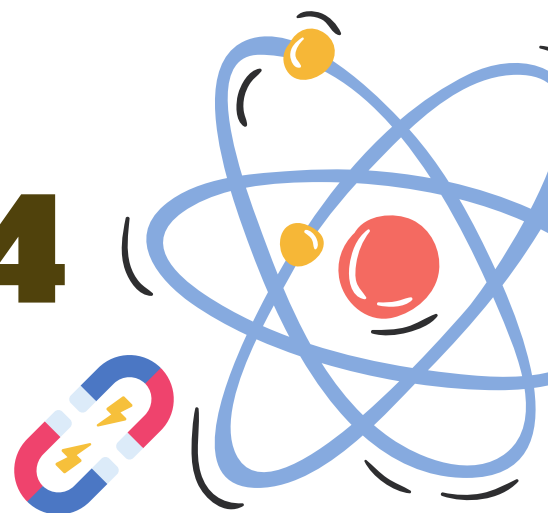




Science Education

E-MODULE 4 (PHYSICS 10)



iLab

An e-module based on Deped CARAGA
LEAST LEARNED COMPETENCIES with
Internet-Based Laboratory Activities



Arranged by :
Elaikah Keith G. Dato-on
MAED Physics



$$d = v_0 t + \frac{1}{2} a t^2$$

$$v = r \omega$$

$$KE = \frac{1}{2} m v^2$$

$$F = m \cdot a$$

$$\rho = \frac{m}{V}$$

$$W = m g$$

$$E = m \cdot c^2$$

Welcome to the Future of Learning Physics! Explore, Experiment, and Discover the Wonders of the Physical World!

To the Facilitator

Welcome to this e-module with an Internet-Based Laboratory Activities in Physics 10, an interactive and comprehensive learning resource designed to enhance your understanding of the fundamental concepts in physics.

- As a facilitator, you are expected to orient the learners on how to use this e-module. You also need to keep track of the learners' progress while allowing them to manage their own learning at home. Furthermore, you are expected to encourage and assist the learners as they do the tasks included in the e-module.

Thank you for choosing this iLab as your learning resource. We hope your journey through this e-module is both delightful and richly rewarding.

To the Learner

Welcome to the exciting world of digital learning! As a learner, you must learn to become responsible of your own learning. We hope that this e-module will serve as a valuable tool in your learning journey, providing you with the knowledge and skills you need to excel in your studies. We encourage you to take full advantage of this resource, explore all its features, and actively participate in the interactive activities.



iLab Policies

As you go through the different activities of this e-module be reminded of the following:

Remember, the goal is not just to complete the module, but to truly understand and absorb the information it provides. Always bear in mind that you are not alone. We hope that through this material, you will experience meaningful learning and gain deep understanding of the relevant competencies.
Happy learning!

Rule 1:

Active Participation: Engage actively with all the materials and activities. The more you interact, the more you learn.

Rule 2:

Pace Yourself: Don't rush through the content. Take your time to understand each concept before moving on to the next.

Rule 3:

Note-Taking: Keep a notebook handy for jotting down important points or questions that arise during your learning.

Rule 4:

Utilize Resources: Make full use of additional resources provided in this module. It is there to enhance your understanding.

Rule 5:

Reflect: After completing each section, take a moment to reflect on what you've learned and how you can apply it.



How to use these e-modules?

The e-module is composed of the following parts.

01

OVERVIEW

This provides you with the general information about the e-module.

02

PRE-TEST

This determines your background knowledge of the lesson.

03

MOTIVATIONAL ACTIVITY

This is an activity before proceeding to the lesson proper.

04

LESSON PROPER

This is the part where you can find the basic concepts about the lessons discussed

05

ILAB

These are the internet-based laboratory activities to be performed by you which will enrich your understanding of the lessons or concepts.

06

POST-TEST

This is the part that intends to determine how much you have learned from the lesson.

07

ANSWER KEY

This is the part that presents the answers to the activities included in the module.

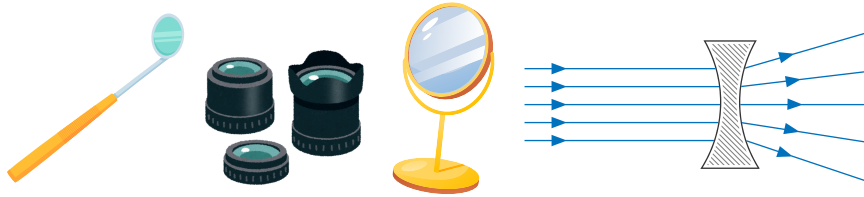


Overview

Understanding Mirrors and Lenses in Optical Instruments

Learning Competency:

Identify ways in which the properties of mirrors and lenses determine their use in optical instruments (e.g., cameras and binoculars). **(S10FE-IIj-54)**



Have you ever wondered how magnifying glasses make tiny objects appear larger, how telescopes help us gaze at distant stars, or how cameras capture crystal-clear pictures? The secret behind these amazing optical instruments lies in the mirrors and lenses they use. Mirrors and lenses play an essential role in manipulating light, helping us see and understand the world in ways that would be impossible with the naked eye alone.

Expected Outcomes:

After reading this e-module and performing the activities you should be able to:

- Identify the types of mirrors and lenses used in optical instruments, such as cameras, magnifying glasses, telescopes, and eyeglasses.
- Understand the role of mirrors and lenses in focusing light, magnifying objects, and forming images in various optical devices.



Pre-Test

Before we delve into our upcoming lesson, it's crucial to establish a foundational understanding of the topic at hand. This not only primes your mind for new information but also allows you to connect new knowledge with what you already know.

To facilitate this, we have prepared a set of questions designed to gauge your existing knowledge on the subject matter. These questions are not a test, but a tool to help you and us understand your current familiarity with the topic.

We encourage you to answer these questions thoughtfully and honestly. There's no need to rush - take your time to reflect on each question. Remember, the goal here is not to get all the answers right, but to provide an accurate snapshot of your current understanding.

So, let's embark on this journey of discovery together. Your responses will guide us in tailoring the upcoming lessons to your learning needs, ensuring a more effective and enjoyable learning experience.

Ready? Let's begin!

Directions: Read and understand each question carefully and encircle the letter of the best answer.

1. Which type of mirror is used in rear-view mirrors of vehicles
 - a) Concave mirror
 - b) Convex mirror
 - c) Plane mirror
 - d) None of the above

2. What is the primary role of a concave mirror in telescopes?
 - a) To spread light
 - b) To focus light
 - c) To reflect light without focusing
 - d) To magnify objects

3. Which type of lens is used in a magnifying glass?
 - a) Concave lens
 - b) Convex lens
 - c) Biconvex lens
 - d) Cylindrical lens

4. Which optical instrument uses a concave mirror to focus light?
 - a) Flashlight
 - b) Magnifying glass
 - c) Eyeglasses
 - d) Telescope

5. What effect does a convex lens have on light rays?
 - a) It causes them to diverge
 - b) It brings them together to a focal point
 - c) It reflects them
 - d) It disperses them in all directions

6. Why are concave lenses used in eyeglasses for nearsightedness?

- a) They focus light in front of the retina
- b) They spread light to correct blurry vision
- c) They bring light to a focal point
- d) They converge light at the retina

7. What type of optical instrument would use a convex mirror?

- a) Camera lens
- b) Rear-view mirror
- c) Magnifying glass
- d) Eyeglasses for farsightedness

8. In which optical instrument are both concave mirrors and convex lenses used?

- a) Microscope
- b) Camera
- c) Telescope
- d) Binoculars

9. Which of the following is true about convex mirrors?

- a) They reflect light to form an image at a focal point
- b) They produce a wider field of view
- c) They converge light
- d) They are used for magnification

10. What is the primary function of lenses in optical instruments?

- a) To reflect light
- b) To magnify distant objects
- c) To bend light to focus it on a specific point
- d) To reflect light off surfaces



Motivational Activity

Matching Game

Directions: Match the optical instrument or function in Column A with the correct mirror/lens type in Column B.

Column A

1. Used in magnifying glasses to enlarge objects
2. Found in rear-view mirrors of vehicles for a wider field of view
3. Used in telescopes to focus light from distant objects
4. Used in eyeglasses for farsightedness
5. Used in microscopes to magnify small objects

Column B

- A) Convex mirror
- B) Concave mirror
- C) Convex lens
- D) Convex lens
- E) Convex lens

Guide: Read the following to help you in answering the question.

These are used in rear-view mirrors because they spread light, providing a wider field of view.

These are used in eyeglasses for farsightedness to focus light onto the retina, allowing individuals to see nearby objects clearly.

These is used in magnifying glasses to converge light and enlarge objects, making them appear larger.

These are used in telescopes to gather and focus light from distant objects, forming a clear image.

These are used in microscopes to magnify small objects by focusing light and enlarging the image.



Understanding Mirrors and Lenses in Optical Instruments



In this lesson, we will explore the two primary types of mirrors and lenses: mirrors and lenses, and examine how each type is designed to control light to form images, magnify objects, or focus light. Whether it's a concave mirror focusing light for a telescope or a convex lens magnifying an object in a magnifying glass, understanding these optical components is key to understanding how optical instruments work.

We'll uncover the crucial role these mirrors and lenses play in focusing light, magnifying objects, and forming images across a wide range of devices, from everyday glasses to sophisticated scientific instruments. Whether it's enhancing vision, focusing light for photography, or exploring the universe, mirrors and lenses are at the heart of every optical device.

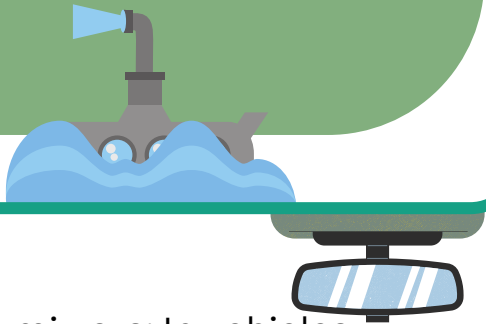
Let's dive in and explore the fascinating world of optics!

TYPES OF MIRRORS

Mirrors are classified based on the shape of their reflective surface. There are three primary types of mirrors: plane mirrors, concave mirrors, and convex mirrors. Each type of mirror has unique properties and applications.

PLANE MIRRORS

A plane mirror is a type of mirror with a flat surface. The images formed from a plane mirror are the reflected images in their normal proportions but reversed from left to right.

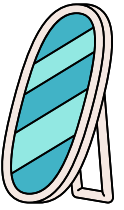


Uses:

- Rear-view mirrors: In vehicles, convex mirrors provide a wider field of view, helping drivers see a larger area.
- Security mirrors: In stores or other surveillance areas to monitor larger spaces.
- Side mirrors: Used on vehicles for wider coverage.

Uses:

- Bathroom mirrors: Used for grooming and personal care.
- Periscopes: Used in submarines and other devices to allow viewing around obstacles.
- Optical instruments: Used in various devices for light redirection and alignment.



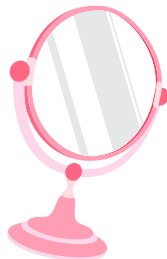
CONVEX MIRRORS

A curved mirror with the reflecting surface on the curved shape's outer side. These mirrors spread light, providing a wider field of view. They are diverging mirrors, meaning they make light rays spread out.



Uses:

- Telescopes: To gather and focus light from distant objects like stars or planets.
- Shaving or makeup mirrors: To magnify images for a closer look.
- Flashlights: To focus light into a beam.
- Dental mirrors: To help dentists focus on small areas inside the mouth.



CONCAVE MIRRORS

A curved mirror where the reflecting surface is on the inner side of the curved shape. These mirrors focus light to a single point. They are converging mirrors, meaning they bring light rays together.

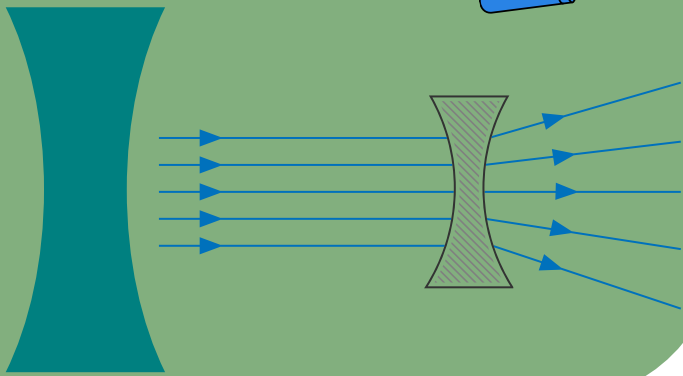


TYPES OF LENSES

Lenses are optical devices made of transparent material, typically glass or plastic, that refract light to focus or spread it. They are classified based on their shape and the way they affect light. The two main types of lenses are concave lenses and convex lenses.

CONCAVE LENS

A concave lens is also referred to as a diverging lens since it “diverges” light rays that are incident on it. They are thicker at the edges and thinner at the center.



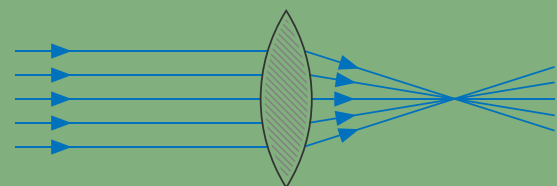
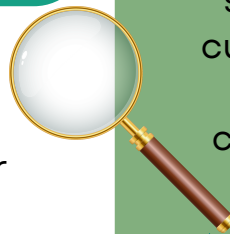
Uses:

- Eyeglasses for nearsightedness (myopia): Concave lenses spread light before it reaches the eye, allowing the light to focus correctly on the retina for individuals who have trouble seeing distant objects.
- Laser systems: Used to control the spread of laser beams.
- Flashlights: Sometimes used in optical systems where light needs to be spread.



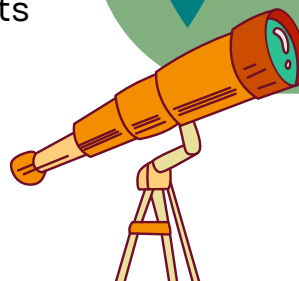
CONVEX LENS

A curved mirror where the reflecting surface is on the inner side of the curved shape. These mirrors focus light to a single point. They are converging mirrors, meaning they bring light rays together. .



Uses:

- Magnifying glasses: Used to enlarge the image of small objects for better viewing.
- Cameras: Used to focus light onto film or a digital sensor to capture sharp images.
- Eyeglasses for farsightedness (hyperopia): Convex lenses help focus light properly onto the retina for individuals who have difficulty seeing nearby objects.
- Telescopes: To magnify distant objects in combination with mirrors.



KEY ROLES IN OPTICAL INSTRUMENTS:

IMAGE FORMATION:

Mirrors and lenses control how light converges (or diverges) to form images. They help create real or virtual images, depending on the optical device.

MAGNIFICATION:

Lenses (particularly convex lenses) magnify objects to make them appear larger. Concave lenses can also magnify objects but make them appear smaller.

FOCUS:

Mirrors (especially concave mirrors) and convex lenses are used to focus light to a point, which is crucial in telescopes, cameras, and microscopes for capturing sharp, clear images.

LIGHT CONTROL:

Mirrors reflect light, while lenses bend (refract) light. Together, they guide light through optical instruments to achieve desired outcomes like magnification, focus, or clarity.

VISION CORRECTION:

Lenses in eyeglasses correct vision by adjusting how light enters the eye. Convex lenses are used for farsightedness, and concave lenses are used for nearsightedness.



Identifying the Types of Mirrors and Lenses Used in Optical Instruments

Objective:

1. Identify the types of mirrors and lenses used in optical instruments (e.g., cameras, magnifying glasses).
2. Understand the role of mirrors and lenses in focusing light, magnifying objects, and forming images in various optical devices.

Materials Needed:

1. A computer or tablet with internet access.
2. Access to the following Interactive Simulations:

CK-12 Magnifying Glass Simulation: CK-12 Magnifying Glass Simulation:

- <https://interactives.ck12.org/simulations/physics/magnifying-glass/app/index.html>

Cassegrain Telescope Simulation: CK-12 Cassegrain Telescope Simulation

- <https://interactives.ck12.org/simulations/physics/cassegrain-telescope/app/index.html?lang=en&referrer=ck12Launcher&backUrl=https://interactives.ck12.org/simulations/physics.html>

Activity Instructions:

1. Access the CK-12 Magnifying Glass Simulation:
2. Set Up the Magnifying Glass Experiment:

- Adjust the object's position in relation to the convex lens in the magnifying glass.
- Beyond the focal point (F): Move the object beyond the focal point.
- At the focal point (F): Position the object at the focal point.
- Between the focal point (F) and the lens: Place the object between the focal point and the lens.
- Observe the image characteristics (real/virtual, upright/inverted, magnified/diminished).

3. Record Your Observations:

- Object Beyond the focal point (F): What happens to the image when the object is beyond the focal point?
- Object at the focal point (F): How does the image change when the object is at the focal point?
- Object Between F and the lens: What is the result when the object is between the focal point and the lens?

4. Access the Cassegrain Telescope Simulation:

- Click on the Cassegrain Telescope Simulation link to explore how light is gathered and focused using mirrors in telescopes.
- The simulation shows the Cassegrain telescope, which uses both concave and convex mirrors to focus light for clearer, more detailed images of distant objects.

5. Set Up the Telescope Experiment:

- Adjust the object (star) position in the simulation to observe how the image changes when the telescope is focused.
- Explore how the concave primary mirror and the convex secondary mirror work together to focus the image and form a sharp, clear image of distant stars.

6. Record Your Observations:

- What happens to the image as you adjust the focus of the Cassegrain telescope?
- How do the concave and convex mirrors work together to gather light and focus it?



Post-Test

As we conclude our lesson, it's important to assess your understanding of the topic we've just explored. This step not only helps reinforce your new knowledge but also enables you to connect the concepts you've learned with your existing understanding.

To assist in this, we've prepared a set of questions designed to gauge how well you've grasped the key points of the lesson. These questions are not a test, but a valuable tool to help both you and us assess your progress.

Take your time to reflect on each question and answer thoughtfully. There's no rush – the goal here is not to get every answer right, but to give an honest and accurate snapshot of your current understanding.

This process will guide us in refining future lessons to better meet your learning needs, ensuring a more effective and enjoyable experience moving forward.

So, let's continue on this journey of discovery! Ready? Let's begin!

Directions: Read and understand each question carefully and encircle the letter of the best answer.

1. Which type of mirror is used in optical instruments to magnify objects?
 - a) Concave mirror
 - b) Convex mirror
 - c) Plane mirror
 - d) None of the above

2. What is the primary function of a convex mirror in a vehicle?
 - a) To focus light on a specific area
 - b) To provide a wider field of view
 - c) To magnify objects
 - d) To reflect light into the eyes of the driver

3. Which type of lens is used in corrective eyeglasses for farsightedness?
 - a) Concave lens
 - b) Convex lens
 - c) Biconvex lens
 - d) Cylindrical lens

4. Which optical instrument uses a convex lens to focus light?
 - a) Camera
 - b) Microscope
 - c) Magnifying glass
 - d) Both a and b

5. What effect does a concave lens have on light rays?
 - a) It converges light to a focal point
 - b) It causes them to diverge
 - c) It magnifies the image
 - d) It focuses light into a single beam

6. Which optical instrument uses a convex lens for magnification?
- a) Magnifying glass
 - b) Telescope
 - c) Rear-view mirror
 - d) Eyeglasses for nearsightedness
7. What is the primary role of a convex lens in a camera?
- a) To spread light
 - b) To focus light on the film or sensor
 - c) To reflect light
 - d) To magnify distant objects
8. Which type of lens is used in laser systems?
- a) Convex lens
 - b) Concave lens
 - c) Biconvex lens
 - d) Cylindrical lens
9. What kind of mirror is typically used in optical instruments to reflect light for focusing purposes?
- a) Concave mirror
 - b) Convex mirror
 - c) Plane mirror
 - d) Biconcave mirror
10. Which optical instrument primarily uses a concave lens for vision correction?
- a) Eyeglasses for farsightedness
 - b) Eyeglasses for nearsightedness
 - c) Magnifying glass
 - d) Telescope

Compare your answers with the pre-test to see how much you've learned and retained.



Answer Key

Pre-test

1. Which type of mirror is used in rear-view mirrors of vehicles?

a) Concave mirror

b) Convex mirror

c) Plane mirror

d) None of the above

Explanation: Convex mirrors are used in rear-view mirrors because they reflect light outward, giving a wider field of view. They are designed to provide a larger image of a larger area.

2. What is the primary role of a concave mirror in telescopes?

a) To spread light

b) To focus light

c) To reflect light without focusing

d) To magnify objects

Explanation: Concave mirrors are used in telescopes to focus light. They converge light rays to form an image at the focal point, which helps in viewing distant objects clearly.

3. Which type of lens is used in a magnifying glass?

a) Concave lens

b) Convex lens

c) Biconvex lens

d) Cylindrical lens

Explanation: A convex lens is used in a magnifying glass because it converges light rays to magnify objects, making them appear larger.

4. Which optical instrument uses a concave mirror to focus light?

a) Flashlight

b) Magnifying glass

c) Eyeglasses

d) Telescope

Explanation: Telescopes often use concave mirrors to gather and focus light from distant objects. These mirrors bring light to a focal point to make distant objects appear clearer.

5. What effect does a convex lens have on light rays?

a) It causes them to diverge

b) It brings them together to a focal point

c) It reflects them

d) It disperses them in all directions

Explanation: A convex lens converges parallel light rays, causing them to meet at a focal point. This is essential in instruments like cameras and magnifying glasses.

6. Why are concave lenses used in eyeglasses for nearsightedness?

a) They focus light in front of the retina

c) They bring light to a focal point

d) They converge light at the retina

b) They spread light to correct blurry vision

Explanation: Concave lenses diverge light rays, which helps in correcting nearsightedness by moving the focal point back to the retina, making distant objects appear clearer.

7. What type of optical instrument would use a convex mirror?

a) Camera lens

b) Rear-view mirror

c) Magnifying glass

d) Eyeglasses for farsightedness

Explanation: Convex mirrors are commonly used in rear-view mirrors because they offer a wide field of view by spreading light rays.

8. In which optical instrument are both concave mirrors and convex lenses used?

a) Microscope

b) Camera

c) Telescope

d) Binoculars

Explanation: Telescopes often use both concave mirrors (to gather and focus light) and convex lenses (to magnify the image) to provide a clearer view of distant objects.

9. Which of the following is true about convex mirrors?

a) They reflect light to form an image at a focal point

b) They produce a wider field of view

c) They converge light

d) They are used for magnification

Explanation: Convex mirrors spread light and give a larger field of view. They are used in applications where a wide perspective is important, such as in vehicle side mirrors.

10. What is the primary function of lenses in optical instruments?

a) To reflect light

b) To magnify distant objects

c) To bend light to focus it on a specific point

d) To reflect light off surfaces

Explanation: Lenses work by bending light through refraction to bring it to a specific focal point. This is crucial for focusing images in optical instruments like cameras, microscopes, and eyeglasses.

Motivational Activity

Matching Game

Directions: Match the optical instrument or function in Column A with the correct mirror/lens type in Column B.

Column A

1. Used in magnifying glasses to enlarge objects
2. Found in rear-view mirrors of vehicles for a wider field of view
3. Used in telescopes to focus light from distant objects
4. Used in eyeglasses for farsightedness
5. Used in microscopes to magnify small objects

Column B

A) Convex mirror
Explanation: Convex mirrors are used in rear-view mirrors because they spread light, providing a wider field of view.

B) Concave mirror
Explanation: Concave mirrors are used in telescopes to gather and focus light from distant objects, forming a clear image.

C) Convex lens
Explanation: Convex lenses are used in eyeglasses for farsightedness to focus light onto the retina, allowing individuals to see nearby objects clearly.

D) Convex lens
Explanation: A convex lens is used in magnifying glasses to converge light and enlarge objects, making them appear larger.

E) Convex lens
Explanation: Convex lenses are used in microscopes to magnify small objects by focusing light and enlarging the image.

Post-test

1. Which type of mirror is used in optical instruments to magnify objects?

- a) **Concave mirror**
- b) Convex mirror
- c) Plane mirror
- d) None of the above

2. What is the primary function of a convex mirror in a vehicle?

- a) To focus light on a specific area
- b) **To provide a wider field of view**
- c) To magnify objects
- d) To reflect light into the eyes of the driver

Explanation: Convex mirrors are used in vehicle side mirrors because they reflect light in a way that gives the driver a larger field of view, helping them to see more of the surrounding area.

3. Which type of lens is used in corrective eyeglasses for farsightedness?

- a) Concave lens
- b) **Convex lens**
- c) Biconvex lens
- d) Cylindrical lens

Explanation: Convex lenses are used in eyeglasses for farsightedness because they focus light on the retina, helping individuals see nearby objects clearly.

4. Which optical instrument uses a convex lens to focus light?

- a) Camera
- b) Microscope
- c) Magnifying glass
- d) **Both a and b**

Explanation: Both cameras and microscopes use convex lenses to focus light onto a film or sensor (camera) or a focal point for magnification (microscope).

5. What effect does a concave lens have on light rays?

- a) It converges light to a focal point
- b) **It causes them to diverge**
- c) It magnifies the image
- d) It focuses light into a single beam

Explanation: Concave lenses diverge light rays, which is useful for correcting nearsightedness and in other optical instruments to spread light.

Compare your answers with the pre-test to see how much you've learned and retained.

6. Which optical instrument uses a convex lens for magnification?

- a) Magnifying glass
- b) Telescope
- c) Rear-view mirror
- d) Eyeglasses for nearsightedness

Explanation: A magnifying glass uses a convex lens to converge light and magnify objects, making them appear larger.

7. What is the primary role of a convex lens in a camera?

- a) To spread light
- b) To focus light on the film or sensor
- c) To reflect light
- d) To magnify distant objects

Explanation: A convex lens in a camera focuses light onto the film or digital sensor, capturing the image.

8. Which type of lens is used in laser systems?

- a) Convex lens
- b) Concave lens
- c) Biconvex lens
- d) Cylindrical lens

Explanation: Concave lenses are often used in laser systems to diverge the light and control the spread of the beam.

9. What kind of mirror is typically used in optical instruments to reflect light for focusing purposes?

- a) Concave mirror
- b) Convex mirror
- c) Plane mirror
- d) Biconcave mirror

Explanation: Concave mirrors are used to focus light and form an image. They are commonly used in telescopes, microscopes, and other optical devices where focusing light is necessary.

correction?

a) Eyeglasses for farsightedness

b) Eyeglasses for nearsightedness

- c) Magnifying glass
- d) Telescope

10. Which optical instrument primarily uses a concave lens for vision

Explanation: Concave lenses are used in eyeglasses for nearsightedness to spread light rays and focus them correctly onto the retina, allowing for clear vision of distant objects.

References

Interactive Simulations:

CK-12 Foundation. (n.d.). Magnifying glass simulation. Retrieved March 27, 2025, from <https://interactives.ck12.org/simulations/physics/magnifying-glass/app/index.html>

CK-12 Foundation. (n.d.). Cassegrain telescope simulation. Retrieved March 27, 2025, from <https://interactives.ck12.org/simulations/physics/cassegrain-telescope/app/index.html?lang=en&referrer=ck12Launcher&backUrl=https://interactives.ck12.org/simulations/physics.html>

Website Article:

BYJU'S. (n.d.). Concave and convex mirrors: Difference between mirror and lens. Retrieved March 27, 2025, from <https://byjus.com/physics/concave-convex-mirrors//physics/difference-between-mirror-and-lens/>