Human Vision

Textbook pages 202-215

Before You Read

Some people can see things clearly from a great distance. Other people can see things clearly only when they are nearby. Why might this be? Write your thoughts below.

Identify Details

As you read the section, use one colour to highlight the text or labels that describe the parts of the eye. Use another colour to highlight facts about light and human vision.

What happens to light that enters the eye?

1. First, light rays are refracted by the cornea. The cornea does most of the focusing of the light rays.

2. Next, the refracted rays enter the eye through the pupil. The iris changes the size of the pupil. The pupil gets larger to let more light in if light levels are dim. The pupil gets smaller to let less light in if light levels are bright.

3. Then the light rays pass through the lens. They converge on the retina. The lens gets thicker to help focus light rays from objects that are closer to you. The lens gets thinner to help focus light rays from objects that are farther away.

4. The image formed on the retina is upside down. Cells in the retina change the image into electrical signals.

5. The electrical signals are sent to the brain along the optic nerve. As the brain interprets the signals, it changes the image so that it is upright.
How can lenses help correct vision problems?

- Near-sightedness: A person who is near-sighted can see objects clearly when they are close to the eye. Distant objects look fuzzy. This condition happens if the light rays converge before they reach the retina. A concave lens can help diverge the light rays before they reach the cornea. Then, as the light rays pass into the eye, they will converge on the retina to form a clear image.

- Far-sightedness: A person who is far-sighted can see objects clearly when they are far from the eye. Nearby objects look fuzzy. This condition happens if the light rays do not converge by the time they reach the retina. A convex lens can help the light rays to start to converge before they reach the cornea. Then, as the light rays pass into the eye, they converge on the retina to form a clear image.

- Astigmatism: If the shape of the cornea is irregular, light rays can focus in more than one place on the retina, resulting in a condition called astigmatism. This problem can also be corrected using lenses.

Reading Check
2. What are three reasons why an image might look fuzzy?

[Blank space for answers]

**Parts of the eye**

Use the vocabulary words in the box below to label the parts of the eye. Place the correct letter on the line next to each part of the eye.

<table>
<thead>
<tr>
<th>Vocabulary</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. iris</td>
</tr>
<tr>
<td>b. lens</td>
</tr>
<tr>
<td>c. pupil</td>
</tr>
<tr>
<td>d. sclera</td>
</tr>
<tr>
<td>e. retina</td>
</tr>
<tr>
<td>f. cornea</td>
</tr>
<tr>
<td>g. optic nerve</td>
</tr>
</tbody>
</table>

Use the same vocabulary words in the box above to fill in the blanks below. Each word can be used only once.

8. Light rays are first refracted by the ____________________________.

9. Surrounding the cornea is an opaque white tissue called the ________________.

10. Light enters the eye through an opening in the centre called the ________________.

11. The __________________________ is the coloured circle of muscle surrounding the pupil. It controls the amount of light entering the eye.

12. Light then passes through the flexible, convex __________________________ which can change its shape.

13. Once light is refracted by the lens, it is focused on the __________________________ at the back of the eye, where an image is formed.

14. Light-sensitive cells detect the image and an electric message is sent to the brain through the __________________________.
Inside the eye

Part of each statement below is false. Rewrite each statement to make it true.

1. The lens does most of the focussing of the light rays that pass through the eye.

2. The light rays that pass through the eye diverge.

3. In bright light, the iris makes the pupil larger to allow more light to enter.

4. The human eye has a concave lens.

5. The lens of the eye produces an upright image.

6. Light rays are sent to the brain through the optic nerve.

7. People who are near-sighted cannot bring nearby objects into focus.

8. Far-sightedness can be corrected by using a concave lens.
Use with textbook pages 208–209.

**Vision problems**

Complete the following table. One answer is provided for you.

<table>
<thead>
<tr>
<th>Problem</th>
<th>Description</th>
<th>Where is image formed?</th>
<th>How is the problem corrected?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Near-sightedness</td>
<td>Nearby objects are clear, but distant objects are fuzzy.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Far-sightedness</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Astigmatism</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Use with textbook pages 202-210.**

## Human Vision

<table>
<thead>
<tr>
<th>Term</th>
<th>Descriptor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. ______ normal vision</td>
<td>A. image forms behind the retina</td>
</tr>
<tr>
<td>2. ______ astigmatism</td>
<td>B. image forms in front of the retina</td>
</tr>
<tr>
<td>3. ______ far-sightedness</td>
<td>C. no image is formed</td>
</tr>
<tr>
<td>4. ______ near-sightedness</td>
<td>D. image forms on more than one point on the retina</td>
</tr>
<tr>
<td></td>
<td>E. image forms on the retina</td>
</tr>
</tbody>
</table>

Circle the letter of the best answer.

5. Which of the following is referred to when we speak about the colour of someone’s eyes?
   - A. iris
   - B. pupil
   - C. retina
   - D. sclera

6. Which of the following is the white part of the eye?
   - A. iris
   - B. pupil
   - C. sclera
   - D. cornea

7. Which of the following statements is true?
   - A. The pupil is larger in dim light.
   - B. The pupil never changes in size.
   - C. The pupil is smaller in dim light.
   - D. The pupil is larger in bright light.

8. Which of the following structures represents the convex lens of the eye?
   - A. M
   - B. N
   - C. O
   - D. P

9. What is the function of the structure labelled N in the diagram?
   - A. to focus the light
   - B. to send electrical signals to the brain
   - C. to provide nutrients and support for the cornea
   - D. to control the amount of light that enters the eye

10. Which structure does most of the focusing?
    - A. M
    - B. N
    - C. O
    - D. P

11. Which of the following describes how the image of an object appears on the retina?
    - A. it is reversed right to left
    - B. it is upright
    - C. it is upside down
    - D. it is a mirror image of the actual object