

**SALWAN PUBLIC SCHOOL, RAJENDRA NAGAR**  
**CLASS – X**  
**SUBJECT-SCIENCE**  
**LESSON PLAN**  
**CHAPTER 10: LIGHT –REFLECTION AND REFRACTION**

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| UNIT                                   | CHAPTER : LIGHT –REFLECTION AND REFRACTION<br>Periods required : 6-7 periods                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| CLASS TRANSACTION                      | Total: 7 periods (approx. 40 min each)<br><br>Sub-Topic 1: Reflection through Spherical mirrors<br>Sub-Topic 2 : Refractive index and Refraction through spherical lenses                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| PRE-REQUISITE KNOWLEDGE FOR THE COURSE | This lesson requires:<br><ol style="list-style-type: none"> <li>1. Basic knowledge of the terms like incident ray, reflected ray, normal, angles of incidence and reflection.</li> <li>2. Knowledge about the uses of plane mirror and the characteristics of the image produced by it.</li> <li>3. Understanding the laws of reflection and its importance</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| LEARNING OBJECTIVES                    | <p>Students will be able to:</p> <ul style="list-style-type: none"> <li>• Understand the types of spherical mirrors and the important terms related to them.</li> <li>• Comprehend the rules of reflection by concave and convex mirrors.</li> <li>• Apply the rules of reflection to make images for the various positions of the object in front of a concave and convex mirror.</li> <li>• Apply sign convention and use the mirror formula and magnification formula to calculate the image position and size.</li> <li>• Understand the concept of refraction of light and calculate refractive index of a given medium.</li> <li>• Understand the types of lenses and the important terms related to them.</li> <li>• Comprehend the rules of refraction by concave and convex lenses.</li> <li>• Apply the rules of refraction to make images for the various positions of the object in front of a concave and convex lens.</li> <li>• Apply sign convention and use the lens formula and magnification formula to calculate the image position and size.</li> <li>• Draw the path of light ray through a glass slab.</li> <li>• Calculate the power of a given lens</li> </ul> <p>SKILLS and COMPETENCIES</p> <ol style="list-style-type: none"> <li>1) Analytical skills and Thinking skills (scrutinizing an observation)</li> <li>2) Reasoning Skills</li> </ol> |

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|  | 3) Attentiveness and Listening Skills<br>4) Drawing Skills<br>5) Critical thinking (Competitive evaluation of given information)<br>6) The ability to understand concepts (Inspecting and analysing reasons for variation in established principles)<br>7) Teamwork and communication skills (working effectively with others)<br>8) Application Skill( Applying the knowledge gained in their daily life) |
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| <b>SUB – TOPIC 1</b>                                                                                                                     | Sub-Topic 1: Reflection through Spherical mirrors<br><b>Periods Required : 2-3 periods</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| <b>Pre- Requisite for the course</b>                                                                                                     | This topic requires knowledge of <ul style="list-style-type: none"> <li>• Basic knowledge of the terms like incident ray, reflected ray, normal, angles of incidence and reflection.</li> <li>• Knowledge about the uses of plane mirror and the characteristics of the image produced by it.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| <b>Learning Objectives</b>                                                                                                               | Students will be able to <ul style="list-style-type: none"> <li>• Understand the types of spherical mirrors and the important terms related to them.</li> <li>• Comprehend the rules of reflection by concave and convex mirrors.</li> <li>• Apply the rules of reflection to make images for the various positions of the object in front of a concave and convex mirror.</li> <li>• Apply sign convention and use the mirror formula and magnification formula to calculate the image position and size.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Transaction Methodology</b><br><b>(The teacher can use the mentioned techniques, wherever applicable, and can use any other too.)</b> | Transaction would proceed in the following manner-<br>-The facilitator can spend first five minutes by helping the students to reckon the concept of reflection learnt by them in grade VII and VIII .The teacher can ask following questions to revise the learnt concept<br>Q1. Define incident ray to a mirror.<br>Q2. How regular reflection differs from diffused reflection?<br>Q3. State the laws of reflection.<br><br>Students' answers will be <b>analyzed and scrutinized</b> with the help of a debate among students.<br><br><b>Evidence-based activity demonstration</b><br>Students will be introduced to spherical mirrors by actually showing them the concave and convex mirrors. They will be asked to perform the following activity in a group of three.<br><br>Member 1: Will be asked to hold the mirror 1 at two different positions that is very near and second position at arm's length from himself and announce the nature and size of the image. |

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|                          | <p>Member 2: Will be asked to hold the mirror 2 at two different positions that is very near and second position at arm's length from himself and announce the nature and size of the image.</p> <p>Member 3: Is to record the observations of the two members and present the results</p> <p>Once all the groups have their presentation, the teacher can comment on the type of image produced one of mirror will always be small and visible in the mirror That mirror is convex mirror.</p> <p>In the second mirror the object will appear enlarged when kept close to the object but will disappear from the mirror as we take the mirror at arm's length.</p> <p>Teacher can create curiosity among students on the fact that why two mirrors behaved differently</p> <p>She can explain here the structure, shape and the focus point of two types of mirror. The session can further proceed with teaching them the rules of reflection and further to use these rules to create real or virtual image by the two types of mirrors</p> <p>For the rules and ray diagrams, the teacher can refer to page number 165 and 166 of NCERT of class X</p> <p>Now the teacher can introduce the equation called as mirror formula which will assist the students to use the object distance, image distance and the focal length of the mirror as variables and can calculate the exact distances from the mirror.</p> <p>He size and nature can also be calculated using magnification formula.</p> |
| <b>Learning Outcomes</b> | <p><b>Students would be able to-</b></p> <ul style="list-style-type: none"> <li>- Understand the nature of image produced by spherical mirrors.</li> <li>- Realize the importance of rules of reflection from a spherical mirror and use them to make images in case of mirrors.</li> <li>- Practice the numerical based on mirror formula and magnification formula using sign conventions.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Assessment</b>        | <p><b>Discussion of topic and Guided Practice</b></p> <p>Continuously monitor student progress by asking oral questions related to nature, size and position of image formed in various cases, in between the class.</p> <p><b><u>Inquiry based learning</u></b> (Critical Thinking and Problem Solving): Students will do questions</p> <p><b><u>Example 10.1 and 10.2 of page 170 of NCERT Book</u></b> with the help of facilitator.</p> <p>The facilitator would take rounds and help the students in solving the questions.</p> <p>A short oral/written test will be taken to check proper assimilation of the topic discussed.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

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| <b>Self-Study,<br/>Assignments,<br/>Homework</b> | <p>NCERT text book back exercise Q2,3,14 and 15 on page 186</p> <p>Extra Questions:</p> <ol style="list-style-type: none"> <li>1. Name the type of mirror used by dentist and why</li> <li>2. State the characteristics of the image produced by a plane mirror</li> <li>3. State the nature ,size and position of the image when an object is kept at the focus of a concave mirror</li> <li>4. State the mirror formula</li> <li>5. What do you understand when a mirror has a magnification of +0.25?</li> </ol> |
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| <b>SUB TOPIC 2</b>                                                                                                                 | <p><b>Refractive index and Refraction through spherical lenses</b></p> <p><b>Periods Required : 3-4 periods</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Pre- Requisite for the course</b>                                                                                               | This topic requires the knowledge that light follows rectilinear propagation in a medium.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Assessment of qualifying knowledge</b>                                                                                          | <p>Teacher can ask one of the student to recapitulate the concept of rectilinear propagation by demonstrating the activity of candle and pipe that they have done in class vii</p> <p>She can ask another student to give explanation of the observation and finally the conclusion.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>Objective</b>                                                                                                                   | <p>Students will be able to learn :</p> <ol style="list-style-type: none"> <li>1. That light changes its path when it travels from one medium to another</li> <li>2. The bending ability of light depends on the mediums.</li> <li>3. Lens helps to end the path of light and hence produces images of different type and sizes due to refraction phenomena</li> <li>4. Power of a lens is the measure of bending ability of any lens</li> </ol>                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Transaction Methodology<br/>(The teacher can use the mentioned techniques, wherever applicable, and can use any other too.)</b> | <p><b><u>Period 1</u></b></p> <p><b>Strategies used- Demonstration ,Observation ,Deduction and Conclusion</b></p> <p><b>Teacher can show or demonstrate the activity that a pencil dipped in a glass of water appears broken/bend at the surface</b></p> <p>Facilitator will ask few questions to arise the interest in the learners like:</p> <ol style="list-style-type: none"> <li>1. Why the pencil appears bend</li> <li>2. Is this phenomena observed anywhere else also?</li> <li>3. Is the rectilinear propagation of light violated?</li> <li>4. Draw the path of light in this case on paper in 2- dimension.</li> </ol> <p>Transaction would proceed in the following manner-<br/>Teacher will explain the path of light ray and its behavior when it travels from one medium to another<br/>She will introduce the phenomena of refraction and the quantity that</p> |

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|  | <p>measures this bending as refractive index.<br/>She can further introduce the formula for refractive index of a medium as the ratio of speed of light in vacuum to the speed of light in that medium</p> <p>Lastly she will give training to students on how to draw the path of light ray when it passes through a glass slab (Reference to page number 173 of NCERT )</p> <p><b>Recapitulation : 5 minutes</b><br/>Oral test on the previous concept would be taken up.</p> <p><b>Assignment :</b><br/>To draw the path of light when it passes through a rectangular glass slab.</p> <hr/> <p><b>Period 2</b><br/><b>Strategies used: Visit to Science Laboratory to observe the images formed by lenses using an optical bench set up.</b></p> <ol style="list-style-type: none"> <li>1. Teacher will show the setup of a lens , screen and a candle mounted on optical bench and will ask the students to explore and move the lens or screen so that they can observe illumination or sharp image on the screen</li> <li>2. Students will be asked to work in group of 4 so that two are involved in recording the various observations.</li> <li>3. Each group will be asked to present their observations.</li> </ol> <p>Teacher can now summarize that a convex lens produces real image when object is kept beyond its focal point and such real images can be obtained on screen .However the image cannot be obtained on screen when object is kept too close to the convex lens.</p> <p><b>Guided Practice :</b><br/>Now students will be introduced to the rules of refraction through a lens and use them to draw image formation for various cases of convex and concave lenses (Reference to page number 179 of NCERT )</p> <p><b>Assignment :</b><br/>To practice the image formation by convex and concave lens and write the size, nature and position of the image formed.</p> <hr/> <p><b><u>Period 3</u></b></p> <p><b>Strategies used :</b><br/><b>Discussion of topic through Collaborative Learning: <u>15 min</u> (Critical</b></p> |
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|                                          | <p><b>thinking)</b></p> <p>Teacher can introduce sign convention ,the lens formula and magnification formula for a lens and pose an example 10.3 of NCERT Students will be asked to work in pairs and solve the numerical.</p> <p>Now the facilitator can ask the students if they faced any problem and share their learning outcomes after solving that example.</p> <p><b>Recapitulation : 5 mins</b></p> <p>Teacher can summarize the characteristics of the image formed by lenses in tabular form with reference to page number 178 of NCERT by asking the students some oral questions on the learnings taken place in class.</p> <p><b>Assignment :</b><br/> <b>Back Exercise of NCERT Page 186 : Q9,10, 11, 12</b></p>                                                                                                                                               |                  |          |                     |                 |
| <b>Learning Outcomes</b>                 | <p><b>Students would be able to-</b></p> <p><u>KNOWLEDGE</u>- <i>Students will <b>develop</b> the ability to <b>distinguish</b> between convex and concave lens on the basis of the type of image formed by it.</i></p> <p><u><b>SKILLS and COMPETENCIES</b></u> - <i>Students would be able to</i></p> <ol style="list-style-type: none"> <li><b>1. Collaboratively</b> and present their observations made in the lab.</li> <li><b>2. Numerical Solving Skills</b> and using sign conventions.</li> </ol>                                                                                                                                                                                                                                                                                                                                                                   |                  |          |                     |                 |
| <b>Self-Study, Assignments, Homework</b> | <p><b>Extra Questions :</b></p> <ol style="list-style-type: none"> <li>1. State Snell’s Law and define refractive index?</li> <li>2. Draw the ray diagram of image formation by a concave lens .State the position, size and nature also.</li> <li>3. A 3cm tall object is placed perpendicular to the principal axis of a convex lens of focal length 15 cm .The distance of the object from the lens is 20cm, find the nature, position and size of the image. Also find the magnification.</li> <li>4. At what distance would you like to place a convex lens working as a magnifying glass :             <table border="0" style="width: 100%;"> <tr> <td>a) lesser than f</td> <td>b) at 2f</td> </tr> <tr> <td>c) between f and 2f</td> <td>d) away from 2f</td> </tr> </table> </li> <li>5. The focal length of a convex lens is 20cm, calculate its power.</li> </ol> | a) lesser than f | b) at 2f | c) between f and 2f | d) away from 2f |
| a) lesser than f                         | b) at 2f                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                  |          |                     |                 |
| c) between f and 2f                      | d) away from 2f                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                  |          |                     |                 |