as a _____ mirror.

1. Energy	2. Rainbow	3. Virtual	4. Lateral inversion	5. Reflection	6. Smaller
7. Can cave	8. Erect	9. Concave	10. Plan	11. Convex	12. Concave

II. Fill in the blanks

1. Complete the following with a suitable word/ words.

i) There are .....types of spherical mirrors

ii) Changing of left side of object to right side of object to right side of image is called .....

iii) Convex mirror always forms .....and .....image.

iv) ..... lens is called converging lens.

v) ..... lens is also known as a magnifying glass.

1) two	2) lateral inversion	3) erect, virtual	4) Convex	5) Convex

I. Match the following.

Column A	Column B
a. Plane Mirror	i. Triangular
b. Convex mirror	ii. Splitting of white light
c. Concave mirror	iii. Bouncing of light from surface
d. Concave lens	iv. Magnifying glass
e. convex lens	v. Myopia
f. Reflection	vi. Headlights of car
g. Dispersion	vii. Rear view of car
h. Prism	viii. solar cooker

a. viii	b. vii	c. vi	d. v
e. iv	f. iii	g. ii	h. i

II. Match the following.

I. Column A	Column B
i) Plane mirror	a) concave and convex mirror
ii) Convex mirror	b) Can be taken on screen
iii) Spherical mirrors	c) Cannot be taken on screen
iv) Real image	d) lateral inversion
v)Virtual image	e) virtual image

i. d	ii. e	iii. c	iv. b	v. c

I. True or False

Write true or false against the following statements

i) Concave lens is converging in nature

ii) Concave mirror is diverging in nature

iii) Plane mirror forms virtual image

iv) The image formed by a concave lens is always erect and virtual.

v) Concave mirror has a virtual focus

1) False	2) False	3) True	4) True	5) False

Quiz Time

1. Name the form of energy which produces sensation of vision.

2. Name a common device which reflects light that falls on it.

3. A ray of light falls on a mirror, what is that ray of light called?

4. How many types of spherical mirrors are there? Name them.

5. Is a mirror capable to change the direction of light?

6. An image is formed by actual intersection of rays and can be taken on the screen. It is real or virtual image?

7. What is a transparent material bounded by both or one spherical surfaces called?

8. What is the nature of image formed by a convex lens?

9. What is the colour of light formed by mixing of seven colours (violent, indigo, blue, green, yellow, orange and red colours)?

10. How many colours are present in the rainbow?

1. Light	2. Mirror	3. Incident ray	4. i) Concave ii) convex mirror	5. Yes	6. Real image
7. Lens	8. Real and inverted	9.White colour	10. Seven colours		

NCERT Corner

Intext Questions.

1. Why was boojho not able to see the candle flame through a bent pipe?

Light travels in a straight line. So, light from the candle cannot travel through a bent pipe.

2. Do you know, what happens when light falls on a polished or a shiny surface?

The light is reflected back.

3. Have you ever seen the reflection of trees or building in water?

Yes.

4. What happens when light falls on a mirror?

The mirror reflects the direction or light that falls on it.

5. Does the mirror change the direction of light that falls on it?

Yes.

6. Do you find any change in the direction of reflection light?

Yes.

7. Do you see the slits the mirror?

Yes.

8. Was the image upright in each case?

Yes.

9. Did the flame appear on top of the candle as in the object?

Yes

10. Can you get the image on the screen?

No.

11. Can you get the image on the screen now?

No.

12. Did you find any relation between the distance of the image from the mirror and that of the object in front of it?

The image is at the same distance behind the mirror as the object is an front of it.

13. When you see your image in a pane mirror, it is a exactly like you?

No

14. Have you ever noticed that there is one interesting difference between you and your image in a mirror?

The right hand seems to be left had in the image.

15. Which hand does your image raise?

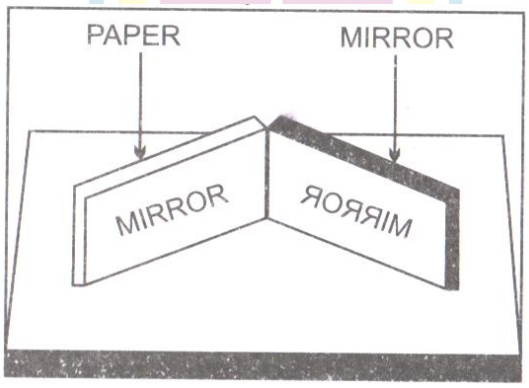
Right

16. Which ear does you hand touch in your image?

Left.

17. Write down your name on a piece of paper and hod it in front of a plane mirror. How does it appear in the mirror?

The letters get literally reversed



18. Boojho saw an ambulance on the road. He was surprised to see that the word ' AMBULANCE' in front was written in a strange manner. Can you now understand why the word ' AMBULANCE' is written inverted?

When the driver of a vehicle ahead of an ambulance looks at her/his rear view mirror, she can read AMBULANCE written on it and give way, to it. It is the duty of every one of us to let and ambulance pass without blocking its path.

19. Do you see your image in it?

Yes.

20. Is this image different from what you see in a plane mirror?

Yes.

21. Is this image erect?

Yes.

22. Is the size of the image the same smaller or larger?

Smaller.

23. Does the paper start burning?

Yes

24. Is this image real or virtual?

Real.

25. Is it of the same size as the flame?

No.

26. Record your observation in Table.

Distance of the object from the mirror	Smaller / larger than the object	Character of the image	
		Inverted / erect	Inverted / virtual
50 cm	Smaller	Inverted	Real
40 cm	Smaller	Inverted	Real
30 cm	Smaller	Inverted	Real
20 cm	Equal	Inverted	Real
10 cm	Very large	Inverted	Real
5 cm	Larger	Erect	Virtual

27. Can you recognize the type of the mirror?

It is a convex mirror.

28. Record your observed in table similar to Table.

Distance of the object from the mirror	Smaller / larger than the object	Character of the image	
		Inverted / erect	Inverted / virtual
50 cm	Smaller	Inverted	Real
40 cm	Smaller	Inverted	Real
30 cm	Smaller	Inverted	Real
20 cm	Equal	Inverted	Real
10 cm	Very large	Inverted	Real
5 cm	Larger	Erect	Virtual

29. Could you get a real image at any distance of the object from the convex mirror?

No.

30. Did you get an image larger in size than the object?

No.

31. Can you now recognize the mirrors used as side mirrors in scooters/

They are convex mirrors.

32. Can you find some difference just by touching?

We feel these lenses thicker in the middle than at the edges.

33. Does the paper begin to burn?

Yes.

34. Do you see a bright spot on the paper this time, too ?

No,

35. Why are you not getting a bright spot this time?

Because concave lens is a diverging lens.

36. What king of image did you get? It is real or virtual?

Real .

37. Record your observations as you did in activity 15.7 for the concave mirror.

Distance of the object from the mirror	Smaller / larger than the object	Character of the image	
		Inverted / erect	Inverted / virtual
50 cm	Smaller	Inverted	Real
40 cm	Smaller	Inverted	Real

30 cm	Smaller	Inverted	Real
20 cm	Equal	Inverted	Real
10 cm	Very large	Inverted	Real
5 cm	Larger	Erect	Virtual

38. Did you get in any position of the object an image which was erect and magnified?

Yes.

39. Could this image be obtained on a screen?

No.

40. Is the image real or virtual?

Virtual.

41. Have you ever seen a rainbow in the sky?

Yes.

42. How many colour are present in a rainbow?

There are seven colours in a rainbow , though we cannot easily distinguish all of them, these are : red, orange, yellow, green, blue, indigo and violet.

43. Does this mean that the white light consists of seven colours?

Yes.

44. Do you see colour similar to those in a rainbow?

Yes.

I. Textbook Questions.

1. Fill in the blanks:

a) An image that cannot be obtained on a screen is called_____.

b) Image formed by a convex _____ is always virtual and smaller in size.

c) An image formed by a _____mirror is always of the same size as that of the object.

d) An image which can be obtained on a screen is called a _____ image.

e) An image formed by a concave _____ cannot be obtained on a screen.

a. Virtual image	b. mirror	c. plane	d. real image	e. lens

2. Mark "T" if the statement is true and "F" if it is false:

a) We can obtain an enlarged and erect image by a convex mirror. (T/F)

b) A concave lens always forms a virtual image (T/F)

c) We can obtain a real, enlarged and inverted image by a concave mirror. (T/F)

d) A real images cannot be obtained on a screen (T/F)

d) A concave mirror always forms a real image (T/F)

3. Match the items given in Column I with one or more items of Column II.

Column I	Column II
a) A plane mirror	i) Used as a magnifying glass
b) A convex lens	ii) Can form image of objects spread over a large area
c) A convex lens	iii) Used by dentists to see enlarged image of teeth
d) A concave mirror	iv) The image is always inverted and magnified.
e) A concave lens	v) The image is erect and same size as the object
	vi) The images is erect and smaller in size than the object.

a. v	b. ii	c. i	d. iii	e. vi

4. State the characteristics of the image formed by a plane mirror.

In a plane mirror the image is formed behind the mirror. It is erect, of the same size and is at the same distance from the mirror as the object is in front of it.

5. Find out letters of English alphabet or any other language known to in which the image formed in plane mirror appears exactly like the letter itself. Discuss your findings.

A, H, I, M, O, T, U, V, W, X, Y

6. What is a virtual image? Give one situation where a virtual image is formed.

Image that cannot be formed on a screen is known as virtual image. Plane mirrors form virtual image.

7. State two differences between a convex and a concave lens

	Convex lens	Concave lens
1.	Thick at middle, thin at edge.	Thin at middle, thick at edge.
2.	Can form real image	Cannot form real image

8. Give one use each of a concave and a convex mirror.

Concave mirror : Used by dentists to see teeth

Convex mirror : Used in vehicles as a rear view mirror.

9. Which type of mirror can form a real image?

Concave

10. Which type of lens forms always a virtual image?

Concave

11. A virtual image larger than the object can be produced by a :

i) Concave lens ii) Concave mirror iii) Convex mirror iv) Plane mirror

ii) Concave mirror

12. David is observing his image in a plane mirror. The distance between the mirror and his image is 4m. If he moves 1 m towards the mirror, then the distance between David and his image will be:

i) 3m ii) 5m iii) 6m iv) 8 m

iii) 6 m

13. The rear view mirror of a car is a plane mirror. A driver is reversing his car at a speed of 2m/s. The driver sees in his rear view mirror the image of a truck parked behind his car. The speed at which the image of the truck appears to approach the driver will be:

i) 1 m/s ii) 2 m/s iii) 4 m/s iv) 8 m/s

iii) 4 m/s

I. Very Short Answer Type Question.

1. How does the light travel?

The light travels along straight line.

2. What do you mean by rectilinear propagation of light?

The light travels in straight line, it is called rectilinear propagation of light

3. What is reflection of light?

When light falls on smooth surface like mirror then it changes its direction, it is called reflection of light.

4. What is mirror?

The smooth surface whose one side is polished and one side is shining and can reflect light is called mirror.

5. Does mirror change the direction of light?

Yes mirror changes the direction of light.

6. What is object and image?

Place a candle in front of mirror. The candle which appears behind the mirror is image and the real candle itself is object.

7. What is the nature of image formed by a plane mirror?

The image formed by plane mirror is erect and of the same size as the object.

8. What is the distance of image from the plane mirror?

Image formed by the plane mirror is at the same distance as object is kept.

9. How many reflected rays can be there for a single incident ray ion respect of plane mirror?

Only a single reflected ray is present for an incident ray for a plane mirror.

10. What do you mean by lateral inversion?

A mirror forms an image such that its left side is object's right side and its right side is object's left side. This phenomenon of change in object and image sides is known as lateral inversion.

11. What are spherical mirrors?

The mirrors having curved shining surfaces are called spherical mirrors.

12. How many types of spherical mirrors are there?

There are two types of spherical mirrors

i) Concave mirror ii) Convex mirror

13. What is concave mirror?

If the reflecting surface of a spherical mirror is concave or inward, it is called concave mirror.

14. What is convex mirror?

If the reflecting surface of a spherical mirror is convex or outward, it is called concave mirror.

15. How many types of images can be formed?

There are two types of images:

i) Real imaged ii) Virtual image

16. What is real image?

The image which can be obtained on a screen is called real image.

17. Define virtual image.

The image which cannot be obtained on a screen is called virtual image.

18. What type of image is formed by a concave mirror?

The image formed by a concave mirror is real and inverted. If the object is placed very near to the mirror then the image formed is virtual and erect.

19. What is nature of image formed by a convex mirror?

The nature of image formed by convex mirror is always virtual and erect.

20. What is lens?

A transparent material bounded on both sides by one or two spherical surfaces is called lens.

21. How many types of lenses are there?

There are two types of lenses.

i) Concave lens ii) Convex lens

22. Define concave lens

The lenses which are thin in the middle and thicker at its edges are called concave lenses.

23. What are convex lenses?

The lenses which are thick in the middle and thinner at its edges are called concave lenses.

24. What is the nature of image formed by a convex lens?

The images formed by convex lens are mostly real and inverted except when object is very close.

25. What type of images are formed by a concave lens?

The images formed by concave lens are always virtual and erect.

26. What is rainbow?

The rainbow is seen as a large arc in the sky with many colours.

27. How many colours are present in a rainbow?

Seven colours are present in a rainbow.

28. Name the seven colour of rainbow.

Red, Orange, Yellow, Green, Blue, Indigo and Violet.

29. What is the composition of sunlight?

Sunlight is a mixture of seven colours.

30. What is the colour of light formed by mixing of seven colours of rainbow?

The colour of light formed is white

31. What is light?

Light is a form of energy which helps us to see the object.

32. How does light travels from one place to other?

Light travels in straight line.

33. Does water reflect the light like a mirror?

Yes, light can be reflected by water like mirror.

34. Which type of mirror is used by ENT doctors?

ENT surgeons use concave mirror.

35. Sunlight looks white in colour. Is it actually white?

No, the colour of light is not white.

36. What are colours which make the sunlight ?

Sunlight is a mixture of seven colour, i.e., red, orange, yellow, green, blue, indigo and violet.

II. Very Short Answer Type Question.

1. What is meant b rectilinear propagation of light?

It means that beam of light always travels in straight line

2. What is a plane mirror?

A smooth and shining surface which rebounces the light back is a plane mirror.

3. What happens when light falls on a mirror or what is reflection?

When a ray of light falls on the surface of any mirror it bounces back in the same medium. This is called reflection of light.

4. Define a real image?

Image which can be obtained on a screen is called a real image.

5. What do you mean by a virtual image?

Image which cannot be obtained on a screen is virtual image.

6. What is a convex mirror?

Mirror which has reflecting surface curved outward is called convex mirror.

7. What is a concave mirror?

A concave mirror has reflecting surface curved inwards.

8. What kind of image is formed by a plane mirror?

A plane mirror forms an image which is erect, virtual and is of the same size as that of the object.

9. Define lateral inversion.

When the right hand side of an object appears on the left side and vice, verse, the phenomenon is known as lateral inversion.

10. What kind of image is formed by a convex mirror?

The image formed by convex mirror is always virtual , erect and diminished in size.

11. Why is convex mirror used as side view mirror?

Convex mirror can be used to view a much larger are a and so it is used as rear view or side view mirror in cars.

12. How does a convex lens look?

A convex lens is a transparent glass with two spherical surface. It is thicker in the middle than at the edges.

13. What is white light?

White light is formed by amalgamation of seven colours in the order VIBGYOR.

14. When does rain bow usually appear?

Rainbow usually appears in rainy season when the sun is low in the sky.

15. Why Does rainbow usually appear?

Convex lens converges (bends inside) the rays of light passing through it. So it is called as converging lens.

16. The image formed by a lens is always virtual, erect and smaller in size for an object kept at different positions in front of it. Identify the natural of the lens.

Concave lens.

17. You are given three mirrors of difference types. How will you identify each one of them?

We can identify the mirrors by forming image of an object.

i. Plane Mirror : in case of plane mirror, image will be virtual, erect and of same size as that object

ii. Concave mirror : in case of concave mirror, image may be real, virtual and magnified or diminished,

iii. Convex mirror in case of convex mirror, image formed will always be virtual, erect and diminished

18. Boojho made light from a laser torch to fall on a prism. Will he be able to observe a band of seven cocours? Explain with a reason.

No, laser torch gives out light of only one colour.

III. Very Short Answer Type Question.

1. The image formed by a lens is always virtual, erect and smaller in size for an object kept at different positions in front of it. Identify the nature of the lens.

[NCERT Exemplar]

Concave lens.

2. Which type of mirror can form a real image?

A concave mirror

3. Which type of lens always forms a virtual image?

A concave lens

4. The side mirror of a scooter got broken. The mechanic replaced it with a plane mirror. Mention any inconvenience that the driver of the scooter will face while using it.

The driver will not be able to see traffic spread over a large area behind him.

5. The concave reflecting surface of a torch got rusted. What effect would this have on the beam of light from the torch?

The beam of light will be diffused with lower internsity.

6. The distance between an object and a convex lens is changing. It is noticed that the size of the image formed on a screen is decreasing. Is the object moving in a direction towards the lens or away from it?

The object is moving away from the lens.

7. What is a ray?

The direction of the path in which light is travelling is called a ray.

8. What type of image is formed on a cinema screen?

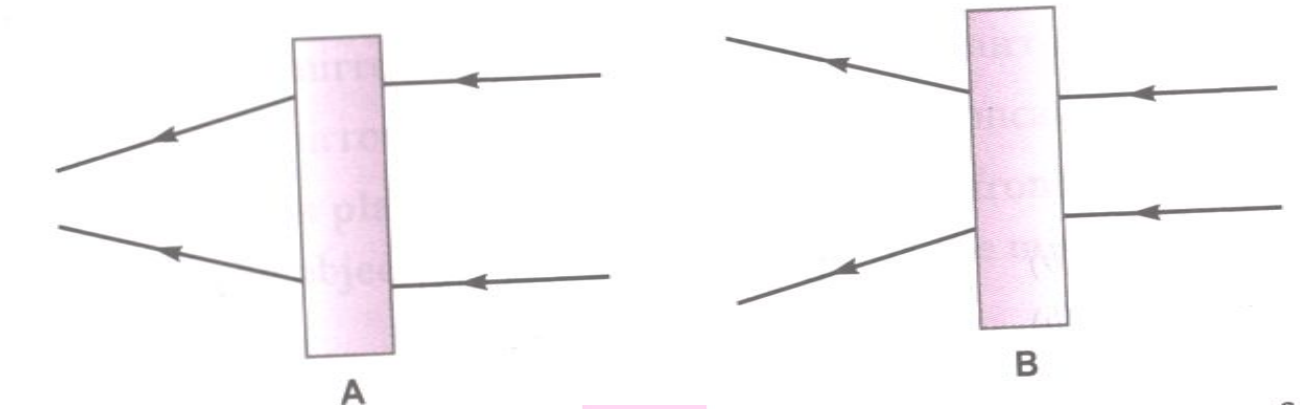
Real image.

I. Short Answer Type Question.

1. What type of mirror is used as a side mirror in a scooter? Why is this type of mirror chosen?

Convex mirror, convex mirrors can form images of objects spread over a large area. So, these help the drivers to see the traffic of a large area behind them.

2. Observe the figures given below carefully.



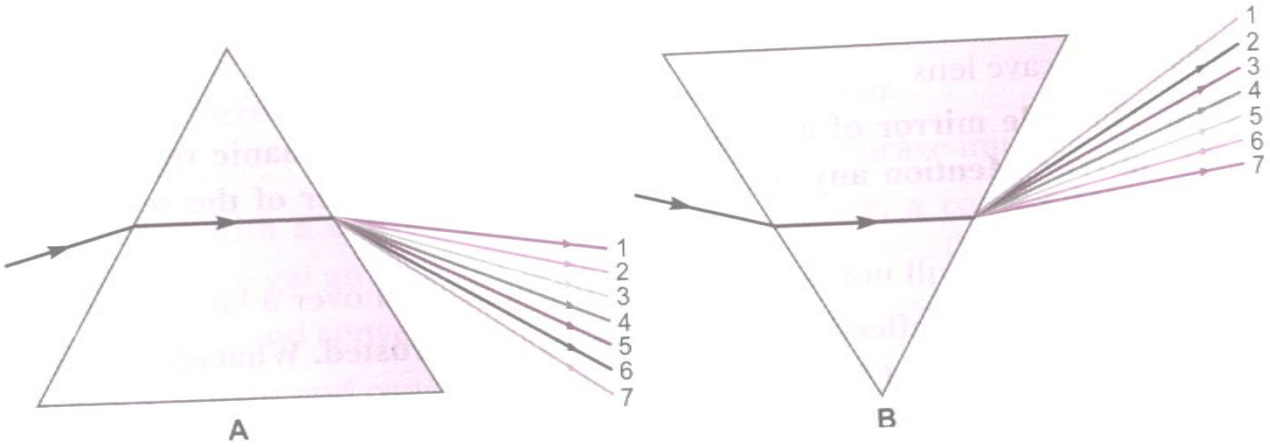
The given figures show the path of light through lenses of two different types, represented by rectangular boxes A and B. What is the nature of lenses A and B?

A – Convex lens; B- Concave lens.

3. Boojho made light from a laser torch to fall on a prism. Will he be able to observe a ban of seven colours? Explain with a reason.

No, Laser torch gives out light of only one colour.

4. Satae the correct sequence (1.7) of colours in the spectrum formed by the prisms A and B, Shown in figure.



A	1	→	Red	←	7	B
	2	→	Orange	←	6	
	3	→	Yellow	←	5	
	4	→	Green	←	4	
	5	→	Blue	←	3	
	6	→	Indigo	←	2	
	7	→	Violet	←	1	

5. An erect and enlarged image of an object is formed on a screen. Explain how this could be possible.

The image formed on the screen could be enlarged and erect if the object is placed upside down between F and 2F of the lens.

6. Two different type of lenses are placed on a sheet of newspaper. How will you identify them without touching?

If the letter appears bigger/ magnified, then the lens is a convex lens, if the letters appears smaller, then the lens will be concave lens.

7. A shopkeeper wanted to fix a mirror which will give a maximum view of his shop. What type of mirror should he use? Give reason.

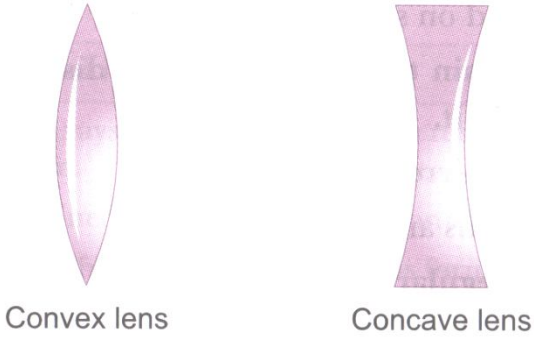
He will fix a convex mirror because it. Can form image of objects spread over a large area.

8. What is a virtual image? Give one situation where a virtual image is formed.

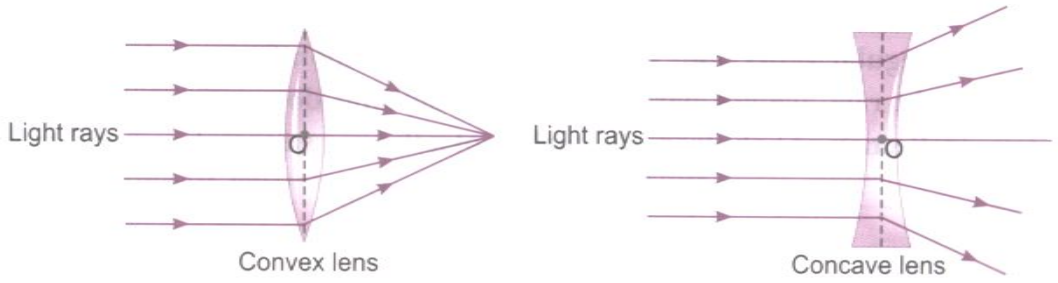
Virtual image is an image in which the rays reflected by a mirror or on passing through a lens diverge, but to the eye they appear to converge at the same point. For example, image in a mirror.

9. State two differences between a convex and a concave lens.

a. Convex lens is thicker in the middle while concave lens is thinner in the middle.



b. A convex lens converges the light rays falling on it, while a concave lens diverges the light rays falling on it.



10. Give one use each of a concave and a convex mirror.

Concave mirror are used by the dentist to see the enlarged image of the patient's teeth.

Convex mirror is used as a side view mirror of the car because it enables the driver to view objects spread over a large area behind him/ her.

11. What is lateral inversion?

The phenomenon of changing left to right and right to left by the mirror while forming images is called lateral inversion.

12. State the characteristics of the image formed by a plane mirror.

a. The distance of the image from the mirror is same as the distance between the mirror and object.

b. Image formed is erect but laterally inverted.

c. it is of the same size as that of the object.

13. What is a Newton's disc?

A Newton's disc is disc having segments of seven colours found in a rainbow and when rotated, the colours fade to while.

14. Why should you not look at the sun through a convex lens?

The sunlight passing through a convex lens becomes concentrated at a point which can damage eyes permanently if you see through a convex lens.

15. It was observed that when the distance between an object and a lens decreases, the size of the image increases. What is the nature of this lens? If you keep on decreasing the distance between the object and the lens, will you still be able to obtain the image on the screen? Explain.

It is a convex lens.

No, When the object is placed close to a convex lens then the image formed is virtual which cannot be obtained on screen.

16. Suppose we wish to obtain the real image of a distant tree. Explain two possible way in which we can do it.

a. By using a concave mirror and a screen.

b. By using a convex lens and a screen.

17. What is regular and irregular reflection?

Regular reflection : It is the reflection from a smooth surface such that the light rays are evenly parallel to each other and an image is formed. For example, reflection from the smooth surface of calm lake can produce and image in water. From the smooth surface of calm lake can produce an image in water.

Irregular reflection: If is the diffused reflection from uneven surface such that the light rays are not parallel to each other and do not form an image. For example. Reflection of light form the surface of a following stream does not form an image.

II. Short Answer Type Question.

1. What is reflection of light? Explain it with the help of an example from the Panchtantra?

The mirror changes the directions of light that falls on it. This change of direction by a mirror is called reflection of light. There is a story of lion and rabbit in Panchtantra, in which the rabbit fooled the lion by showing him his reflection in water.

2. Write the characteristics of image formed by plane mirror:

i) The image is virtual and erect.

ii) The image is laterally inverted

iii) The image is of same size as the object

iv) The image is formed at the same distance as object is placed from mirror

3. How many types of images are there? Explain of them

There are two types of images:

i) Real image: The image which can be obtained on a screen is called a real image.

ii) virtual image : The image which cannot be obtained on a screen is called virtual image.

4. Mention differences between real and virtual images.

Real image	Virtual image
i) It can be taken on the screen	i) It cannot be taken on the screen
ii) It is formed by actual intersection of two rays	ii) There is no actual intersection
iii) It is always inverted	It is always erect.

5. Write two uses of concave mirror

i) Concave mirror are used by doctors for examining eye, ears, nose and throat,

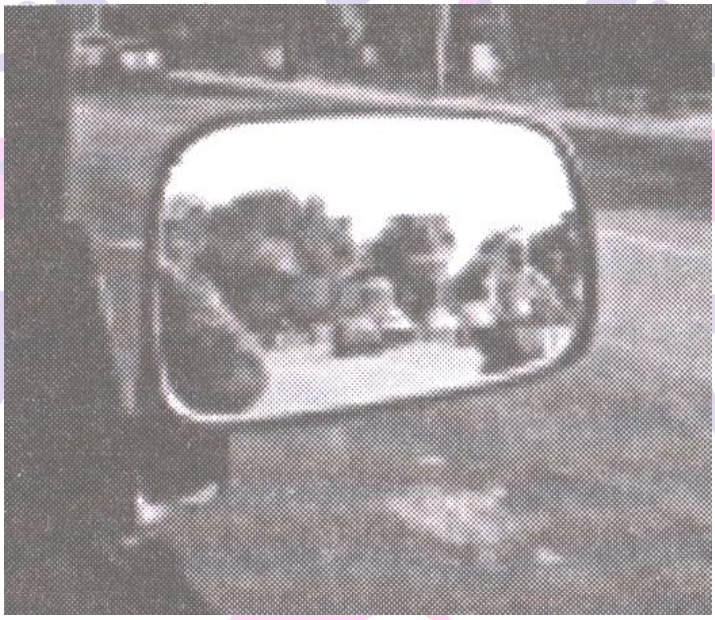
ii) Concave mirror is used by dentists

6. Why do we need a shiny surface for reflection?

The extent of reflection depends upon the shine and smoothness of the surface more will be the reflection. That is why mirrors reflect most of the light falling on it. Therefore, for reflection, shiny surfaces are required.

7. Why is convex mirror used as side mirror in scooters?

You can recognise that the mirrors used as side mirror in scooters are convex mirrors,, convex mirror can from images of objects spread over a large area. So, it helps the drivers to see the traffic behind them.



8. Explain why the word AMBULANCE is written as in figure.

When the driver of a vehicle ahead of an ambulance looks in his rear view mirror, he can read AMBULANCE written on it and give way to it. Since Ambulance carried seriously ill or injured patients with it, we must give it way at once.

9. Why is convex lens called converging lens and concave lens diverging lens?

A convex lens converges (bends inward) the light falling on it. Therefore, it is called a converging lens. On the other hand, a concave lens diverges (bends outward) the light and is called diverging lens.

10. Why are the convex lenses used as a magnifying glass?

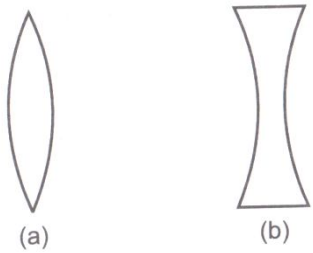
When an object is placed near the convex les then an enlarged image is formed, due to this property convex lenses are used as magnifying glass.

11. Explain the two types of lenses.

Lenses are of two types.

(i) Convex lens : Those lenses which are thicker in middle than at the edge are convex lenses.

(ii) Concave lens : The lenses which are thinner in the middle than at the edges are concave lenses



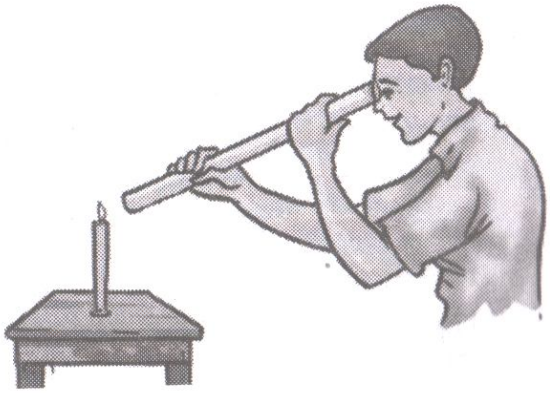
12. What is the nature of images formed by concave and convex lenses?

The image formed by concave lens is always virtual, erect and smaller in size than the object. The image formed by convex lens is mostly inverted and real. Sometimes it is erect and virtual. The size of image depends on the position of object. It may be smaller or bigger than object.

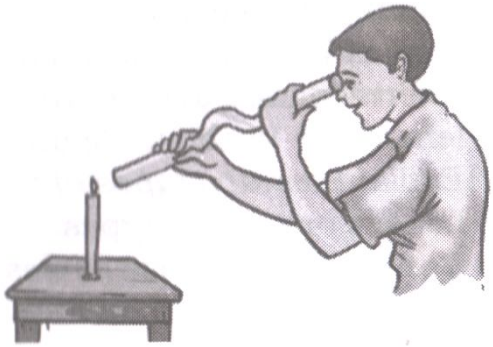
13. How will you show that light travels in straight line?

Take a lighted candle. See the candle first through a straight pipe and see it through a bent pipe. You observe that you can see the candle only in the straight pipe but not in bent pipe. It shows that light travels in a straight line.

a.



b.



III. Short Answer Type Question-1

1. What are spherical mirrors? Given their types

Mirror having curved surfaces are known as spherical mirrors because they are a part of hollow spheres.

a. Concave mirror if the reflecting surface is curved inside.

b. Convex mirror if the reflecting surface is bulged out.

2. Give eight English alphabet letters which do not show lateral inversion while placed before a plane mirror.

Eight English alphabet letter which do not show lateral inversion are:

A,H,I,M,O,T,U,X

3. What is regular reflection?

When a ray of light falls on a smooth and shiny surface, the whole of light is sent back, silvered glass or mirrors do not allow even a small amount of light to pass through them. Mirrors thus show regular or complete reflecting.

4. If standing before a plane mirror you touch your nose with your left hand, which had of your image will touch your nose? What is this phenomenon called?

In the image before a plane mirror, our right hand will appear to touch the nose. This phenomenon is called lateral inversion.

5. When the ray of light is reflected along the same line, what would be angle of incidence and angle of reflection ? Explain.

When the incident ray is triking at 90°, the angle of reflection will also be 90° as per laws of reflection. This also means that ray of light is reflected back along the same line.

6. How does a shiny surface help in giving better reflection?

Shiny and polished surface absorb minimum light and reflect most of the light falling on them. Thus shiny surfaces are better reflectors.

7. Give two uses of a concave mirror.

Uses of concave mirror.

i. It is used as a reflection in search light and headlights of the automobiles.

ii. it is used by doctors to examine certain body parts like, ear, nose, throat, eyes, teeth.

8. When does a real image form ? explain giving an example.

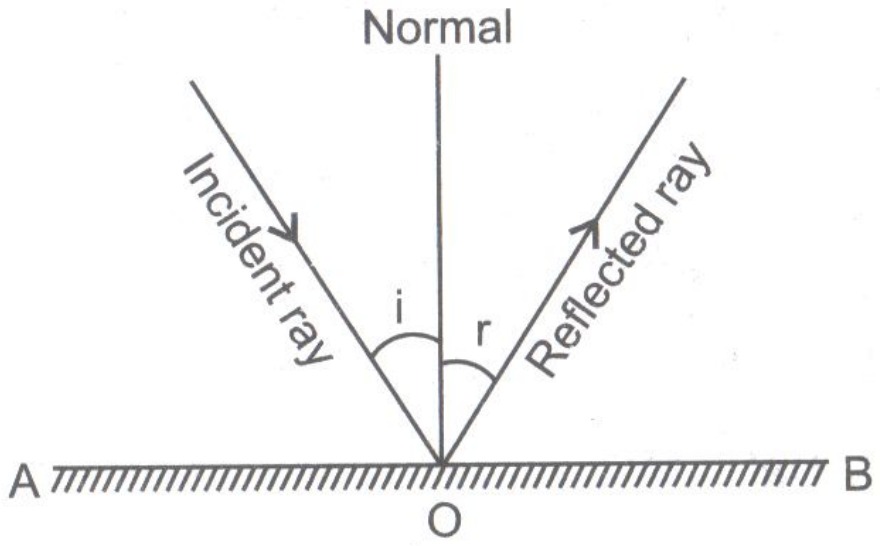
Real image is formed when the reflected rays actually meet and is obtained on a screen. It is always inverted, pinl-hole camera forms a real image.

9. State the laws of reflection.

Laws of reflection are:

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

ii. The angle of incidence is equal to the angle of reflection, i.e., $\angle I = \angle r$.



10. A man walks towards a plane mirror at when rate will his image move if;

a. the mirror is stationary?

b. the mirror is moving towards the man?

a. if the mirror is stationary, image moves at the same rate as the man.

b. When the mirror is moved towards the man, the image moves twice as the rate of movement of mirror.

11. What is a lens? How is it different form a morror ?

A lens is a piece of transparent material which has one or two spherical surfaces, contrary to mirrors where the incident rays are reflected back, in case of lens the light rays pass through the spherical surface of the lens and change their path. This is also called refraction of light.

12. What is a mirror? What are the types of mirrors?

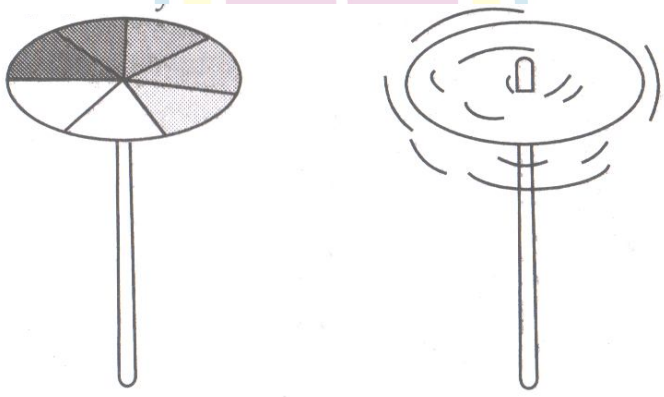
Any smooth or polished surface which can reflect a ray of light is called a mirror. When the reflecting surface is plane, the mirror is called plane mirror while a mirror with spherical or curved reflecting surface is called spherical mirror. Further, spherical mirrors are of two types.

i. Concave mirrors are the mirrors mirror whose reflecting surface is curved inwards inwards.

ii. Convex mirrors are the mirrors whose reflecting surface is curved outwards.

13. What is Newton's disc?

Newton thought that we should be able to get white light by mixing seven colours of a rainbow. To prove his point, he made a disc on which seven colours of the rainbow were painted in equal section. When this disc was rotated all the colours disappeared and whit e colour appeared. this disc is popularly known as Newton's disc.



Disc with colours

Disc when rotated appears white

14. Give one use each of a concave mirror and convex mirror in automobiles.

In automobiles, concave mirror is used as a reflector in headlights of cars or scooters. In automobiles convex mirror is used as side mirror behind.

15. Light takes 8.5 minutes to reach the earth from the sun. What is the distance between the sun and the earth? Velocity of light is 3×10^{10} cm per second.

Light travels in 1 second = 3×10^{10} cm

= 3×10^{5} km

Light travels in 1 min = $60 \times 3 \times 10^{5}$

Light travels in 8.5 min = $8.5 \times 60 \times 3 \times 10^{5}$

= 1530×10^{5} Km

Therefore, the distance between the sun and the earth is 1.53×10^{8} km

16. Prove that shiny surfaces reflect better light.

Place a mirror, a shiny steel plate and a sheet of paper facing a wall. throw a beam of light from a torch on these objects one by one such that reflected light falls on the wall. It will be seen that a patch of light falls on the wall only in case of mirror and shiny steel plate but no patch of light in case of paper. This shows shiny surfaces reflect light better.

17. What are converging and diverging lens?

A convex lens bends inwards the light falling on it. It is called a converging lens. On the other hand, concave lens bends outwards the light and is called diverging lens.

18. What type of mirror is used as a side mirror in a scooter? Why is this type of mirror chosen?

Convex mirror. Convex mirrors can form images of objects spread over a large area. So these help the drivers at see the traffic a large area behind them.

19. The side mirror of a scooter got broken. The mechanic replaced it with a plane mirror. Mention any inconvenience that the driver of scooter will face while using it?

The driver will not e able to see traffic spread over a large area behind him.

20. The concave reflecting surface of a torch got rusted. What effect would this have on the beam of light from the torch?

The beam of light will be diffused with lower intensity.

21. An erect and enlarged image of an object is formed on a screen. Explain how this could be possible.

The image formed on the screen could be enlarged and erect if the object is placed upside down between F and 2F of the lens.

23. Two different types of lenses are placed on a sheet of newspaper. How will you identify them without touching?

If the letters appear bigger/magnified then the lens is a convex lens if the letters appear smaller , then the lens will be concave lens.

24. A shopkeeper wanted to fix a mirror which will give a maximum view of his shop. What type of mirror should he use? Give reason.

He will fix a convex mirror because it can form image of object spread over a large area.

25. The distance between an object and convex lens is changing. It is noticed that the size of the image formed on a screen is decreasing is decreasing. Is the object moving in a direction towards the lens or away from it?

The object is moving away from the lens.

26. Suppose we wise to obtain the real image of a distant tree. Explain two possible ways in which we can do it.

i. By was observed that when the distance between an object and a lens decreases, the size of the image increases. What is the nature of this lens? If you keep on decreasing the distance between the object and the lens, will you still able to obtain the image on the screen ? explain.

It is a convex lens.

No, when the object is placed close to a convex lens then the image formed is virtual which cannot be obtained on screen.

III. Short Answer Type Question-II

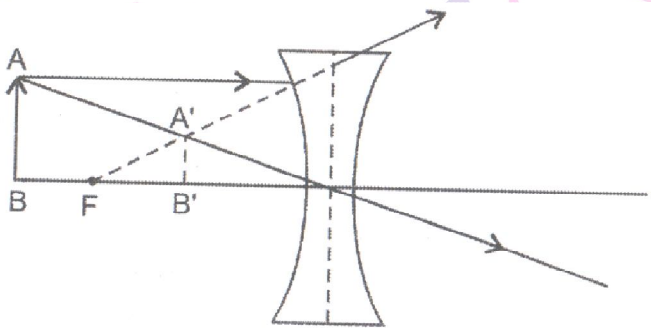
1. State the use of different kinds of mirrors

a. plane mirror are used as looking glasses . they are also used in solar cookers, periscopes and kaleidoscopes.

b. concave mirrors are used as reflectors in the headlights of automobiles. As these give erect and magnified images, these are used by doctors to examine parts of bodies, such as ear, nose , throat etc.

c. Convex mirror can be used to view a much larger area than is possible with a plane mirror. These are therefore used as rear view or side view mirrors in cars and seconds.

2. Consider the following ray diagram.



Answer the following questions.

i. Which lens is used?

ii. What is the characteristics of the image formed?

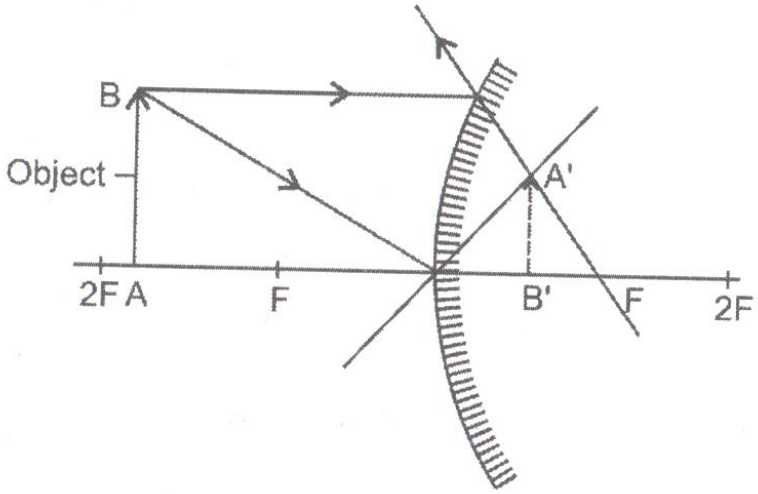
iii. How will the position of image change if position of image is changed?

i. Concave lens.

ii. The image formed is erect, virtual and diminished.

iii. The characteristics of the image will not change on changing the position of object

3. Given below is a ray diagram of an experiment done with a mirror.



Answer the following questions:

i. Name the mirror used.

ii. What are the characteristics of the image formed?

iii. How will the position of image change if the position of object is changed?

i. Convex mirror

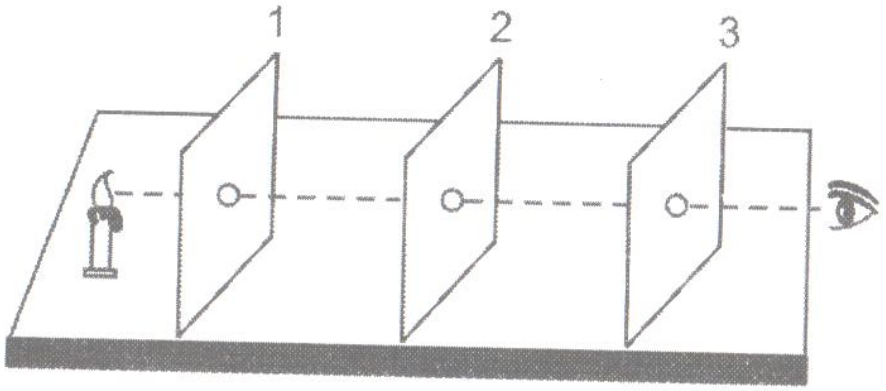
ii. The image formed is virtual, erect and smaller than the size of the object.

ii. the size of the image will increase as the object is moved closer to the convex mirror but is never larger than the size of the object.

4. How will you prove that light travels in straight line?

Take three cardboards of similar size and make a hole in the centre of each. Make sure that the size and position of the hole is the same in each cardboard.

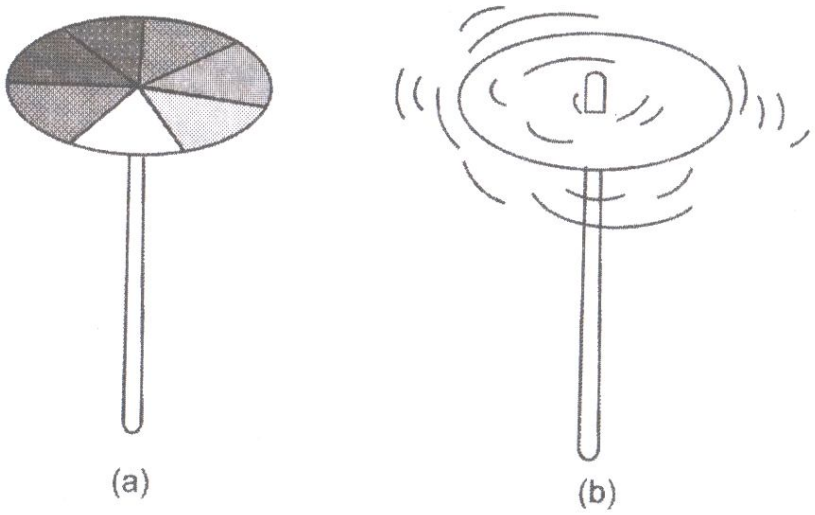
Now put the three cardboards in vertical position with the help of bricks in such a way that the holes in the three cardboards are in a straight line. Place a lighted candle in front of the cardboards no. 1 as shown in Gig. Look through the hole or the last cardboard no.3



The flame can be seen clearly through the holes. When one of the cardboards is slightly raised, no flame can be seen. When the holes of the three cardboards are not in a straight line because light can not bend.

5. Describe an activity to show that seven colours can be mixed to get white light.

Take a circular cardboard disc of about 10 cm diameter. Divide this disc into seven segments paint each segment with the seven rainbow colours, as shown in the following figure. Make a small hole at the centre of the disc. Fix the disc loosely on the tip of a refill of a ball pen . rotate the disc at the high speed. All the colours get mixed up and the disc will appear whitish. Such a disc is popularly known as newton's disc.



I. Long Answer Type Questions.

1. Give the properties of the image formed by the following:

i. Plane mirror ii. Concave mirror iii. Convex mirror

iii. Convcave iv . Concave lens v. convex lens.

i. Plane mirror : The image formed by a plane mirror is always erect. It is virtual and is of the same size as the object. The image is at the same distance behind the mirror as the object is in front of it. In an image formed by a mirror, the left side in the image.

ii. Concave mirror : A concave mirror can form a real and inverted image . when the object is placed very close to the mirror, the image formed is virtual, erect and magnified

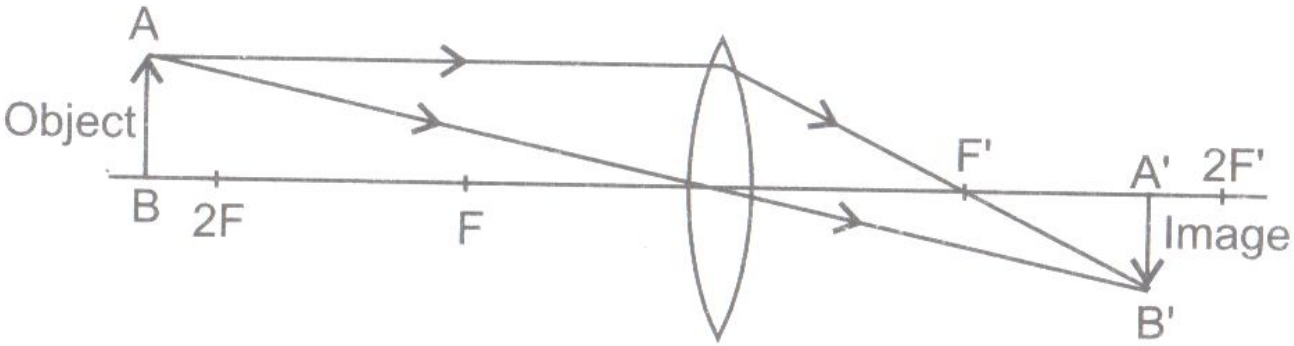
iii. Convex mirror : image formed by a convex mirror is erect, virtual and smaller in size than the object.

iv. concave lens ; a concave lens always forms erect , virtual and smaller in than the object.

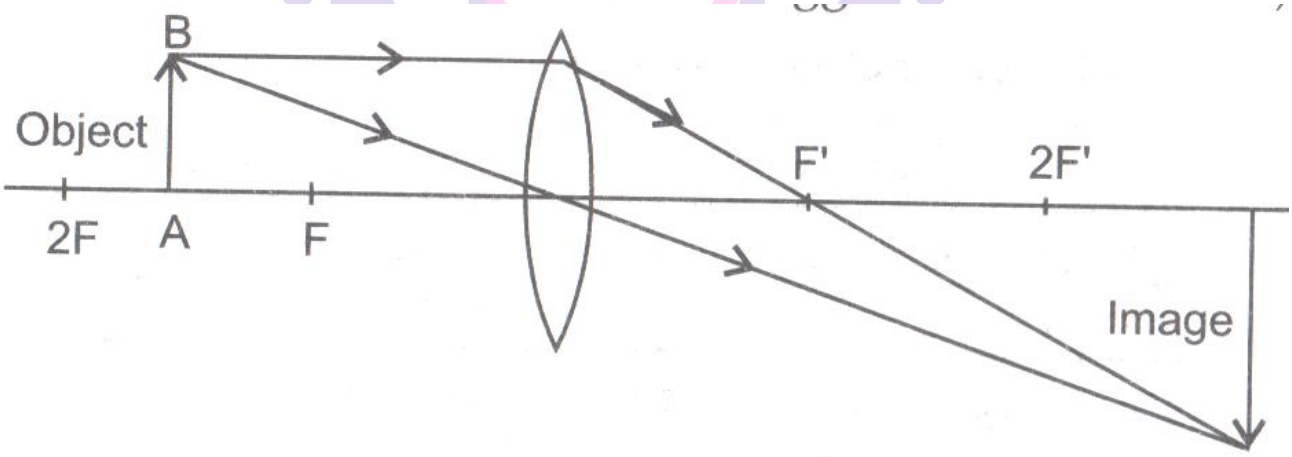
v. Convex lens : A convex lens can form real and inverted image. when the objectis placed very close to the lens, the image formed is virtual, erect and magnified. When used to see magnified objects ,the convex lens is called a magnifying glass.

2. Draw the ray diagram formed by a convex lens under three different positions of the object.

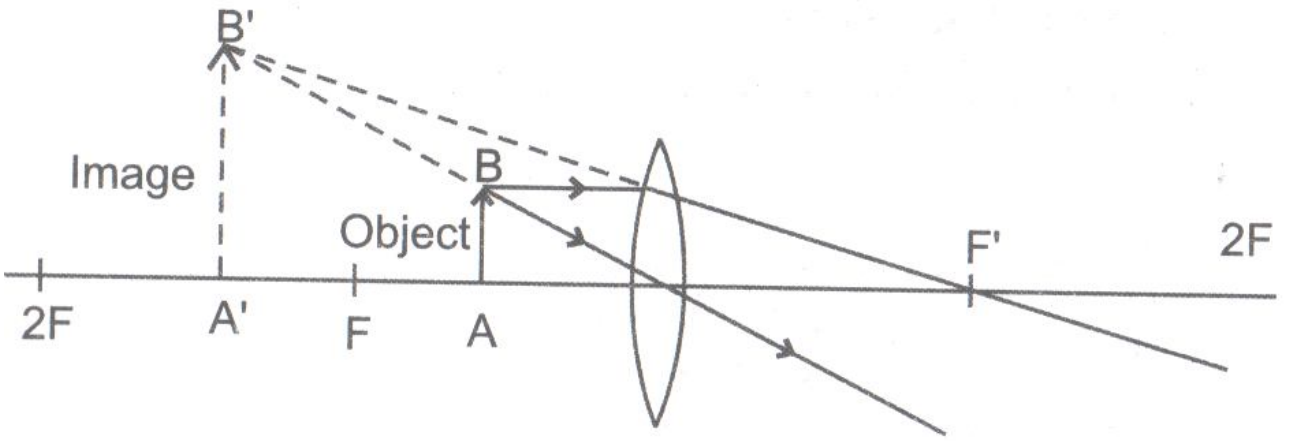
a. When the object is far away the image is real inverted and smaller in size.



b. When the object is between F and radius lens, the image is real, inverted but bigger in size.



c. When the object is near to the lens. The image is real, inverted and much bigger (magnified)



3. Give one use of all mirror and lenses.

a. Plane mirror.

It is used as a looking glass. It is used a s reflector in solar cookers

b. concave mirror.

i. doctors use concave mirror for examining eyes, ears, nose, and throat

ii. Concave mirrors are also used by dentists to see an enlarged image of the teeth.

iii. The reflectors of torches, headlights of cars and scooters are concave in shape.

c. Convex Mirror

Convex mirror is used as a side view mirror. These help the drivers to see the traffic behind them.

d. Convex lens

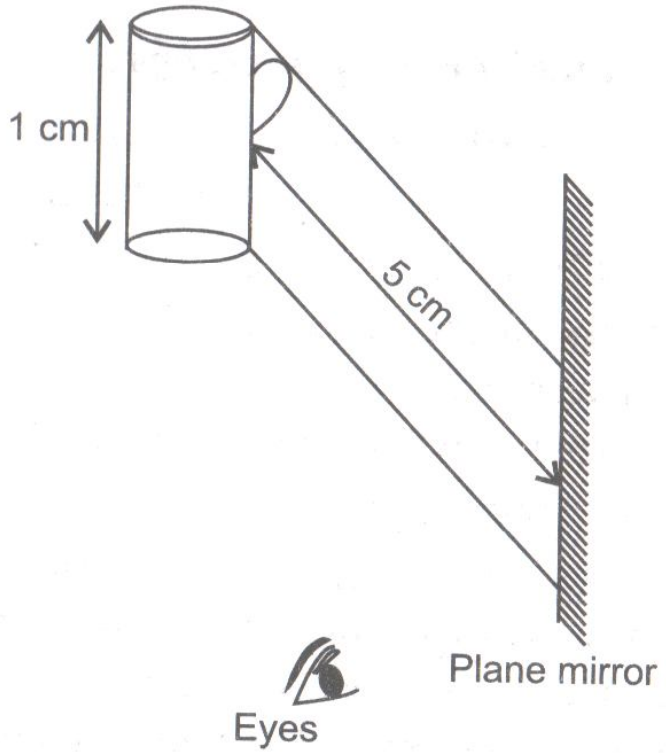
i. it is used as a magnifying glass in microscopes, telescopes etc.

ii. Used in spectacles to correct far sightedness.

e. Concave lens

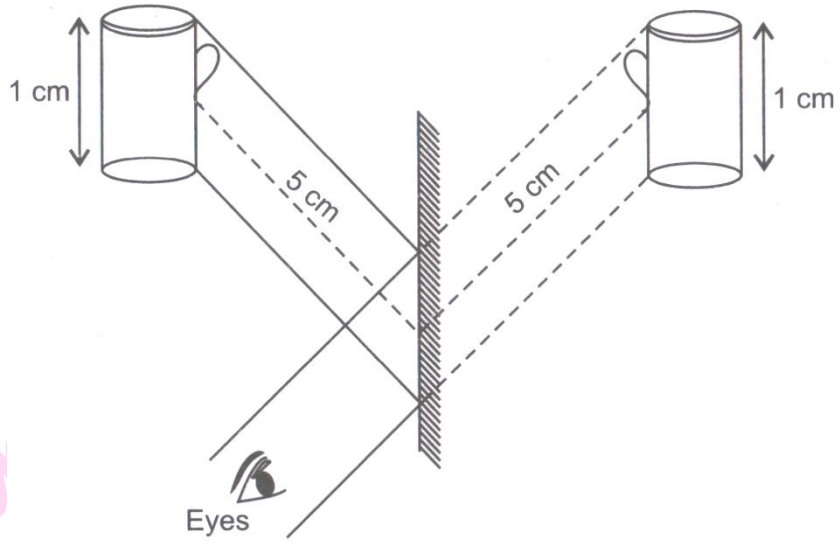
i. it can be used to correct short sightedness in spectacles.

4. A jug placed facing a plane mirror. Draw the position or image of jug.



i. What is the size of the image of the

ii. What is the distance between image of jug and mirror?

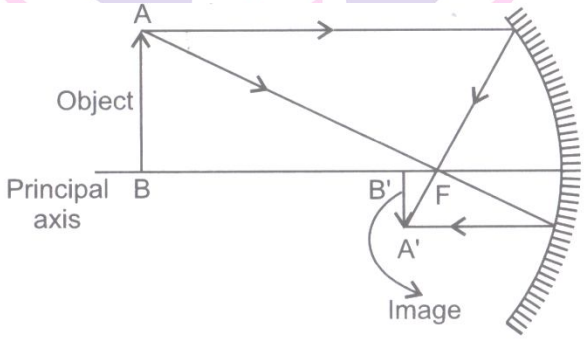


i. Size of image of jug is 1 cm.

ii. Distance between image of jug and mirror is 5 cm.

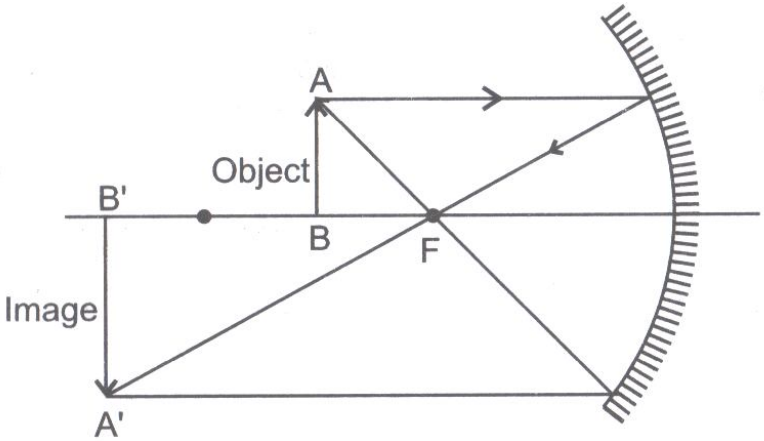
5. Draw the ray diagrams formed by a concave mirror under three different positions of the objects.

a. When the object is far away from the mirror.



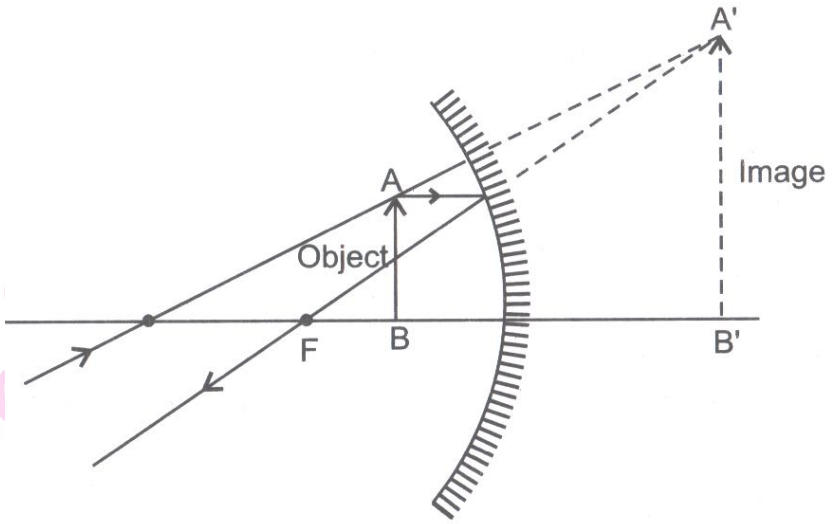
The image is inverted, real and smaller in size.

b. When the object is little away from focal point.



The image is real, inverted and magnified.

c. When the object is between focal point and centre of mirror.



II. Long Answer Type Questions.

1. Write the properties of the image formed by a (i) plane mirror (ii) Concave mirror (iii) convex mirror (iv) concave lens and (v) convex lens.

(i) Plane mirror : The image formed by a plane mirror is erect and virtual, has same size as the object. It is formed at the same distance behind the mirror as the object is placed. The image is laterally inverted.

ii) Concave mirror: The image formed by a concave mirror is real and inverted. When object is placed very close to the mirror, the image formed is virtual, erect and magnified.

iii) Convex mirror: The image formed by a convex mirror is erect, virtual and the smaller in size than the object.

iv) Concave lens : A concave lens always forms erect, virtual and smaller in size than the object.

v) Convex lens: The image formed by a convex lens is real and inverted. When the object is placed very close t the lens, the image formed is virtual, erect and magnified.

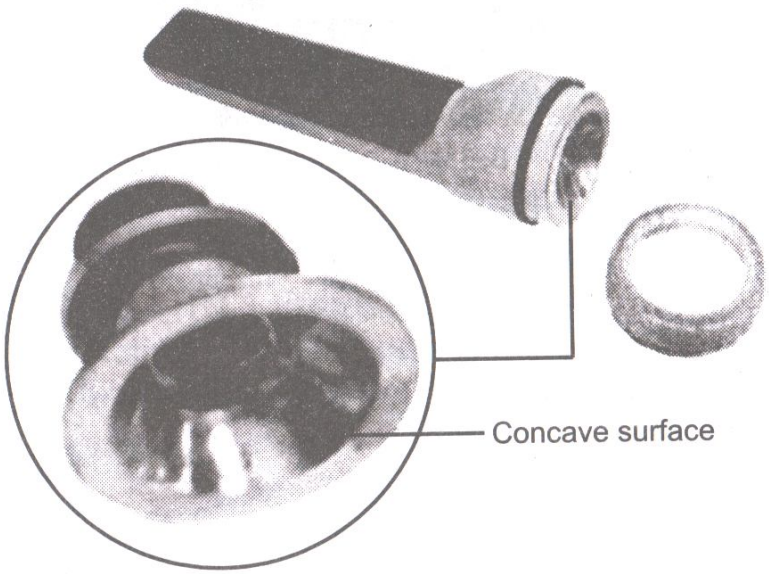
2. State the uses of (i) concave mirror (ii) convex mirror (iii) concave lens (iv) convex lens.

Concave mirror:

i) Concave mirror is used for examining eyes, card, nose and throat by the doctors.

ii) It is used to get enlarged image of the teeth by dentists

iii) The reflectors of torches, headlight of card and scooter are concave in shape.



Convex mirror : It is used as aside view mirror. These help the drivers to see the traffic behind them.

Concave lens: These are used in spectacles to correct short sightedness.

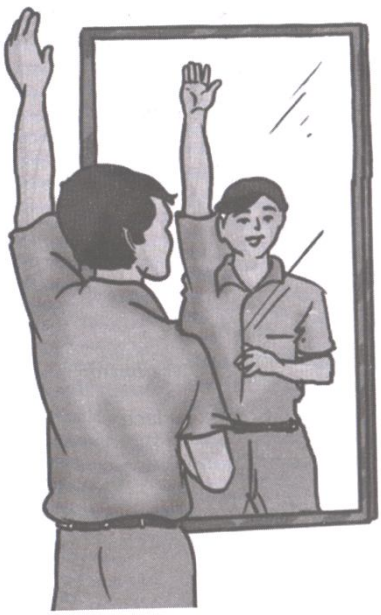
Convex lens :

i) It is used as a magnifying glass in hand lenses, microscopes, telescopes etc.

ii) It is used in spectacles to correct far sightedness.

3. With the help of an activity show that plane mirror forms laterally inverted image.

Take a plane mirror. Stand in front of a plane mirror. Look at your image. Raise your left hand. It will find that in the mirror right appears left and left appears right. Such type of image is called laterally inverted. Now touch your right ear. It will appears right ear. It will appear right side. Note that in this image only sides are interchanged but the image does not appear upside down.



III. Long Answer Type Questions.

1. What is rectilinear propagation of light? How will you prove it?

Light travels in a straight line. This is called rectilinear propagatin of ligh t

Activity:

- Take a straight straw and look at the light rays through it.
- Take another straw which is bent and try to look at the light rays through it. Yu will observe that when the straw was straight you could see the light and when the straw was bent you could not see the light.
- This means that we cannot bend the ray of light to travel through the bent straw.
- Thus, this activity proves that light travels in a straight line.

2. You are given three mirrors of different types. How will you identify each one of them?

The three different types of mirrors cn be identified by forming the images .

- Plane mirror forms an erect image which is of the same size as the object. The image formed by plane mirror cannot by obtained on a screen, i.e., it is virtual.
- Concave mirror forms both real and virtual images. The image can be smaller or larger in size than the object.
- Convex mirror always produces virtual and upright images. The size of the image is always smaller than the object.

3. Distinguish between the following.

Convergent beam and divergent beam.

S.No	Convergent beam	Divergent beam
i.	It is a beam of light which comes together as if to meet or join.	It is beam which proceeds in different directions form a point.
ii.	Beams converge in convex lenses and concave mirrors.	Beams diverge in concave lenses and convex mirrors.

4. Explain the reflection of light on white paper screen with the help of an activity.

Activity.

- Place a concave mirror fixed on a stand, on a table. Make a screen of about 15cm x 10 cm using white paper pasted on a cardboard.
- Keep a lighted candle at a distance of 50 cm from the mirror, on a table.
- Try to obtain the image of the flame on the screen, by moving the screen. Till a sharp image of the flame is obtained.
- Next, move the candle towards the mirror and place it at different distance from it, so as to obtain the image on the screen.
- You will observe that the image formed by a concave mirror can be smaller or larger in size than the object or may be real or virtual.

I. High order Thinking Skills (HOTS) Questions:

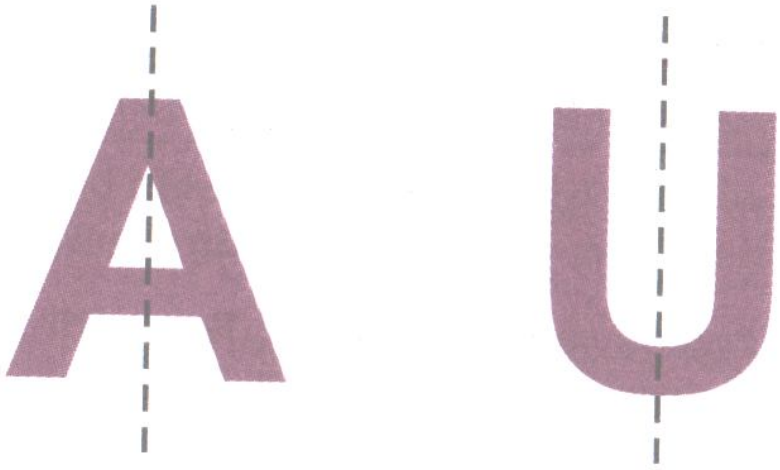
1. Two different types of lenses are placed on a sheet of newspaper, how will you identify them without touching?

On identifying the letters of newspaper, we can differentiate the two types of lenses. If image is large or magnified then the lens is a convex lens and if the image is smaller or diminished in size for all positions of the objects, then the lens is concave.

II. High order Thinking Skills (HOTS) Questions:

1. Find out the letters of English alphabet or any other language known to you in which the image formed in a plane mirror appears exactly like the letter itself Discuss your findings.

If the letters of English alphabet A, H,I,MO,TU,V,W,X,Y are kept in front of a plane mirror, then they would form images which exactly look like the original letters of the alphabet. These letters are vertically symmetric. For example, if we divide letters A and U in the middle, then we would find that the right halves are equivalent to the left halves of the letters.



Hence, even if the image interchanges sidewise, it will appear same as the letter.

2. Why do lemons kept in a glass of water appear to be enlarged?

Water acts as a convex lens, which is a magnifying lens, due to its density. Therefore, lemons kept in water appear larger.

Value based Questions

1. Rajiv neighbour got hear t attack. He immediately extended help and called for an ambulance. Due to the rush of vehicles on road and the fact that people were not giving way to ambulance, the Patient Could not reach hospital in time and died. Rajiv felt bad and started spreading awareness amoung people to be sensitive regarding this issue.

a. Which value is being promoted by Rajiv?

b. Why is word "Ambulance" written in its mirror image form?

c. Write any four characteristic of image formed by plane mirror.

a. Humanitarian value of given way to AMBULANCE so that any patient can immediately reach to the hospital.

b. Because any person driving the vehicle which is ahead of the Ambulance van, can see the laterally.

Inverted alphabets correctly from his rear view mirror & make way for it to pass through.

a. Characteristics of image formed by plane mirror.

1. Virtual & Erect

2. it is of the same shape and size.

3. It is at the same distance behind the mirror as the object in front of it.

4. it is formed behind the mirror.

2. "Vision' is one of the wonderful gifts given to us by God. But most of the people never take care of Their eyes. Care for eyes should be taken, suggest some methods for proper eye care?

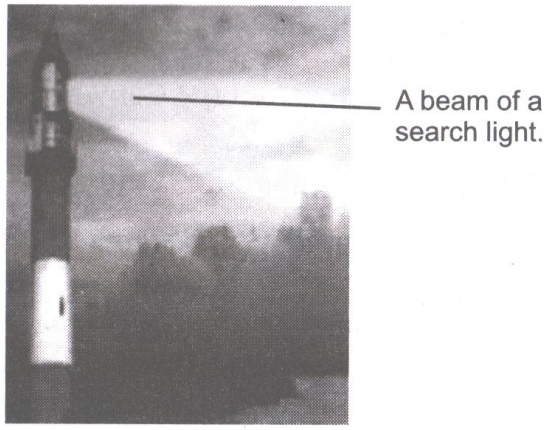
i. Don't Rub eyes.

ii. Wash them properly and sofly.

iii. Get your eyes checked regularly by doctors.

Skill – Based Question

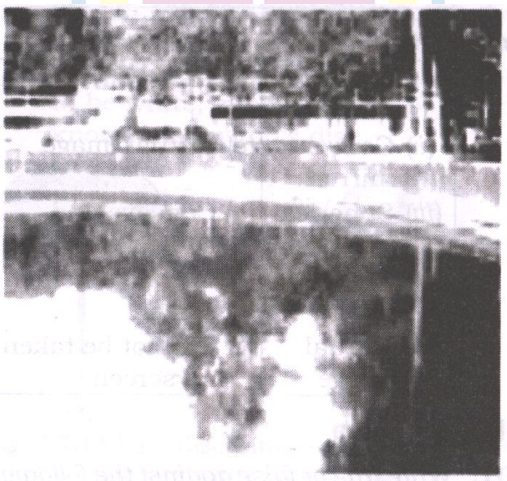
1. Draw a diagram of a light house to show a beam of search light.



2. Observe the following figure and answer the questions:

i) Which phenomenon of light is indicated by this figure?

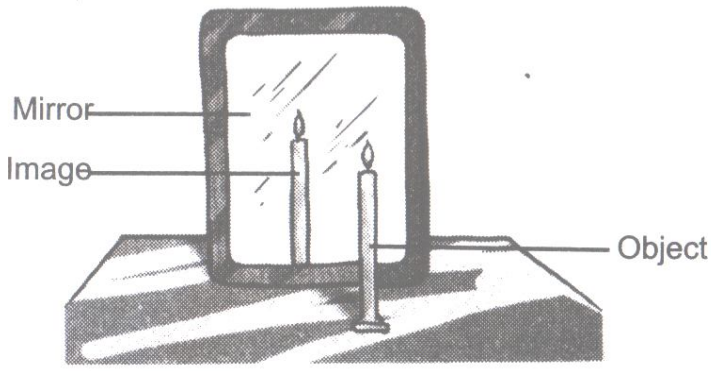
ii) Define phenomenon



i) This figure indicated the reflection of light by water.

ii) The change of direction of light by smooth and shiny surface is called reflection.

3. Draw a diagram to show the image formation by a plane mirror. What type of image is formed by a plane mirror?



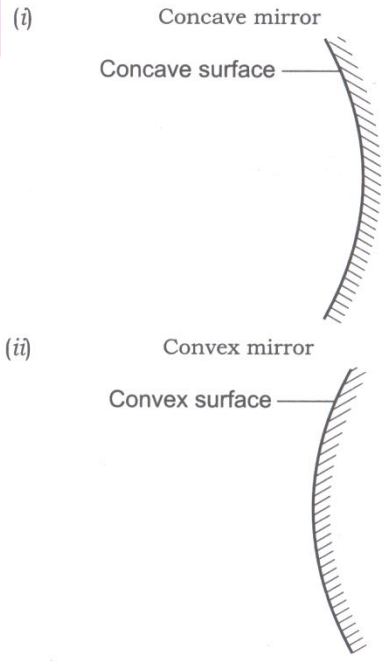
The image formed by a plane mirror is erect and virtual. It is of same size as the object

4. Draw a diagram to show a

i) Concave mirror

ii) Convex mirror

Define these terms and write one important difference between them.



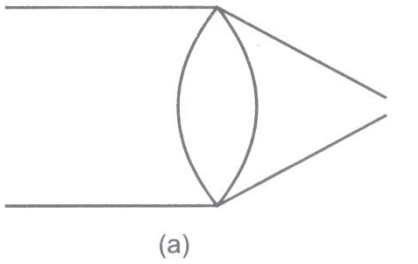
i) Concave mirror: If reflecting surface of a spherical mirror is concave, it is called concave mirror.

ii) Convex mirror : If the reflecting surface of a spherical mirror is convex, it is called convex mirror.

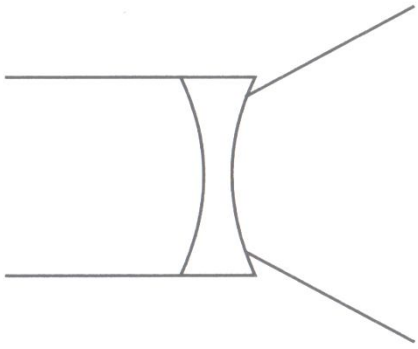
Difference : The concave mirror is converging and convex mirror is diverging in nature.

5. Draw a diagram to show converging nature of convex lens and diverting nature of a concave lens.

What do you mean by converging and diverging nature



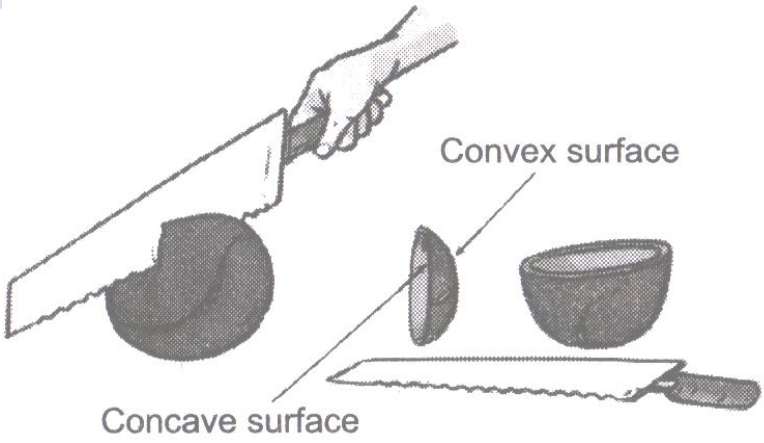
(a)



(b)

Convex lens is also called converging lens. It means that it bends light rays inwards. Concave lens is also called diverging lens. It means that it bends light rays outwards.

5. Draw a program to show that spherical mirror is a part of a sphere.



(a) (b)

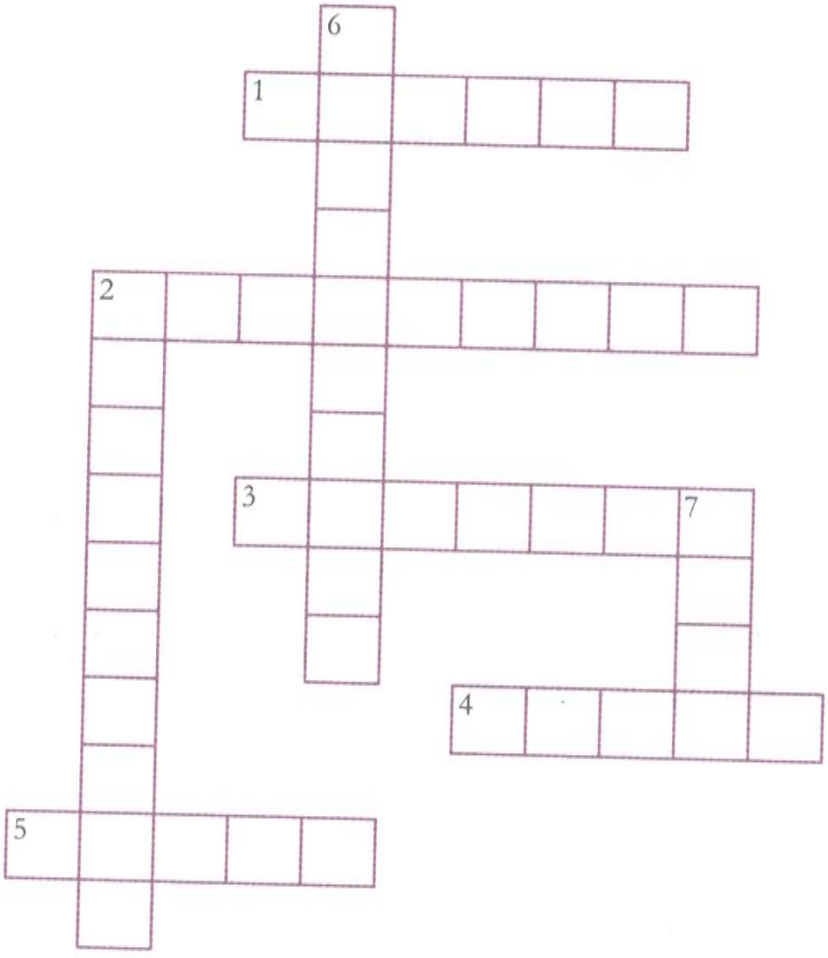
6. Draw a diagram of

a)convex lens b) concave lens

(a)

(b)

Crossword Puzzle



Across

1. A curved mirror with silver polish on its inner side.

2. A concave lens is also called this

3. an image obtained by not actual meeting of reflected rays by those which appear to come from a point.

4. A triangular three dimensional device made of glass

5. An object that is an artificial source of light and has a concave mirror.

Down

2. Splitting of white light into 7 colours

6. A convex lens is also called this

7. A transparent medium bounded by two curved surfaces

Across

1. Convex

2. Diverging

3. Virtual

4. Prism

5. Torch

Down

2. Dispersion

6. Converging

7. Lens