

How does a Camera Work?

1. What is a Photograph?

A photograph is described as a snapshot in time, capturing the light rays that bounce off objects and enter the camera. Each object in view emits or reflects countless light rays in all directions, but only those entering the camera lens are relevant for the image.

2. Key Components of a DSLR Camera

The video highlights three fundamental internal components that convert light into a photo:

- **Aperture:** Located inside the lens, the aperture is a spiraled assembly of leaves that open and close to control how much light enters the camera. The size of the opening is measured in f-stops. A wide (low f-stop) aperture lets in more light and creates a shallow depth of field (blurry background), while a narrow (high f-stop) aperture lets in less light and increases the depth of field (more of the image in focus).
- **Shutter:** The shutter, located behind the mirror box, consists of two curtains. When you take a photo, the mirror flips up, the first curtain opens to expose the sensor to light, and the second curtain closes after the set exposure time. This process controls how long the sensor is exposed to light, known as the shutter speed.
- **Sensor:** The sensor is made up of millions of pixels (e.g., a 16-megapixel sensor has 16 million pixels). Each pixel comprises three layers: a microlens, a color filter (red, green, or blue), and a photodiode. The microlens focuses incoming light, the color filter allows only specific colored photons through, and the photodiode converts the light into an electrical charge. The amount of charge corresponds to the brightness of that pixel.

3. How the Camera Focuses Light

- The lens refracts (bends) light rays from each point on the subject, focusing them onto the sensor. If the light rays from a point converge exactly on the

sensor, that point is in focus. If they converge before or after the sensor, the point appears blurry.

- The aperture also affects focus: a narrow aperture (high f-stop) blocks more peripheral light rays, increasing the range of distances that appear in focus (depth of field).

4. The Mirror and Viewfinder System

- In a DSLR, light entering the lens is first reflected by a mirror up into a pentaprism, which directs the image into the viewfinder. This allows the photographer to see exactly what the lens sees.
- When the shutter button is pressed, the mirror flips up, allowing light to reach the sensor.

5. The Image Capture Sequence

- Pressing the shutter button initiates a sequence: the mirror flips up, the shutter opens, light hits the sensor for the set duration, then the shutter closes and the mirror returns.
- The sensor collects light data, which is then read row by row and sent to the camera's processor to create the final image.

6. Sensor Details and Image Processing

- Each pixel's photodiode accumulates an electric charge proportional to the light received. The ISO setting determines how much the signal is amplified.
- The camera's processor reads the electrical charges from all pixels, processes the data, and constructs the digital image.

Conclusion

The video effectively demonstrates how a DSLR camera uses the interplay of aperture, shutter, and sensor-along with the mirror and pentaprism system-to capture focused, well-exposed images by converting light into digital data. The animated breakdown clarifies how each component contributes to the final photograph, from light entry to digital processing.