

Image Formed By A Concave Lens LR

Image formed by a concave lens. Objective. To understand the size, the position, and the nature of the image formed by a concave lens.

Let's place a concave lens at position A and mark the principal axis passing through the optical center O. Mark points F_1 and $2F_1$ on the left side of the concave lens and F_2 and $2F_2$ on its right side. These are the two foci of the concave lens. F_1 is known as the first focus and F_2 is known as the second focus of the concave lens.

Place the object anywhere between the optical center and infinity. Allow a light ray to pass from the tip of the object through the optical center of the concave lens. The light ray will pass through the lens without bending.

Now, allow another light coming from the object to traverse horizontally to the principal axis. The refracted light ray appears to come from the focus, which is on the same side of the concave lens, where the object is placed. The two rays meet at one point.

This is where the virtual, erect, and diminished image of the object is formed. Now, move the object anywhere on the principal axis between the optical center and infinity. The image formed in each case is always between the focus and the optical center on the same side of the lens.

To summarize, at least two light rays should appear to intersect to form the image by a concave lens. The image will be formed where the rays appear to intersect each other. The size, the position, and the nature of the image formed by a concave lens does not change, even after changing the position of the object.

Summary of Image Formation by a Concave Lens

Understanding Image Formation in a Concave Lens

A **concave lens** is a **diverging lens** that always forms a **virtual, erect, and diminished image** regardless of the object's position.

Steps to Form an Image Using a Concave Lens

✓ Step 1: Placing the Concave Lens

- A **concave lens** is placed at **position A** with its **principal axis** passing through the **optical center (O)**.
- Two focal points are marked:
 - **F_1 and $2F_1$** (on the left side of the lens)
 - **F_2 and $2F_2$** (on the right side of the lens)
- **F_1** is the **first focus**, and **F_2** is the **second focus** of the concave lens.

✓ Step 2: Placing the Object

- The object is placed **anywhere on the principal axis between the optical center and infinity**.

✓ Step 3: Tracing the Light Rays

- **First Light Ray:**
 - Passes **straight through the optical center (O)** without bending.
 - **Second Light Ray:**
 - Travels **horizontally to the principal axis** before passing through the lens.
 - After refraction, the light ray **diverges** but appears to come **from the focus (F_1)**.
 - The two refracted rays **appear to meet at a point**, forming the image.
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Nature of the Image Formed by a Concave Lens

- ✓ **Always Virtual** (cannot be projected on a screen)
 - ✓ **Always Erect** (upright position)
 - ✓ **Always Diminished** (smaller than the object)
 - ✓ **Always Formed Between the Focus (F_1) and the Optical Center (O) on the Same Side as the Object**
 - ✓ **Position of the Image Remains the Same**
 - No matter where the object is placed, the **image is always between F_1 and O**.
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Key Takeaways

- ✓ **A concave lens always forms a virtual, erect, and diminished image.**
 - ✓ **The image is always located between the focus (F_1) and the optical center (O).**
 - ✓ **The size and position of the image remain unchanged even if the object's position is altered.**
 - ✓ **At least two light rays should appear to intersect to form the image.**
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Quiz on Concave Lens Image Formation

1. What type of image is always formed by a concave lens?

- ☒ **Virtual, erect, and diminished**
- ☐ Real and inverted
- ☐ Enlarged and real
- ☐ Inverted and magnified

2. Where is the image always formed by a concave lens?

- ☒ **Between the focus (F_1) and the optical center (O)**
- ☐ Beyond $2F_2$
- ☐ At the second focus (F_2)
- ☐ On the other side of the lens

3. What happens when an object moves closer to a concave lens?

- ☒ **The image remains virtual, erect, and diminished**
- ☐ The image becomes real and inverted
- ☐ The image disappears
- ☐ The image forms beyond the lens

4. What happens to a light ray passing through the optical center of a concave lens?

- ☒ **It continues in a straight line without bending**
- ☐ It bends toward the principal axis
- ☐ It refracts and converges at a point
- ☐ It reflects back toward the object