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Examining the Use of Lenses

Nastaran Ochmas

Member of the Scientific Staff , Department of Physics, Faryab University, Faryab, AFGHANISTAN.

Corresponding Author: muzafarsaber288@gmail.com

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ABSTRACT

Lenses are an important topic of light physics. The inverse of the focal distance of any lens is called the convergence of that lens, if the unit of measurement of the focal distance is meters, then the unit of measurement of convergence is diopters. In terms of physics, the lens of the eye can be defined as a convex lens. Eyes that can see far but cannot see near, usually convex lenses are used to correct it. Various images in lenses and their use in optical instruments, including magnifiers, microscopes, binoculars, projectors, are used in a wide range of applications. In this article, such precious and valuable examples have been pointed out in a manner that encourages our mind and senses to continue it.

Keywords- lens, light, glass, magnifying glass, microscope, projector.

I. INTRODUCTION

Magnifiers, glasses, cameras, microscopes, etc. are used to observe objects. In the construction of the mentioned devices, glass devices called lenses are used. A lens is a piece of glass or another transparent material that is bounded by two spherical surfaces, one of these two surfaces can be flat. The light rays that pass through these objects either meet at a point or diverge. Lenses whose sides are thin compared to the middle are called converging lenses and lenses that have thick sides are called divergent lenses. A spherical lens is a transparent object that is bounded by two spherical surfaces or one flat surface and one spherical surface. There are three types of convex and concave spherical lenses.

II. LENSES

Lenses are transparent objects bounded by two spherical surfaces or one spherical surface and one flat surface. The radii of the respective spheres are called the radius of curvature of the lens and the straight line that connects the centers of these two spheres is called the main axis or the optical axis of the lens. The straight lines that connect the center of curvature with other parts of the lens surface are called minor axes. The point of intersection of the main axis and the axis of the lens is called the optical center and we denote it by o. Any ray of light that passes through this point exits without refraction. Lenses have two centers of curvature, the center of the object and the center of the image, the center where the object is located is the center of the object, and the other center is called the center of the image. Whenever a bunch of rays parallel to the main axis and close to it shines on the lens, the rays after refraction in the lens on the main axis are gathered at one point, this point is called object illumination and if it is on the other side, it is called image illumination. Therefore, each lens has two lenses. Lenses constitute an important physical issue of light.

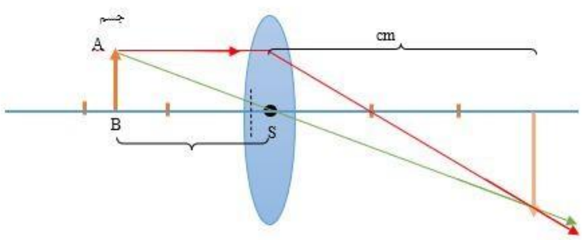

Figure 1. Image formation in a convex lens [9]

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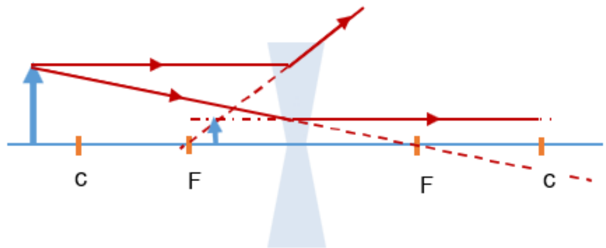

Figure 2: Image formation in a concave lens [7]

Spherical lenses

A spherical lens is a transparent object that is bounded by two spherical surfaces or one flat surface and one spherical surface. These lenses are divided into two groups, convex and concave.

1- Convex lenses

If the two limiting surfaces intersect, the lens is called convex or converging lens [8].

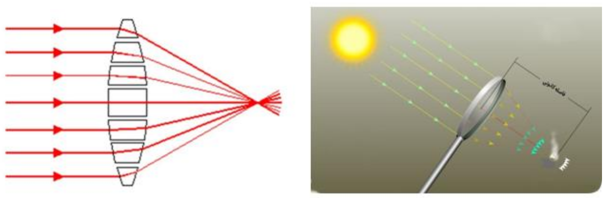

Figure A Figure B

Figure 3: Expressing, a light beam after passing through a convex lens [4]

2- Concave lenses

If the two limiting surfaces do not intersect each other, the lens is called concave or divergent.

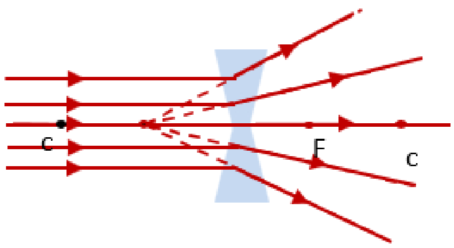

Figure 4. The divergence of the light beam after passing through the concave lens [1]

There are three types of convex and concave spherical lenses. Terms of concave-sided lens, flat-concave lens, concave-convex lens, flat-convex lens, flat-convex lens, concave-convex lens.

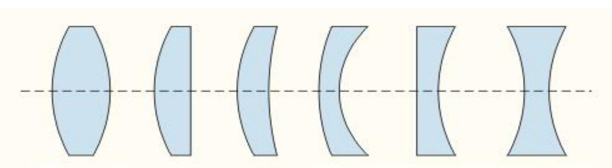

Figure 5. Six types of lenses [1]

III. PATH OF RAYS IN CONVERGING LENSES

1. The ray that is parallel to the main axis, after passing through the lens and refraction, passes through the lens.

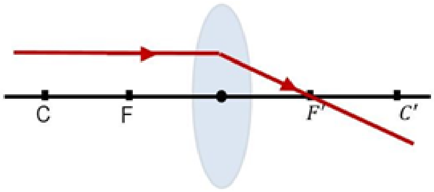

Figure (a)

2. The ray that passes through the focal point of the lens, after passing through the lens and refraction, runs parallel to the main axis.

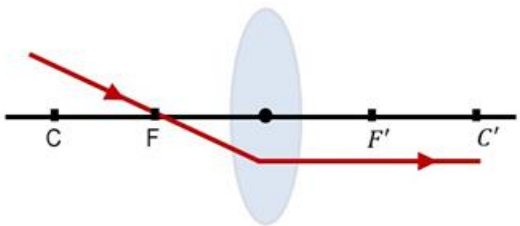

Figure (b)

3. The ray that passes through the center of illumination of the lens extends along its path without refraction.

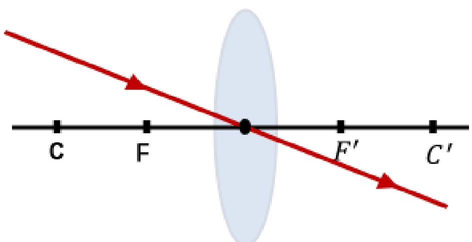

Figure (c)

4. The ray that passes through the center, after passing through the lens and refraction, passes through the center.

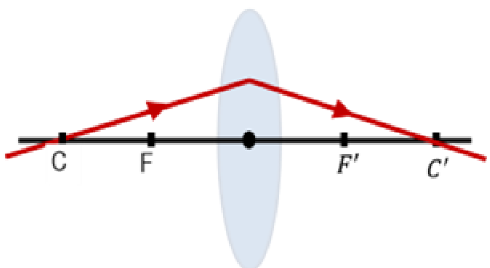

Figure (d)

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IV. DIFFERENT IMAGES IN CONVERGING LENSES

We place an object at a distance of 4cm in front of a convex lens whose focal distance is 8cm, so a virtual image, straight, twice the size of the object at a distance of 8cm is formed in focal point F of the lens as shown below:

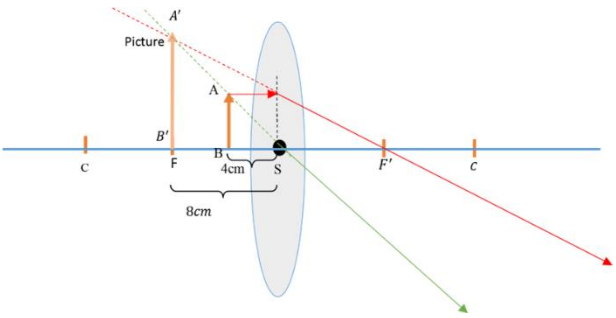

Figure 7. Formation of a virtual image of two multiple objects in a convex lens [2]

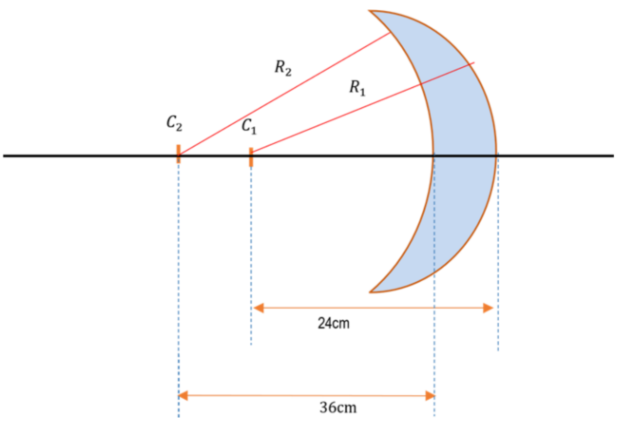

Figure 8. The convergence and focal distance of a crescent convex-concave lens [2]

V. RAY PATH IN DIVERGING LENSES

The ray parallel to the main axis diverges after passing through the lens and refraction, through the virtual lens. travels along the center.

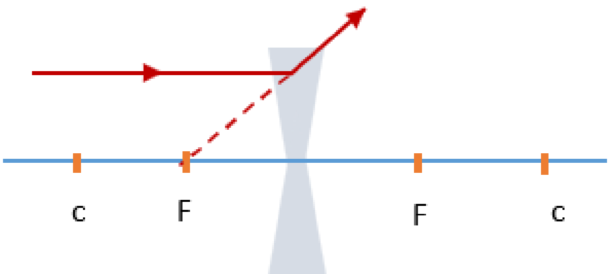

Figure (a)

The ray that shines along the center, after passing through the lens, its extension passes.

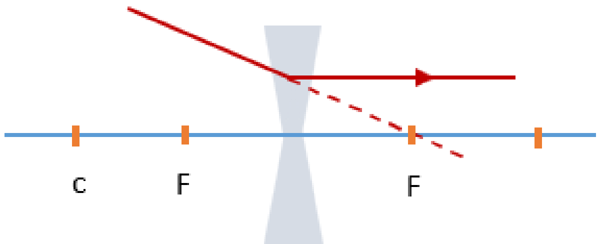

Figure (b)

The ray that passes through the center of light of the lens extends along its path after passing without noticeable refraction.

The ray that shines along the center, after passing through the lens and refraction, travels along the center.

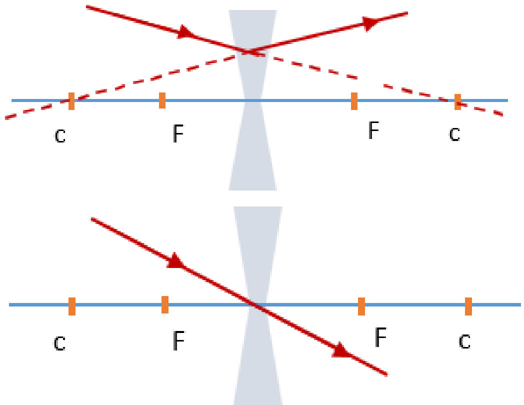

Figure 9. The passage of the radius in concave lenses [6]

VI. THE IMAGE IN THE DIVERGING LENS

A virtual object is located at a distance of 20 cm from a concave lens whose focal distance is 30 cm, so the real image is straight, and there are several objects in the center of curvature of the lens object at a distance of 60 cm from the lens, as shown in the figure below.

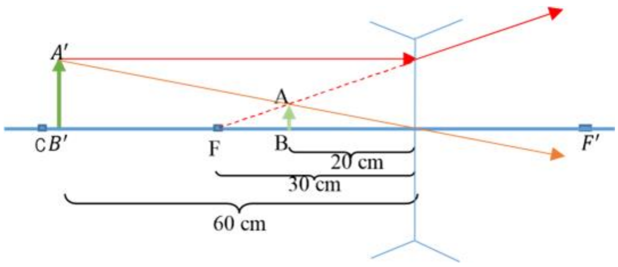

Figure 10. The drawing of a virtual object in a concave lens object in a concave lens

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The concave-convex lens whose refractive index is 2.3 and the radii of curvature are 10cm and 20cm, respectively, so the convergence of the dup is 2.3.

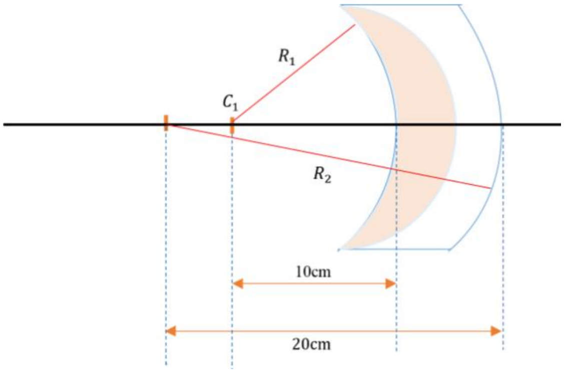


Figure 11. The radius in convergence of the concave-convex lens [2]

Convergence of lenses: the inverse of the focal distance of each lens is called the convergence of that lens and we denote it by c, that is

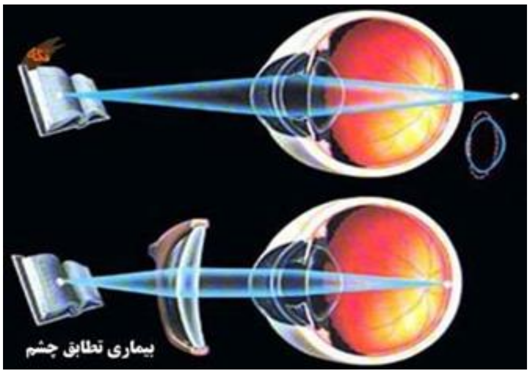
c = ± _

If the focal distance measurement unit is a meter, the convergence measurement unit is a diopter, that is, the greater the focal distance of a lens, the greater its convergence or divergence.

VII. USE OF LENSES

Magnifiers, glasses, cameras, microscopes, etc. are used to observe objects. In the construction of the mentioned devices, glass devices called lenses are used.

In terms of physics, the lens of the eye can be defined as a convex lens. Therefore, eye adaptation is a feature by which the convexity of the eye lens should change so much that the image of the objects above the retina becomes clear. This action is carried out by the muscles located around the eye lens. To see near objects, the thickness of the lens is increased and as a result its focal length is reduced. In any case, these changes occur in the normal eye in such a way that a clear image of distant or near objects is formed on the retina.



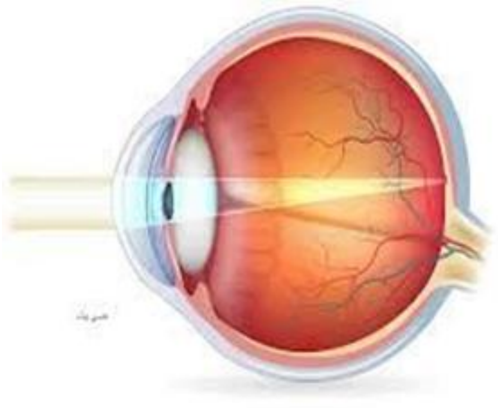


Figure 12. The eye of a convex lens [2]

Eye Defects

The eyes that can see far away cannot see near. To correct it, convex lenses are yusually used to collect the rays more and form the image on the grid. Eyes that can see near but cannot see far, concave lens is used as a lens to correct this defect.

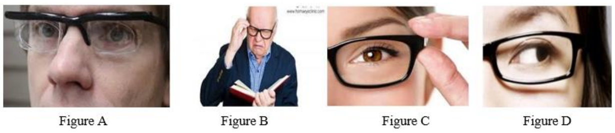


Figure 13. Eyes of nearsighted and nearsighted [2]

Magnifier

The magnifying glass is made of a convex lens with a focus distance of 1 to 5 cm. In this case, the lens forms a virtual image of the said object, straight (straight) and larger than the original object, which the observer can see clearly.

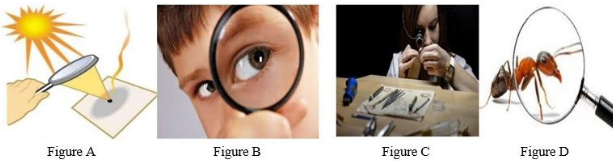


Figure 14. The magnifying glass and its use [2]

Microscope

The microscope consists of two convex lenses. One of these lenses is located towards the object, which is called the objective lens, and has a focal length of about a few millimeters. The second lens is placed on the side of the eye, which is called the ocular lens and has a focus distance of about a few centimeters.

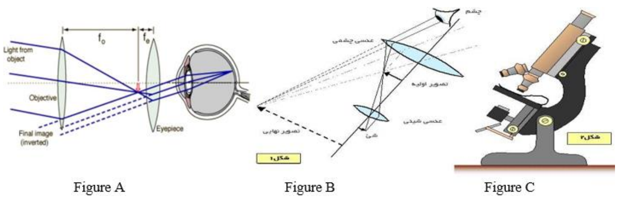


Figure 15. The microscope and its use [3]

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Astronomical Cameras

Astronomical cameras are cameras that are used to see the stars, these cameras consist of two convex lenses. One is the lens of the object whose focusing distance is about a few meters and forms the real and inverted image A^' B^' of the object AB which is at infinity in the focusing of this lens and the other lens is the lens of the eye which The lens performs the function of a magnifier and forms a virtual image A^' B^' of A^' B^' which is inverted and larger than the object AB, which can be clearly seen [2].

Figure 16. The types of astronomical cameras and their use [2]

Field Cameras

In field cameras, another convex lens is added between the object lens and the eye lens. Its image is aligned so that A^' B^' is located outside its focal distance.

Figure 17. Field cameras and their use [2]

Galileo cameras

The Galileo camera consists of two lenses. As the lens of the object is a convex lens and forms the real and inverted image A^' B^' of the object located at infinity in its focal plane, the lens of the eye is a concave lens and is placed in such a way that A^' B^' for it The ruling finds the virtual object that is located outside its focal distance, and finally the image A^" B^" is formed virtually inverted and larger than A^' B^'.

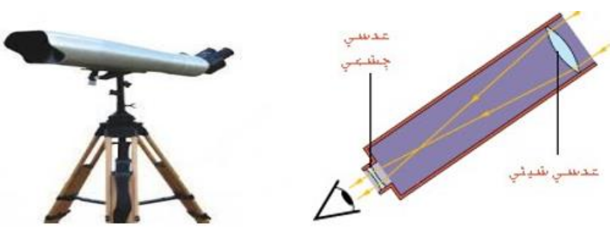

Figure 18. Galileo's cameras and their use [2]

The camera

The camera consists of a closed chamber with a convex lens that forms the real image and a film behind the lens for the purpose of capturing the image. A person adjusts the camera by changing the distance between the lens and the film. The proper adjustment of the camera, which is necessary to produce clear images, is related to the distance of the lens from the film, the distance of the object, and the focal length of the lens [2].

Figure 19. The types of cameras and their use [2]

Projector

A projector is an optical structure that forms a large image on the screen from film, object or slide. We know that when the object is located between the center of curvature and the focus of a lens, its image is real, inverted and larger than the object, which is used in the projector. To get an image that is perpendicular to the top, the film must be placed in the projector downwards.

Figure 20. The types of projectors and their use [2]

VIII. CONCLUSION

Physics is very important in all advances in science and technology today. Lenses constitute an important physical issue of light. A lens is a piece of glass or other transparent material that is bounded by two spherical surfaces, one of these two surfaces can be flat. If the spherical faces of a lens intersect each other, they produce a lens or a thin edge, and if they do not intersect, they create a lens with a thick edge. Lenses whose sides are thin compared to the middle are called converging lenses and lenses with thick sides are called divergent lenses. A convex lens with two sides is called a convex lens, and a concave lens with two sides is called a concave lens. In terms of physics, the lens of the eye can be defined as a convex lens. Eyes that can see far but cannot see near, usually convex lenses are used to correct it. Astronomical cameras are cameras that are used to see the stars, these cameras consist of two convex lenses. The camera consists of a closed chamber with a convex lens that forms the real image and a film behind the lens for the purpose of capturing the image.

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REFERENCES

[1] Ghori Mohammadanur. Mohammad Homayoun Stanekzai // Fundamentals of physics. – First edition. – Kabul: Saeed Publications, 2010.
[2] Siddiqi Faizanullah. General physics. – First Edition. – Kabul: Besharat Publishing Center, 2012.
[3] Motmohad Ruqiya. Physics of light First Edition. – Kabul: Jahan Islam Publications, 2014.
[4] Frederick Buick, Eugene Hasht. Pre-university physics. Translation: Hoshang Sepehari. – First Edition. – Tehran: Revolution Square. New release, 1989.
[5] Pirouz Mohammad Jan. General Physics. – Kabul: Sarir Publishing House.
[6] Kashmus Mohammad Azim. Physics for secondary education. – Second edition. – Pakistan, 2016.
[7] Shams Mohammad Anwar. Physics for everyone. – First Edition. – Kabul: Saeed Publications, 2012.
[8] Ahdiar Fariba. Solving general physics problems. – Second edition. – Kabul: Saidi Publications, 2013.
[9] Reznik Jeral Walker. Dutch Fundamentals of physics / translated by Dr. Mohammad Ebrahim Abu Kazemi. – First edition. – Tehran: Nopardozan, 2010.