

Light SUMMARY SHEET

**Learner
Previous
Knowledge**

Light and its sources; optical mediums; rectilinear propagation of light; shadows and reflection;

**Target
Knowledge for
this Topic**

Examine how an image is formed when ray of light gets reflected; Discuss the characteristics of image formed by a plane mirror; Concept of real and virtual image; Find out how mirror can be used in daily life
Investigate how spherical and curved mirrors can be useful in real life; Find out what are concave and convex lenses and what kind of images they form;

Dispersion of light

Figure out how light gets dispersed Lateral inversion; Regular and irregular reflection; reflected light reflected again

Learning Goals

More Complex Learning Goal- Students will be able to infer what kind of optical object has been used based on the images formed; categorize the given images into real/virtual based on its characteristics and describe the uses of various mirrors and lenses

Target Learning Goal- Students will be able to describe characteristics of image formed by plane mirror, concave and convex mirror as well as lenses and give their uses in detail and explain dispersion of light.

Simpler Learning Goal- Students will be able to state the characteristics of image formed by plane mirror and list the uses of different types of mirrors and lenses.

**Period
No.**
Lesson Objectives
Teaching Learning Materials Required

1

- Recall how light travels in a straight line and how to change its direction by reflecting it.

- Board and markers
- Worksheet 1
- Bent tube, straight tube, candle (for every group)

2

- Deduce characteristics of image formed by plane mirror.

- Board and markers
- Worksheet 2
- Mirror, candle

3	Demonstrate their understanding of spherical mirrors and explain formation of virtual and real image	- Board and markers - Worksheet 3 - Stainless Steel spoons
4 and 5	- Demonstrate what kind of image is obtained with a concave mirror and convex lens. - Find out the uses of spherical mirror and lens.	- Board and markers - Concave mirror, convex lens, stand, white paper, candle (for each group)
6 and 7	- Find out about the phenomenon of dispersion of light. - Understand the use of Newton's Disc	- Board and markers - Prism and torch light - Worksheet 4

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Period 1

Lesson Objectives

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

- Recall how light travels in a straight line and how to change its direction by reflecting it.

Teaching Learning Materials required

- Board and markers
- Worksheet 1
- Bent tube, straight tube, candle (for every group)

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4 or 5

Lesson Beginning <u>Time:</u> 5 min <u>Purpose:</u> Activate the prior knowledge	<u>Introduction to the topic</u> - Introduce the topic of light by posing questions to recall previous knowledge such as: - How can you define light? - What are luminous/non-luminous objects? - What is an opaque object? - Why does a shadow form? - What is the difference between transparent and translucent object? - Collate their responses on the board.
Lesson Middle <u>Time:</u> 25 min. <u>Purpose:</u> Develop conceptual understanding	<u>Activity & Worksheet</u> - Now assign worksheet 1 to all the groups. Ask them to do the first activity which is simple and does not take much time. - Ask them to work in groups to deduce which previously learnt concept is associated with it. - Ask the groups to attempt questions based on it. - Let the groups now share their responses and brainstorm for the answers. Collect all the answers and ensure that they arrive at a common consensus.

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Lesson End <u>Time:</u> 5 min <u>Purpose:</u> • Finish up	<u>Finish Up</u> • Clear doubts of the students.
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Worksheet 1**Skill: Drawing Inferences**Activity

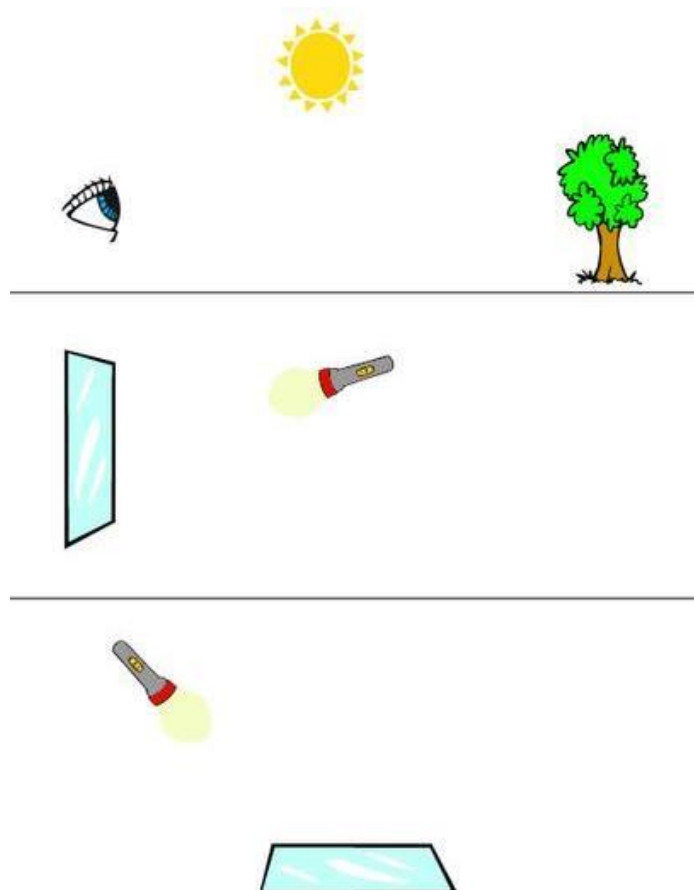
Material: one plastic straight pipe/tube, one plastic bent pipe/tube, candle

Instructions

1. Fix the candle on the table.
2. Look at the flame through the straight pipe.
3. Now try to look at the flame through the bent pipe.
4. Let each member do this activity individually.

Questions**I. Complete the sentences.**

1. Light always travels _____
2. Light gets reflected by _____
3. Opaque objects are objects which _____
4. If the object is transparent, light will _____

II. Draw the path of reflected ray in the diagrams below.

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Period 2

Lesson Objectives

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

- Deduce characteristics of image formed by plane mirror.

Teaching Learning Materials required

- Board and markers
- Worksheet 2
- Activity 1: mirror, candle

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 what they will call a reflection that they see in a polished surface. Pose questions such as: ○ Will you call it a reflection or an image? ○ Can a transparent object form an image? • Inform the students that they will now find out what are the characteristics of image formed by a plane mirror through activities.
Lesson Middle <u>Time:</u> 25 min. <u>Purpose:</u> • Develop conceptual understanding	<u>Activity</u> • Distribute worksheet 2 to all the students and also distribute items for activity. • Let them follow the instructions and do the activity. • Ask them to record their observations in their rough notebook. • Ask them to discuss their observation with the whole class. • Discuss the characteristics of the image formed by the plane mirror. • They must now attempt the questions given in the worksheet after the characteristics of image formed by plane mirror. • Let there be a whole class discussion in which the conclusions as well as 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	<u>Finish Up</u> Wrap up the class by clearing any doubts.

Worksheet 2**Skill: Drawing Inferences**Activity 1

Material: mirror, candle

Instructions

1. Light the candle and fix it in front of the mirror.
2. Move the candle to different positions and observe the image in each case.

Observation Questions

1. In the above activity, what is an object and what will you call as an image?

2. Was the image upright in each case?

3. Was the flame of the candle on the top exactly as in the object?

4. Is the image of the same size or different size?

5. What can you deduce from this activity with respect to the characteristics of image formed by the mirror?

Characteristics of images formed by a plane mirror

1. The image formed by a plane mirror is always erect.
2. The image is as far behind the mirror as the object is in front of it. It means the object and the image are equidistant from the mirror.
3. The image is of the same size as the object.
4. The image is laterally inverted, that is, right hand side of the object appears as the left hand side of image.

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1. If Nita stands 2 feet in front of a plane mirror, how far from the person will her image be located?

2. If a toy car when pushed travels towards a mirror at a rate of 0.5 m/s, then at what speed will the car and the car's image approach each other?

3. How is lateral inversion of image helpful?

Period 3**Lesson Objectives**

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

- Demonstrate their understanding of spherical mirrors and explain formation of virtual and real image

Teaching Learning Materials required

- Board and markers
- Worksheet 3
- Stainless Steel spoons

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 type of image that they observed using plane mirrors. Let the students exchange their answers for the homework that they must have done. Ask them if it is possible to obtain the image of a plane mirror on a screen like a photograph. Now ask the students if this is the only kind of image obtained or is there any other type of image too. Collect the response. • Now ask the students that what will happen if the surface of a mirror is not flat as in a plane mirror. Will it affect the image formation? Instruct the students that they will now find out about this through an activity.
Lesson Middle <u>Time:</u> 25 min. <u>Purpose:</u> • Develop conceptual understanding	<u>Activities</u> • Distribute worksheet 3 to all students. • Let them do the activities. • Now show them the actual spherical mirrors, both concave and convex. • Let them do the activities to arrive at the concept of real and virtual image. • Ask the groups to attempt the questions. • 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.

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Lesson End <u>Time:</u> 5 min <u>Purpose:</u> • Finish Up	<u>Finish Up</u> • Wrap up the class by clearing doubts.
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Worksheet 3**Skill: Drawing Inferences**Activity 1

Material: stainless steel shining spoon

Instruction

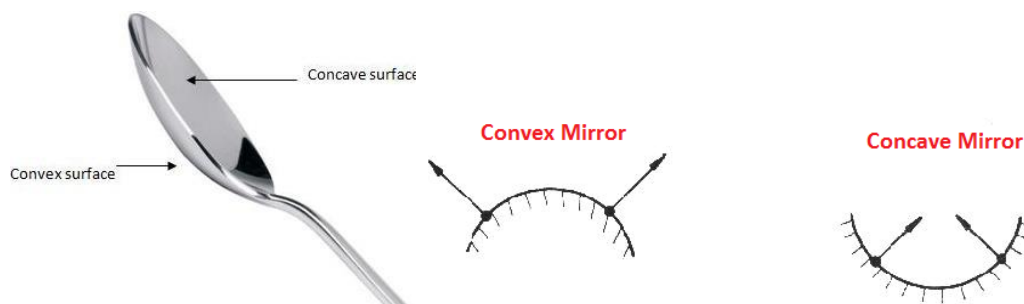
1. Hold the spoon in your hand and turn its outer side towards you.
2. Bring it near till you see your image and observe the image.
3. Now turn the spoon and try to observe image in the inner side of the spoon.
4. Move the spoon away from your face and observe the image.

Questions:

1. Is the image that you see in the spoon, different from what you see in a plane mirror?

2. Is this image erect? _____
3. Is it of the same size or different? _____
4. What kind of image do you see when you turn the spoon and observe it on the inner surface of the spoon?

* When the reflecting surface of a mirror is curved inwards it is a concave mirror and when it is curved outward it is a convex mirror. Such mirrors are called spherical mirrors.



Based on the above information and the activity that you have done, complete the following sentences.

1. Image formed by the convex surface of the spoon was _____
2. Image formed by the concave surface of the spoon was _____

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Activity 2

Material: concave mirror, sheet of paper

IMPORTANT

[Caution - Do not to look at the sun directly or focus the mirror on some other person. Just observe the image thrown on the sheet of paper.]

1. Hold the mirror to the sun.
2. Try to adjust its position such that the light gets reflected on a sheet of the paper that you have been given.
3. Adjust the distance of paper until you get a sharp bright spot.
4. Observe this image.
5. Now hold the mirror in the same position for some time.
6. Observe what happens.

Questions

1. Were you able to obtain the image of the sun on a screen? _____
2. What happened when you focused the mirror on the paper? _____

* An image which can be obtained on screen is called **real image**.

** An image which cannot be obtained on the screen is called **virtual image**.

So now state what kind of image does a plane mirror form?

A plane mirror forms

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Period 4 & 5

Lesson Objectives

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

- Demonstrate what kind of image is obtained with a concave mirror and convex lens.
- Find out the uses of spherical mirror and lens.

Teaching Learning Materials required

- Board and markers
- Concave mirror, convex lens, stand, white paper, candle (for each group)

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4 or 5

Note for facilitator – Prepare different setups for image formation by concave mirror and convex lens in advance in the lab.

Lesson Beginning <u>Time:</u> 10 min. <u>Purpose:</u> Recap the previous learning	<u>Recap of topic</u> • Ask a few students to recap what spherical mirrors are. Ask the students the definition of real and virtual image. • Collect responses and arrive at a common consensus. • Now ask the students to predict if the image formed by a concave mirror and a plane mirror will be same or different. After collecting response from a few, inform the students that they will find out the answer themselves with an activity.
Lesson Middle <u>Time:</u> 45 min. <u>Purpose:</u> Develop conceptual understanding	<u>Activities</u> • Provide concave mirror or convex lens, stand, candle and white sheet to each group. • Instruct them to trace the image of the candle when it is kept at different distances from the mirror or lens. • Demonstrate how to trace the image. • Let them write their observation in their rough notebook and share it with whole class. • Encourage them to use convex mirror and concave lens as well for the image formation.

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	• Make sure that everyone gets a change to observe the images forms.
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. <u>Homework Assignment</u> • Find out the uses of different mirror and lenses from your textbook or from any encyclopedia or the internet and write them down in your notebook. <u>Note to the students</u> • Get circular cardboard, colour pens or paints, an empty ball pen refill or any similar tube for the next class.

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Period 6 and 7

Lesson Objectives

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

- Find out about the phenomenon of dispersion of light.
- Understand the use of Newton's Disc

Teaching Learning Materials required

- Board and markers
- Prism and torch light
- Worksheet 4

Details of Teaching Learning Experience

Seating Arrangement: - In groups of 4-5

Lesson Beginning <u>Time:</u> 15 min. <u>Purpose:</u> Recap the previous learning	<u>Introduction to the topic</u> • Ask the students to share the information about the uses of different mirror and lenses. • Ask students what happens when a shiny glass such as a crystal or a diamond is kept in the path of a bright light or sunlight. • Pose questions such as: ○ Why do such objects sparkle? ○ By 'sparkle', what exactly happens? Can you see light being spilt in colours? ○ How does this happen? • Inform the students that they will now find out answers to all these questions themselves.
Lesson Middle <u>Time:</u> 45 min. <u>Purpose:</u> Develop conceptual understanding	• Demonstrate the dispersion of light with the help of prism and torch. • Let few students also explore the same and share their experience with others. • Ask students to relate the phenomena with some natural phenomena. • Discuss how the rainbow is formed in the sky after the rain as the rain droplets acts as prism. • Discuss the phenomena of dispersion of light.

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	Distribute worksheet 4 to the students and motivate them to make Newton's Disc.
Lesson End <u>Time:</u> 10 min <u>Purpose:</u> Finish Up	<u>Finish Up</u> Clear the doubts of the students if any.

Worksheet 4

Skill: Observation

Newton's Disc

Material: a cardboard, colour pens or paints, an empty ball pen refill or any similar tube, scissors

Instructions

1. Cut a disc of the cardboard.
2. Divide the disc into seven segments.
3. Colour each segment with colour of rainbow.
4. Make a small hole in the centre.
5. Fix an empty refill or a tube or a pencil in the centre through the hole such that the disc can rotate.
6. The disc must rotate freely.
7. Rotate the disc rapidly.

Questions:

1. What do you see when the disc is rotating?

2. What does this prove?

* This disc was first made by Isaac Newton and hence it is also called as Newton's Disc.