Focal Length of a Human Eye

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Edited by Glenn Elert -- Written by his students
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Bibliographic Entry	Result (w/surrounding text)	Standardized Result
Serway, Raymond & Beichner, Robert. *Physics for Scientists and Engineers with Modern Physics, Fifth Edition*.Saunders College Publishing. 2000.	"For an object distance of infinity, the focal length of the eye is equal to the fixed distance between the lens and the retina, about 1.7 cm"	17 mm
Cameron, John R.; James G. Skofronick & Roderick M. Grant. *Physics of the Body. Second Edition*. Madison, WI: Medical Physics Publishing, 1999.	"The diameter of the central bright spot at the retina is the product of the effective aperture to retina distance (17 mm) …."	17 mm
Alexander, David. Light and Color (PHYS 1230) Lecture 21. University of Colorado. 1997.	"The normal relaxed eye focuses rays from infinity onto the retina, with a focal length of about 1.7 cm or power of about +60 diopters."	17 mm
The Eye: The Wonder of Accommodation. The Physics Classroom and Mathsoft Education and Engineering, Inc. 2002.	"The distance from the cornea (where the light undergoes most of its refraction) to the central portion of the fovea on the retina is approximately 1.7 cm."	17 mm

The human eye is the organ which gives us the sense of sight, allowing us to learn more about the surrounding world than we do with any of the other four senses. We use our eyes in almost every activity we perform, whether reading, working, watching television, and driving a car, among countless other ways.

And how exactly does the eye work? The eyeball is a spherical structure approximately 2.5 cm (about 1 in) in diameter with a pronounced bulge on its forward surface, the cornea. Just behind the cornea is the iris, a colored area with a hole in the center called the pupil. Circular muscle tissue in the iris allows it to open and close the pupil to regulate the amount of light that gets inside the eyeball. Just behind the iris and pupil is the lens. The cornea and the lens work together to focus images on the retina, which is the light-sensitive layer that lines the inside of the eyeball.

Light moves in straight lines. Whenever a light ray encounters a surface of a different transparent medium, however, it refracts. The amount of refraction depends on the refractive index of the substance, the angle at which the light hits it, and the color of the light. On a curved surface such as a lens, parallel rays of light will hit the surface at different angles and will be refracted in different directions.

The eye focuses on an object by bending all of the light rays from a single point on the observed object toward a single point on the retina. In the eyeball, light rays passing through the cornea are bent by its curvature toward the pupil. The lens flexes to change its curvature and finish the focusing process. When an object is located at infinity, the focal length, or the distance from the cornea to the retina, of a normal relaxed eye is about 1.7 cm (17 mm).
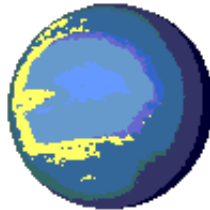
Julia Khutoretskaya -- 2002

Bibliographic Entry	Result (w/surrounding text)	Standardized Result
Clark, R.N. Notes on the Resolution and Other Details of the Human Eye. Clarkvision Photography. 26 December 2007.	"What is the focal length of the eye? I did a google search and found many "answers" ranging from 17mm to 50mm (50 is totally absurd). For the correct answer, is Reference: Light, Color and Vision, Hunt et al., Chapman and Hall, Ltd, London, 1968, page 49 for 'standard European adult'": Object focal length of the eye = 16.7 mm Image focal length of the eye = 22.3 mm The object focal length is for rays coming OUT OF THE EYE. But for an image on the retina, the image focal length is what one wants…. So this explains the commonly cited ~17mm focal length, but the correct value is ~22 mm focal length."	22.3 mm
Phys 531, Lecture 11, Survey of Optical Systems [pdf], University of Virginia, 7 October 2004.	"So f_i = 22 - 24 mm"	22 - 24 mm

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