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The Human Eye, *continued*

5 The back of the eye is like a movie screen for the images you see. The retina is made up of very specialized cells called *rods* and *cones*. There are about 120 million rods and about 7 million cones in each eye! Rods cannot sense things in color, but they can see black and white and different shades of gray. After the sun has set, when you can no longer see anything in color, the rods are working very hard. Rods also allow you to see the shape of different objects. There are three different types of cones that work in bright light: red, blue, and green. Together, these cones process the light waves that come into the eye and let you see the many different colors you do. The rods and cones send all the information they gather through the optic nerve at the back of the eye. The brain then uses the nerve signals to put together a picture of the outside world. The place in the retina where the optic nerve exits is called the *blind spot*. This is because there are no rods or cones in this area, and if an image is projected onto this part of the retina, you cannot see it.

6 The eye also has a couple of ways to protect itself. The biggest protection for the eye is the *eyelid*. The eyelid helps to keep the eye clean and moist. Opening and closing the eyelid is called blinking, and you can do it when you want to and without even thinking about it. This means that blinking is both a *voluntary* (it sounds like the word *volunteer*) and *involuntary* action. Your eyelids will shut automatically to stop things from getting into your eye. Don't forget your *eyelashes*! They form a team with your eyelids to keep dirt and dust out of your eye. But what happens when a piece of dust does get in your eye? That's when *tears* come in to play. Tears come from glands called *lacrimial glands* which are located just above the outer corner of your eyes. Every time you blink a small amount of tears is released into your eye to keep it moist. Tears also help to wash away bacteria and dust from the surface of your eye. Tears drain out of your eye by entering the *lacrimial duct* or *tear duct*.

7 Some people wear glasses; do you know why? Sometimes people have trouble seeing and glasses help them. When you have your eyes tested, the doctor asks you to read letters from different lines of an eye chart. If you have normal vision, you have 20/20 vision. This means that you can read line twenty at twenty feet away. If your vision is 20/200, this means that you can read the same letter at 20 feet that a normal eye can read at 200 feet! A person with 20/200 eyesight is legally blind in the United States. There are many other degrees of vision between 20/20 and 20/200, and some people even have better than 20/20 vision. People wear glasses for different reasons. Some people cannot see things very far away, and they are called *nearsighted* (*myopic*). In these people, the image is focused *in front* of the retina. Some people have trouble seeing things that are close, and these people are called *far-sighted* (*hyperopia*). In these people the image is focused behind the retina. Glasses help to bend the light enough so that the image is always focused on the retina.

8 Your eyes do a very important job. They help you see the colors and shapes of things around you. The eyes you have now will be with you forever, so make sure you take good care of them!

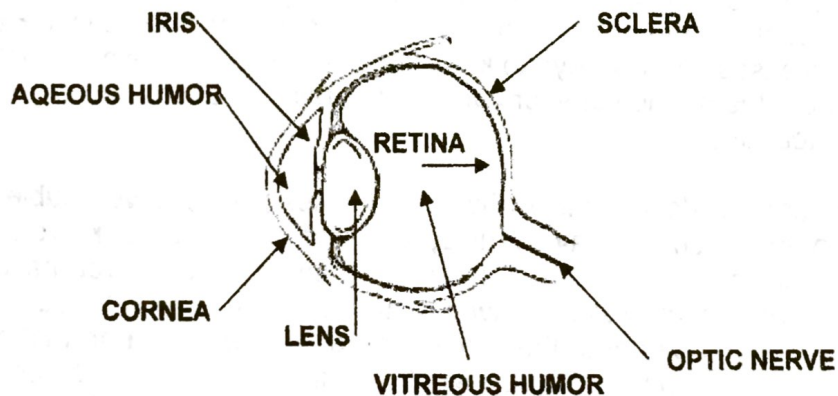


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The Human Eye

1 You use your five senses to understand the world around you and to figure out what's going on. One of your five senses is sight, and it is with your eyes that you see the world. Eyes are constantly working, from the time you wake up in the morning to the time you go to sleep. Let's take a closer look at the human eye!

2 The eye is about 2.5 cm in length, weighs about seven grams and is shaped roughly like a ball. It sits in a special place in your skull called the *eye socket*. When you look in the mirror you can see several parts of your eye. The white part is called the *sclera*. The sclera is very tough and covers most of your eye. If you look very carefully you can see little red threads, which are tiny blood vessels bringing oxygen to the sclera. If you rub your eyes a lot, some of the tiny vessels break, and that is why your eye sometimes looks a little pink. The sclera covers the colored part of your eye as well, but here it is clear, and has a different name: the *cornea*. The cornea is very important because it lets light come into your eye. It also helps the eye to focus as light passes through. The colored part of your eye is called the *iris*. In the middle of your iris is the black *pupil*. Light first travels through the cornea, and then into the pupil. There are tiny muscles attached to the iris that help control the amount of light that can get through. In very bright light, the pupil will get smaller, and when it is darker, the pupil will get bigger, just like a camera lens. Between the iris and the cornea is the *anterior chamber*. Anterior means "front". The anterior chamber is filled with a clear liquid called the *aqueous humor*. The aqueous humor provides oxygen, proteins and glucose (sugar) to the eye.



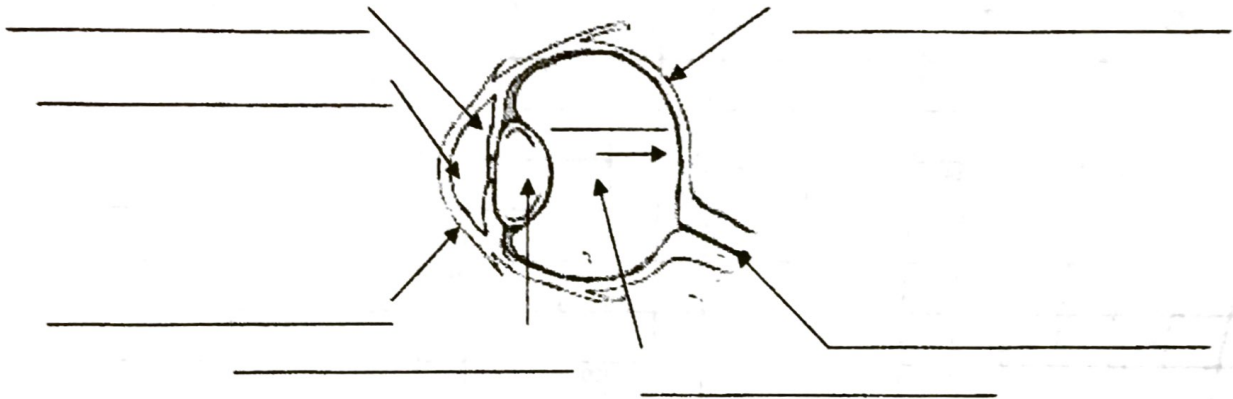
4 After light passes through the pupil, it passes through the *lens*. The lens is roughly the shape of a squished ball, and it is completely clear. The lens's job is to focus the stream of light coming through the pupil onto the back of your eye, which is called the *retina*. The lens is attached to a muscle called the *ciliary muscle*. This muscle causes the lens to actually change shape as you focus on things! When you look at something very close to you, the lens gets thicker, and when you look at something far away, the lens gets thinner!

Between the lens and the retina is a gel-like clear material called the *vitreous humor*. The vitreous humor is important because it gives the eye its shape.

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Answer the questions about eyes.

1. Label the different parts of the eye.



2. What parts of the eye does light travel through?

3. What is between the *cornea* and *iris*?

4. What is the *lens's* job?

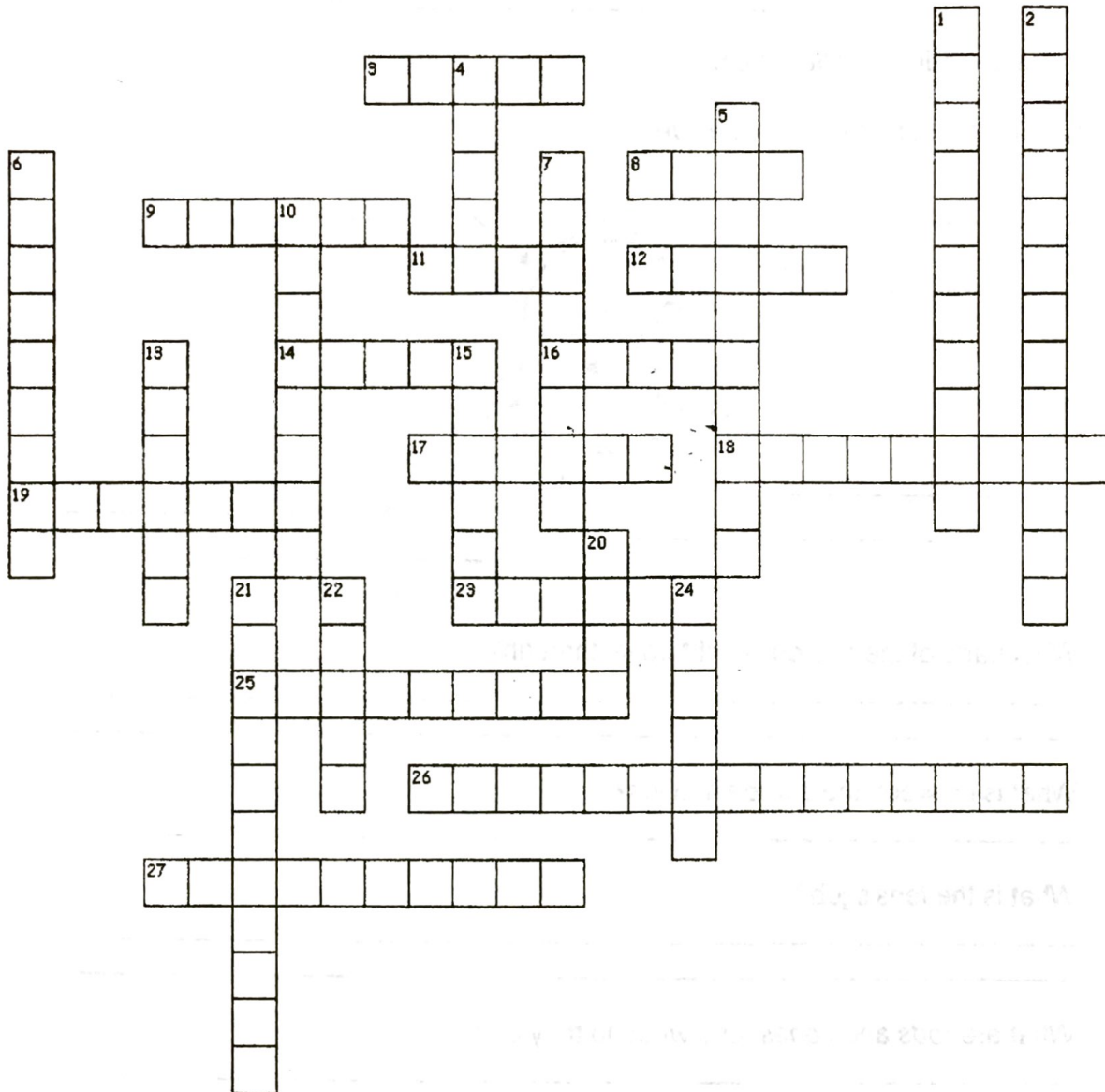
5. What are *rods* and *cones*, and what do they do?

6. What is the *blind spot*?

7. How does the eye protect itself?

8. What does it mean if somebody is *nearsighted*?

Using Waves Crossword



Across

3. It's visible
8. Feeling this is a way of detecting IR
9. Between violet and blue
11. Can transfer energy and information
12. Colour of higher frequency than yellow
14. Longest wavelength electromagnetic wave
16. λ in m with $v = 300000\text{km/s}$ and $f = 100\text{MHz}$
17. Electromagnetic waves can travel through this
18. One billion hertz
19. What light is to us
23. Transferred by a wave
25. Radio waves are lowest in this
26. Family of waves that includes light
27. All electromagnetic waves are this type

Down

1. Causes sun-tan
2. A use of radio, microwaves, IR and light
4. Highest frequency electromagnetic wave
5. Gamma rays are shortest in this
6. Radiation used by mobile phones
7. A collection of radiations
10. IR
13. Needed to pick up a radio wave
15. Colour of longer wavelength than yellow
20. Used to photograph bones
21. Can be carried by radio waves
22. Light and radio have the same of this in a vacuum
24. Between green and orange