

Class:8	Subject: Science	Topic: Light
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SUMMARY SHEET		
Learner Previous Knowledge	Light and its sources; optical mediums; rectilinear propagation of light; shadows and reflection; characteristics of images formed by a mirror; Uses of mirror	
Target Knowledge for this Topic	Laws of reflection Lateral inversion; Regular and irregular reflection; reflected light reflected again- Multiple images; Making a kaleidoscope; Refraction-definition- Dispersion of light; Human eye ; perception of image; Taking care of eyes; Braille system	
Learning Goals		
<i>More Complex Learning Goal-</i> Students will be able to can make and defend predictions based on laws of reflection& regular and irregular reflection and explain the phenomenon of multiple images and explain working of human eye.		
<i>Target Learning Goal-</i> Students will be able to describe laws of reflection, regular and irregular reflection and the concept of multiple images and explain how human eye works.		
<i>Simpler Learning Goal-</i> Students will be able to state laws of reflection and define regular and irregular reflection and also name the parts of human eye.		
Period No.	Lesson Objectives	Teaching Learning Materials Required
1	Recall the previously learnt concepts of light.	- Board and markers - Worksheet 1 - Activity: For every group: white sheet of paper, board pins, drawing board or table, plane mirror, laser light
2	The students will deduce the laws of reflection with an experiment.	- Board and marker - Worksheet 2 - Material Required- A plane mirror strip, a few knitting needles, a few sheets of chart paper, Protractor.
3	Explain formation of virtual image and regular as well as irregular reflection.	- Board and markers - Worksheet 3

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4	Explain the concept of multiple images and demonstrate it by making a kaleidoscope	- Board and markers - Worksheet 4 - Activity 1: two plane mirrors, any object [coin, match stick, eraser...] - Activity 2: 3 identical mirror strips, rubber band, coloured glass bangle pieces, translucent paper such as gelatin paper or butter paper or a plane glass piece, circular cardboard tube or chart paper tube
5	Demonstrate refraction of light.	- Board and markers - Worksheet 5 - For every group: Glass of water and pencil - Activity :(for every group): Glass Bowl, coin, water, cello tape
6	- Demonstrate the phenomenon of dispersion of light and explain working of human eye. - Discuss how image is perceived and how braille script is useful to the visually challenged.	- Board and markers - Worksheet 6 - Human eye model

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Period 1

Lesson Objectives

At the end of this lesson students will be able to:

- Recall the previously learnt concepts of light.

Teaching Learning Materials required

- Board and markers
- Worksheet 1
- Activity: For every group: white sheet of paper, board pins, drawing board or table, plane mirror, laser light

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4 or 5

Note for facilitator- Keep the materials ready well in advance.

Lesson Beginning <u>Time:</u> 10 min <u>Purpose:</u> Activate the prior knowledge	<u>Introduction to the topic</u> - Pose questions to recall previous knowledge such as: - How can you define light? - How does light travel? - What are luminous/non-luminous objects? - What is reflection? - Why does light get reflected? - Collate their responses on the board. - Inform the students that they will now find out aspects of light and the underlying principle of how it travels.
Lesson Middle <u>Time:</u> 20 min. <u>Purpose:</u> Develop conceptual understanding	<u>Instructions for Activities & Worksheet</u> - Distribute the material required for activity to the groups. - Distribute worksheet 1 to all the students. - Ask the groups to read the instructions. - Let them do the activity. - Ask them to fill in the worksheet appropriately. - Let the groups now share their responses and brainstorm for the answers.

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	Collect all the answers and ensure that they arrive at a common consensus.
Lesson End <u>Time:</u> 5 min <u>Purpose:</u> • Finish up • Homework Distribution	<u>Finish Up</u> • Clear doubts of the students. <u>Note to the students</u> • Keep the material used for the activity intact as it will be used gain in the next class. <u>Homework Assignment</u> • Find out the difference between ray and beam from an encyclopedia or using your text book.

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Worksheet 1

Skill: Drawing Inferences

Activity

Material: white sheet of paper, strip of black paper, drawing board or table, comb, torch, plane mirror

Instructions

1. Fix a white sheet of paper on board or on the table.
2. Use the laser light to produce a light beam on the white paper.
3. Now place a mirror in the path of this light beam.
4. Observe what happens.
5. Record your observation by answering the first two questions.

Observation Questions

1. How does the light seem to travel before the mirror is placed in its way?

2. What happens to the light when the mirror is placed?

3. Imagine that the ray falling on the mirror through the comb is XX' and the ray travelling after hitting the mirror is X'Y. Which ray can be called as the reflected ray in that case? _____
4. A ray of the torch falls on the mirror before it is reflected. It is the incident ray. Which one will you call an incident ray in the above activity? _____

From the above, frame your own definition of incident ray and reflected ray.

Incident ray:

Reflected ray:

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Period 2

Lesson Objectives

At the end of this lesson students will be able to:

- The students will deduce the laws of reflection with an experiment.

Teaching Learning Materials required

- Board and marker
- Worksheet 2
- Material Required- A plane mirror strip, a few knitting needles, a few sheets of chart paper, protractor.

Details of Teaching Learning Experience

Seating Arrangement: In groups of 4-5 each

Lesson Beginning <u>Time:</u> 5 min <u>Purpose:</u> • Activate prior knowledge.	<u>Introduction of the topic</u> • Ask the students to recap the definitions of incident and reflected ray. Also ask them to share their homework on what the difference is between a ray and a beam. • Inform the students that they will now find out how light get reflected only in a specific manner through an experiment.
Lesson Middle <u>Time:</u> 25 min. <u>Purpose:</u> • Develop conceptual understanding	<u>Experiment</u> • Distribute worksheet 2 to the students. • State the aim of the experiment i.e verify the laws of reflection. • Let them follow the instructions and do the activity. • Ask them to record their observations. • Let there be a whole class discussion in which the conclusions as well as the answers are discussed. • Arrive at a common consensus.

Lesson End <u>Time:</u> 5 min <u>Purpose:</u> • Finish Up • Homework Distribution	<u>Finish Up</u> • Wrap up the class by clearing any doubts and stating that the inferences that they drew from the experiments are called the laws of reflection. • Write the laws of reflection on the board. <u>Homework Assignment</u> • Write the following questions on board. Ask the students to write it in their notebook for homework. a) What would happen if light is made to be incident along the normal? b) What will be the angle of reflection and angle of incidence in that case?
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Worksheet 2

Skill: Observation and Investigation

Aim- To verify the laws of reflection

Material Required- A plane mirror strip, a few knitting needles, a few sheets of chart paper, protractor.

Steps of Activity

1. Take two small rectangular pieces of thermocol. Make slits in them and fix a plane mirror. Make sure that the mirror is vertical.
2. Draw a line at an angle of about 45° to the mirror such as AO using protractor. Place a knitting needle on this line such that one of its ends touches the mirror.
3. Look at the image of the knitting needle in the mirror. Place another needle in line with this image. At the end of this needle mark a point such as B on the chart paper.
4. Remove the mirror and the needles and join point B with O.
5. At O draw a line ON perpendicular to the mirror. This is called the normal to the mirror.
6. Measure angle AON. This is called the angle of incidence.
7. Measure angle BON. This is called the angle of reflection.
8. Repeat the activity twice by placing the needle at different angles.

Observation No.	Angle of incidence	Angle of reflection

Conclusion

From my observation I can conclude that

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Period 3

Lesson Objectives

At the end of this lesson students will be able to:

- Explain formation of virtual image and regular as well as irregular reflection.

Teaching Learning Materials required

- Board and markers
- Worksheet 3

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4 or 5

Lesson Beginning <u>Time:</u> 5 min <u>Purpose:</u> Activate prior knowledge	<u>Class Discussion</u> • Ask each group to recap the laws of reflection. Ask them the meaning of incident ray, reflected ray, angle of incidence and angle of reflection. • Inform the students that now they will do an activity to find out more about substances which can combust. They will also deduce what keeps a fire burning.
Lesson Middle <u>Time:</u> 25 min. <u>Purpose:</u> • Develop conceptual understanding	<u>Video</u> • Distribute worksheet 3 to all students. • With the help of reference sheet 1, explain the image formation and its type along with the types of reflection. • The students must attempt the worksheet individually. • Let there now be a brainstorming session in which each answer is discussed. The whole class must arrive at a common consensus with respect to the answers.
Lesson End <u>Time:</u> 5 min <u>Purpose:</u> • Finish Up	<u>Finish Up</u> • Wrap up the class by clearing doubts. • Distribute Annexure 3B to all the groups.

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Worksheet 3

Skill: Drawing Inferences

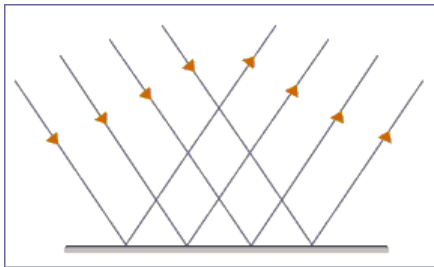
I. Complete the sentences

1. If the angle of incidence is 62° then the angle of reflection is _____.
2. If the angle of reflection is 89° then the angle of incidence is _____.
3. According to the law of reflection, the incident ray, normal and the reflected ray are _____

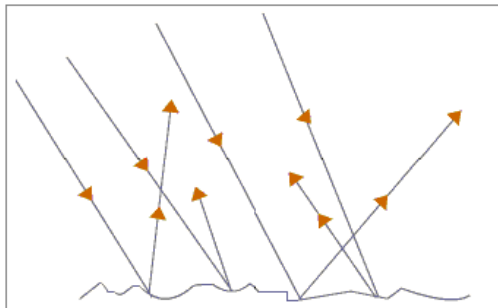
4. A virtual image cannot be _____
5. A polished shoe will show _____ type of reflection.
6. In irregular reflection, we cannot see clear image because _____

Reference sheet 1

- A virtual image is produced when rays of light reach our eyes that appear to come from a real object, but there is in fact no object at the apparent source of the light. The most common example is when light from an object strikes a simple plane mirror. The reflected rays appear to come from an identical object that is located behind the mirror.
- We cannot actually place a screen at the point where the image appears to be.
- Virtual images cannot be obtained on a screen.
- If a beam of light strikes a smooth, polished surface it gets reflected in the same direction and the reflected rays are parallel to one another. This is called regular reflection.



- When the reflecting surface is rough, the parallel rays falling on it are reflected in different directions. Such a reflection is known as diffuse reflection or irregular reflection.



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Period 4

Lesson Objectives

At the end of this lesson students will be able to:

- Explain the concept of multiple images and demonstrate it by making a kaleidoscope

Teaching Learning Materials required

- Board and markers
- Worksheet 4
- Activity 1: two plane mirrors, any object [coin, match stick, eraser...]
- Activity 2: 3 identical mirror strips, rubber band, coloured glass bangle pieces, translucent paper such as gelatin paper or butter paper or a plane glass piece, circular cardboard tube or chart paper tube

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4 or 5

Lesson Beginning <u>Time:</u> 5 min. <u>Purpose:</u> Recap the previous learning	<u>Recap of topic</u> • Ask a few students to recap what is the difference in regular and irregular reflection and what is a virtual image. • Collect responses and arrive at a common consensus. • Now ask the students how a hair dresser shows you your haircut from behind where you cannot see. • Pose questions such as: ○ Will you be able to see the back of your head if you don't have a mirror in front of you? ○ How do the 2 mirrors together allow you to see the part which otherwise are not visible? • Inform the students that they will now find out answers to these questions with an activity.
Lesson Middle <u>Time:</u> 25 min. <u>Purpose:</u> Develop	<u>Activities</u> • Make a kaleidoscope with the help of worksheet 4. • Let the observe the pattern. • Distribute worksheet 4.

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conceptual understanding	- Let the students now attempt questions. Now there can be a whole class discussion in which the answers of both parts of worksheet are discussed. Arrive at a common consensus. - Finish up the discussion by clarifying any doubts.
Lesson End <u>Time:</u> 5 min <u>Purpose:</u> Finish Up	<u>Finish Up</u> Clear the doubts, if any.

Worksheet 4**Skill: Spirit of Enquiry**Activity 1

What happens when two plane mirrors are used in combination?

Material: two plane mirrors, any object [coin, match stick, eraser...]

Instruction

1. Place two plane mirrors at right angles to each other such that their edges touch each other.



2. Place any object between the mirrors.
3. Record the number of images that you see.
4. Adjust the angle between the mirrors at different angles such as 90° , 120° , 80° and 45° .
5. Now put the mirrors parallel to each other and keep the object in between. Find out how many images you get.

Can you think of places where multiple images are useful? _____

Activity 2Making a Kaleidoscope

Material: 3 identical mirror strips, rubber band, coloured glass bangle pieces, translucent paper such as gelatin paper or butter paper or a plane glass piece [as instructed in previous class], circular cardboard tube or chart paper tube

Instruction

1. Join the three mirrors at an angle with a rubber band such that their reflecting side face each other.
2. Put this inside a cardboard tube.
3. Close one end of the tube with a cardboard disc which has a hole in the centre.
4. At the other end touching the mirrors, fix a circular plane glass plate.
5. On this plate put some colourful pieces of broken bangles.
6. Close the other end with this plate. Ensure that the pieces can move around.
7. Now direct your kaleidoscope to some source of light and look through the eye piece hole.

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8. What can you see?

Questions:

1. Do you see the same image every time?

2. What can be the reason for formation of lovely patterns?

3. Will you get the same result if you use only one mirror?

4. It means that to obtain multiple images you must use at least _____

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Period 5

Lesson Objectives

At the end of this lesson students will be able to:

- Demonstrate the phenomenon of refraction and explain it.

Teaching Learning Materials required

- Board and markers
- Worksheet 5
- For every group: Glass of water and pencil
- Activity :(for every group): Glass Bowl, coin, water, cello tape

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4 or 5

Lesson Beginning <u>Time:</u> 5 min. <u>Purpose:</u> Generate interest.	<u>Introduction to the topic</u> • Ask the students that as until now they have studied how a ray gets reflected from a surface. What will happen if the surface is transparent or translucent and the ray passes through it? Will we get a 'reflected ray'? • Distribute a glass of half-filled water to each group and ask them to put a pencil in the glass such that half of it is outside the water. • What do they observe? Why does the pencil appear to be broken or not aligned? • Inform the students that they will now find out why this happens.
Lesson Middle <u>Time:</u> 25 min. <u>Purpose:</u> Develop conceptual understanding	<u>Activity</u> • Distribute worksheet 5 to all the students. • Let them answer the questions. • Now let them do an activity and arrive at a conclusion on why this happens. Ask them to do the activity and record observation. • Now there can be a whole class discussion in which all the answers are discussed. Arrive at a common consensus.

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Lesson End <u>Time:</u> 5 min <u>Purpose:</u> Finish Up Homework Distribution	<u>Finish Up</u> • Finish up the discussion by clarifying any doubts. Homework • Ask the students to find out information on Braille script and also read up on Heller Keller either from the internet or from the textbook. • Also ask the students to find out how we must take care of our eyes especially since we continuously use the phone or computer. They may ask their parents what kind of food they must eat for better eye sight. They can refer to the lesson food components from the previous grades to find answers.
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Worksheet 5**Drawing Inferences****Questions**

1. What makes the pencil appear to be broken?

2. Does the light bend at the same angle in different mediums (materials like air, glass water)?

3. When light travels from one medium to another _____

4. Refraction is the phenomenon in which the light _____ when it travels from _____

Activity

Material: Glass Bowl, coin, water, cello tape

Instructions

1. Tape the coin at the bottom of the bowl.
2. Slowly move away from the rim of the bowl so that you cannot see the coin.
3. Now ask a friend to pour water carefully in the bowl.
4. What do you see? Do you see the coin now?
5. Based on your previous knowledge and the videos that you saw, deduce why this happened.

1. The coin reappeared 'magically' because _____

2. In this case the two mediums through which light is travelling are _____

Information

- Light travels in a straight line as it passes through a transparent substance. But when it moves from one transparent material to another—for example, from air to water or from glass to air—it bends at the two surfaces meet. This bending is called refraction.
- The bending occurs because when light passes from one medium (material) to another it changes speed.

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Lesson Plan 6

Lesson Objectives

At the end of this lesson students will be able to:

- Demonstrate the phenomenon of dispersion of light and explain working of human eye.

Teaching Learning Materials required

- Board and markers
- Worksheet 6
- Human eye model

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4-5

Lesson Beginning <u>Time:</u> 5 min. <u>Purpose:</u> Recap the previous learning	<u>Introduce the topic</u> ○ Pose following questions to introduce the topic. ○ How does a rainbow occur? ○ In the previous grade you have learnt that sunlight is actually made of seven colours. Then why do you see only bright light and not the colours around you? ○ Sometimes a glass crystal when held in sunlight gives out 7colours. What does this tell you? ○ Let a few students speak on their understanding of braille system and also share thoughts on the life of Helen Keller.
Lesson Middle <u>Time:</u> 25 min. <u>Purpose:</u> Develop conceptual understanding	• Discuss the human eye with help of the model of human eye. • Distribute worksheet 6 to all students. • Let the students now attempt the questions. • Let there be a whole class discussion on the questions and ensure that all the students arrive at a common consensus • Discuss about Braille system and care of eyes.

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Lesson End <u>Time:</u> 5 min <u>Purpose:</u> • Finish Up	<u>Finish Up</u> • Conclude the topic by clarifying doubts if the students have.
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Annexure 6A**Skill: Drawing Inferences**

1. What is the transparent frontal part of the human eye called? _____
2. There is a crystalline _____ which is thicker in the centre.
3. What is iris? What does it do?

4. Why is retina the most important part of the eye?

5. What kind of cells in the retina converts light rays into signals or impulses ready to be sent to the brain?

6. What is the blind spot?

7. What part of eye transports information to the brain?

Information

The impression of image does not vanish immediately from the retina. It persists there for $1/16^{\text{th}}$ of a second. So if the images are formed very quickly they are perceived in continuous pattern. That is why it looked as if the bird had gone in the cage in your activity.

This occurrence is called **Persistence of Vision**.

The movies that we see are based on this principle. We actually see a number of separate pictures which move swiftly at the rate of 24 pictures in a second which ensures that we see a moving picture.