

Pre-Content/content Post-Content	Learning outcomes/Objectives	
	General	Specific
Pre-Content Plane mirrors, reflection, properties of image formed in plane mirrors, spherical mirrors, types of spherical mirrors, properties of image formed in spherical mirrors. Convex and concave surfaces. Content Laws of reflection, geometry of spherical mirrors:- principal axis, pole, aperture, focus, focal length, radius of curvature and centre of curvature, image formation by spherical mirrors, magnification formula, mirror formula. Convex and concave lenses. Refraction, laws of refraction, refraction through glass slab, refractive index, refraction through spherical lenses, types of spherical lenses, Ray diagrams, Magnification formula, lens maker's formula, uses of mirrors and lenses.	Students will be able to: study reflection by mirrors in detail. - comprehend geometry of spherical mirrors. - comprehend the concept of focal length of concave mirrors. - draw ray diagrams to depict image formation by spherical mirrors. - Comprehend the phenomenon of refraction - explore the phenomenon of refraction of light in detail.	Students will be able to: - recall reflection and state laws of reflection. - distinguish between real and virtual image. - list types of spherical mirrors - concave and convex. - draw geometry of spherical mirrors. - develop definition for Focus, principal axis, pole, focal length, radius of curvature and centre of curvature. - relate focal length with the radius of curvature mathematically. - perform experiment to find out the focal length of concave mirror. - draw ray diagrams for image formation by concave and convex mirrors. - express mirror formula and magnification formula mathematically. - solve numerical on the magnification formula and mirror formula. - express the phenomenon of refraction. - develop definition of refraction. - verify laws of refraction experimentally. - infer the meaning and importance of refractive index.

Post Content Numerical on mirror formula, magnification and $R=2f$. Numerical on refractive index, magnification and lens maker's formula.	• develop the concept of spherical mirrors in detail. • develop the concept of spherical lenses in detail. • comprehend the positions of images formed when concave and convex lenses are used.	• apply the concept of refraction to explain various situations and observations. • apply the mirror formula in solving numericals. • draw the geometry of spherical lenses. • develop definition for Focus, principal axis, optical centre, focal length. • perform experiment to find the focal length of convex lens. • draw ray diagrams for image formation by concave and convex lens. • express lens maker's formula and magnification formula mathematically. • solve numerical on the magnification formula and lens maker's formula. • illustrate the uses of lenses and mirrors with the help of activities
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Home Work /Assignments

NCERT exercise discussed in the class will be given as the home task

Worksheets prepared by the teacher will be discussed in the class and given as homework.

Teacher's Activity	Student's Activity	Teacher's observation and Remedial
Teacher will help students to recall the concept of reflection by plane mirror. discuss the types of images formed by mirrors – real and virtual. explain the types of spherical mirrors – concave and convex. introduce geometry of spherical mirrors by drawing on the board and explain the relation between focal length and radius of curvature. explain the concept to find the focal length of the concave mirror. draw the ray diagrams for “image formation by concave mirror and convex mirror” for any one position of the object. provide the mirror formula and magnification formula and give challenging questions to solve. explain the concept of refraction of light through a glass slab in laboratory. relate the speed of light in different media with the refractive index of the media. provide situation based questions as an application of refraction of light.	Students will define reflection, state laws of reflection and list properties of image formed by a plane mirror. list the differences between real and virtual image. Draw an analogy between spherical mirrors and spoon to remember the shapes. draw the geometry of spherical mirrors neatly, define focus, principal axis, radius of curvature, centre of curvature and aperture and also write the formula. comprehend the concept of finding out the focal length of a concave mirror. comprehend the method for drawing ray diagram and use it to draw ray diagrams of all other positions. of the object. develop the sign conventions based on the understanding of co-ordinate and apply them to solve the numerical based on magnification formula and mirror formula. Comprehend the concept and verify the laws of refraction. discuss and solve the questions and numerical based on the co-relation of refractive index with speed of light. do the brainstorming to answer questions like:- why lemon appears larger as seen in a glass full of water, why pencil appears to be bending at the interface.	

<u>Annexure 10 (A)</u> demonstrate the phenomenon of refraction of light as it passes from water to air. explain the types of spherical lenses and their geometry by drawing on the notebook. explain the concept of finding out the focal length of a convex lens. initiate the ray diagrams for image formation by concave lens and convex lens at any one position. discuss the lens maker's formula and magnification formula and give challenging questions to solve. provide challenging and situation based questions and worksheet to students for solving.	<u>Annexure 10 (a)</u> perform the activity and record observations in the worksheet. comprehend the geometry of convex lens and then draw for the concave lens on the basis of their understanding. comprehend the concept of finding out the focal length of convex lens. comprehend the method for ray diagram and will also be able to draw the ray diagrams for various other positions on their own. develop the sign conventions and apply them to solve the numerical based on magnification formula and lens maker's formula. solve the questions by applying concepts and formulae.	
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Teaching Aids : NCERT , Internet access, plane, concave and convex mirror, meter scale, optical bench in laboratory.

Methodology/Innovative: Demonstration, Hands On activity, Discussion and Lecture.

Interdisciplinary Links: Optics, Mathematics – Integers, co-ordinates and x-y axes.

HOD

Coordinator

Vice-Principal

Principal

ANNEXURE 10 (A), (a) -Disappearing coin

Subject	Science
Class	X
Chapter/Unit	Chapter 10-Light reflection and refraction
Topic	Refraction of light
Time	10 Minutes
Nature of Activity	Pair work

What will I learn (Learning Outcome)?

To demonstrate the phenomenon of refraction of light as it passes from water to air and derive the necessary condition for refraction to take place.

Skills: Analyzing and Creating

What I have to do?

To demonstrate an activity to show the refraction of light using a coin and a glass of water

What do I require?

Two glasses, two coins, water.

What do I need to know?

Refraction of light is the phenomenon of change in the path of light in going from one medium to another. In going from a rarer to a denser medium, the ray of light bends towards normal and in going from a denser to a rarer medium, the ray of light bends away from normal.

Teacher's Activity

Teacher will :

1. discuss the concept of bending of light when it moves from one medium to another
2. will explain the steps of the activity.
3. ensure that each participant in pair performs the activity .

How will I proceed?

Students activity

1. Put a coin inside a glass and fill it with water slowly and observe from the side the glass.
2. Then, place the other coin on the table and put another glass on top of it.
3. Fill the second glass with water and observe from a side of this glass.

What have I observed?

Put a tick in front of the correct option.

S. No	Position of coin	Coin is visible or not from the side
1.	Below the glass filled with water	
2.	Inside the glass filled with water	

What have I learnt?

1. The coin is _____ (visible/ not visible) if it is kept below a glass filled with water and viewed from the side of the glass.
2. The coin is _____ (visible/not visible) if it is put inside a glass of water and viewed from side of the glass.
3. Also we can conclude that for refraction to happen we need two _____ media.

What am I curious to learn? Expression to be improved

- A small beaker is filled with oil to its brim and is put in a bigger glass which is later filled with oil slowly . Will I be able to see the smaller beaker inside the bigger beaker? Perform the experiment to verify this statement. Why does it happen?

Let me evaluate myself

1. Define refraction.

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2. Explain with the help of diagrams, what happens to a ray of light as it travels from (a) rarer to denser and (b) denser to rarer medium?

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3. Explain why a swimming pool seems to be shallow as seen from outside?

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4. A pencil immersed in a glass of water seems broken at the interface? Explain with the help of a diagram.

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5. Do sound waves also undergo refraction? Discuss by giving reasons.

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