Chapter – 11: Light

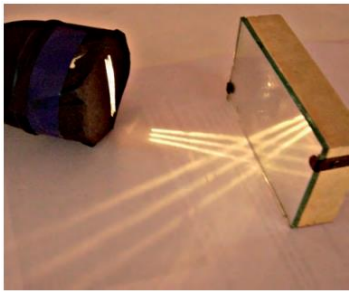
- Beam of sunlight – enters the room – narrow opening or hole
- Beam of light – vehicles – scooters, cars, train engines
- Beam of light – torches, searchlight from light house, airport tower

Light Travels in a Straight Line

- Light a candle – see it through straight pipe – flame visible
- See it through bent pipe – flame invisible
- This proves – light travels in straight line
- Path of light – changes in some conditions

Reflection of Light

- One way – change direction of light – falls on shiny surface
- Example – shining stainless steel plate, steel spoon, surface of water
- Any shining or polished surface – acts as mirror
- Change of direction – reflection of light
- Activity –
    - Take a torch – cover it with chart – make 3 small holes
    - Spread a chart paper – place a mirror vertically
    - Turn the torch on – direction of beam – towards mirror
    - Move the torch – side by side – direction of reflection changes



- This activity – confirms – mirror reflects the light
- Activity –
    - Light a candle – place it in front of mirror
    - Observe the reflection of flame in the mirror
- Looks like – another candle – behind the mirror
- Candle – behind the mirror – image
- Candle – front of mirror – object
- Move the candle to different position – observe the images
- Image – upright in each case – flame always on top of the candle – erect image
- Image by plane mirror – always erect and same size as object
- Place a screen – behind the mirror – in front of mirror – no image obtained on screen
- Activity –
    - Take a chess – place a mirror vertically in the middle
    - Place a small object – pencil sharpener – boundary of 3rd square from the mirror

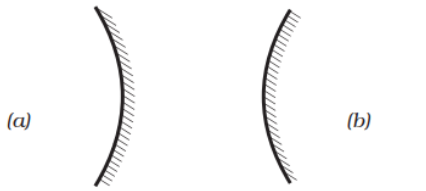
  - Note the position of image
  - Move the object – 4th square – note the position of image again
- Image – same distance behind the mirror – AS – object in front of the mirror

Right or Left!

- Small interesting difference – between the image and object
- Activity –
  - Stand in front of mirror – look at image
  - Raise your left hand – image raises right hand
  - Touch your right ear – image touches left ear
- Only sides are interchanged – image is not upside down
- Write your name – piece of paper – hold it in front of plane mirror – appears inverted sideways
- 'AMBULANCE' written on ambulances – sideways inverted – driver in vehicle ahead of it – read it easily in rear view mirror
- Side mirror of vehicles – objects appear smaller

Playing with Spherical Mirrors

- Boojho – picks up a plate – watches his image on it – erect and same size – acts as plane mirror
- Paheli – picks up a spoon – watches her image on the back side – erect but smaller – acts as mirror – some kind
- Activity –
  - Take a steel spoon – place it near your face
  - Observe the image – outer surface – inner surface
- Curved shining surface – acts as mirror – spherical mirror
- Reflecting surface – concave – concave mirror
- Reflecting surface – convex – convex mirror
- Inner surface of spoon – concave mirror
- Outer surface of spoon – convex mirror

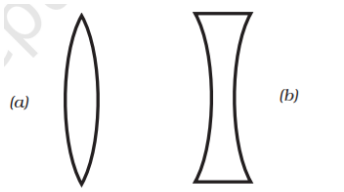


(a) A concave and (b) a convex mirror

- Image obtained by plane mirror – cannot be obtained on screen
- Activity –
  - Take a concave mirror – hold it facing the sun
  - Light reflected by mirror – obtain it on sheet of paper
  - Adjust the distance – obtain sharp image of reflection
  - Hold them for some time – same position – paper starts burning
- This sharp image – image of sun – formed on screen – real image
- Image by plane mirror – cannot be obtained on screen – virtual image
- Activity –
  - Fix a concave mirror on a stand – place it on a table
  - Paste a piece of paper on a cardboard sheet – acts as screen
  - Light a candle – place it around 50 cm from the mirror – obtain its image on the screen
  - Move the candle or the screen – different distances – different sizes of images
- Image formed by the concave mirror – smaller or larger, real or virtual
- Concave mirrors – different purposes

    - Doctors – examine – ears, eyes, nose, throat, teeth
    - Reflectors – torches, headlights
- Boojho – observed his image – shiny surface of bicycle bell
- Image – erect and smaller – convex mirror
- Activity –
    - Repeat previous activity – use convex mirror
    - Record observations
- Image by convex mirrors – erect and smaller in size
- Used in side mirrors in vehicles – form image of large area – helps the drivers – view traffic behind them

Images formed by Lenses



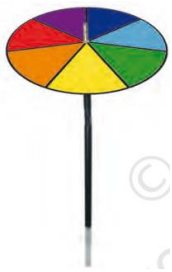
(a) A convex lens and (b) a concave lens

- Magnifying glass – used to read very small print
- This glass – a type of lens
- Lenses used in – spectacles, telescopes, microscopes
- Some lenses – thicker in the middle – convex lens
- Other lenses – thinner in the middle – concave lens
- Lenses – transparent – light passes through them
- Activity –
    - Take a magnifying glass – put it in front of sunrays
    - Place a paper below it – adjust the distance – obtain a bright spot on paper
    - Hold it in place – after sometime – paper burns
    - Replace the convex lens with concave lens – no bright spot
- Different positions of object – nature and size of image – changes
- Activity –
    - Take a convex lens – fix it on a stand – place it on table
    - Light a candle – place it at 50 cm from lens
    - Obtain image on a paper screen – adjust to get a sharp image
    - Change the distance between candle and lens
    - Some position – image – erect and magnified – virtual image
- Images by concave lens – always virtual, erect, smaller in size

Sunlight – White or Coloured?

- Observe a rainbow – appears after rain – when sun is lower
- Rainbow – large arc – many colours
- Observe carefully – 7 colours – red, orange, yellow, green, blue, indigo, violet – difficult to distinguish them
- Blow soap bubbles – appear colourful
- Light reflected from Compact Disk (CD) – many colours seen
- Activity –
    - Take a glass prism – pass a beam of sunlight
    - Place a white sheet in front of prism
    - Light exits from the prism – falls on the white sheet

- This activity – confirms – sunlight contains 7 colours
- Sunlight – white colour – consists of 7 colours
- Activity –
    - Take a circular cardboard disc – 10 cm diameter
    - Divide this disc – 7 parts – paint 7 rainbow colours
    - Make a hole at the centre – fix it on a refill
    - In sunlight – rotate the disc
    - Rotated with speed – disc appears white
    - Such a disc – Newton's disc



- This activity – confirms – 7 colours – mixed to make white light