THE HUMAN EYE

Lesson Description

In this lesson we:

- Describe the structure and state the functions of the parts of the human eye
- State what is meant by binocular vision
- Describe the changes that occur in the human eye for each of the following:
  - Accommodation
  - Pupil reflex/pupillary mechanism
- Describe each of the following visual defects using diagrams, and state how each visual defect is treated:
  - Short-sightedness
  - Long-sightedness
  - Astigmatism
  - Cataracts

Summary

The Human Eye
<table>
<thead>
<tr>
<th>Part</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conjunctiva</td>
<td>Protection, refraction</td>
</tr>
<tr>
<td>Cornea</td>
<td>Refracts light - bends it as it enters the eye</td>
</tr>
<tr>
<td>Iris</td>
<td>Controls how much light enters the pupil</td>
</tr>
<tr>
<td>Pupil</td>
<td>Allows light to pass through</td>
</tr>
<tr>
<td>Lens</td>
<td>Focuses light onto the retina</td>
</tr>
<tr>
<td>Suspensory Ligaments</td>
<td>Holds lens in position/accommodation</td>
</tr>
<tr>
<td>Ciliary muscle and body</td>
<td>Accommodation</td>
</tr>
<tr>
<td>Retina</td>
<td>Contains the light receptors</td>
</tr>
<tr>
<td>Choroid</td>
<td>Prevents reflection of light/nourishment of the eye</td>
</tr>
<tr>
<td>Sclera</td>
<td>Protection/attachment of muscles</td>
</tr>
<tr>
<td>Optic nerve</td>
<td>carries impulses from the eye to the brain</td>
</tr>
</tbody>
</table>
Binocular Vision

Accommodation

Binoculars, you say! I don't see how it can be useful to me, matey!
Pupillary Mechanism

- Bright light: Circular muscle contracts
  - Parasympathetic nerve radial muscle relax
  - Pupil contracts

- Dim light: Circular muscles relax
  - Sympathetic nerve radial muscles contract
  - Pupil dilates
Eye Disorders

<table>
<thead>
<tr>
<th>Myopia</th>
<th>Hyperopia</th>
<th>Astigmatism</th>
</tr>
</thead>
</table>

- **Myopia**: Light rays converge in front of the retina, causing blurred vision.
- **Hyperopia**: Light rays converge behind the retina, causing blurred vision.
- **Astigmatism**: Light rays do not converge at a single point, resulting in multiple focus points and blurred vision.

Astigmatism causes blur along one direction:

- Vertical lines may be more blurred.
- Horizontal lines can be more blurred.
A cataract is an opacity of the normally clear lens which may develop as a result of aging, metabolic disorders, trauma or heredity.
“The problem with living in water is I can never tell when my contact lens is in!”

I could not work today
because I had an eye problem
When they asked me what type of eye problem,
I told them I simply could not see myself working today

Lollygagging.net
Test Yourself

Select the most correct answer from the options given. Write down only the correct letter.

Question 1
The region on the retina that produces the sharpest vision is called the ______________.
A  Sclera
B  Aqueous humor
C  Yellow spot
D  Blind spot

Question 2
The sensitive surface of the eye that acts like the film in a camera - has millions of photoreceptors.
A  Cornea
B  Sclera
C  Choroid
D  Retina

Question 3
Which one of the following parts of the eye does not play a role in the refraction of light?
A  Lens
B  Sclera
C  Cornea
D  Conjunctiva

Question 4
Light passes through the following structures in which order?
A  Vitreous humor, lens, aqueous humor, cornea
B  Cornea, aqueous humor, lens, vitreous humor
C  Cornea, vitreous humor, lens, aqueous humor
D  Aqueous humor, cornea, lens, vitreous humor.

Question 5
The part of the eye that holds the lens in position...
A  Ciliary muscle
B  Optic nerve
C  Optic chiasma
D  Suspensory ligaments
Question 6

Indicate whether each of the statements in COLUMN I applies to **A only**, **B only**, **both A and B** or **none** of the items in COLUMN II. Write **A only**, **B only**, **both A and B** or **none** next to the question number.

<table>
<thead>
<tr>
<th>COLUMN I</th>
<th>COLUMN II</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Area where optic nerve connects to retina</td>
<td>A: Yellow spot</td>
</tr>
<tr>
<td></td>
<td>B: Blind spot</td>
</tr>
<tr>
<td>2 Darkly pigmented layer of the eye</td>
<td>A: Choroid</td>
</tr>
<tr>
<td></td>
<td>B: Retina</td>
</tr>
<tr>
<td>3 The condition of the eye where a person cannot see distant objects clearly</td>
<td>A: Astigmatism</td>
</tr>
<tr>
<td></td>
<td>B: Hypermetropia</td>
</tr>
<tr>
<td>4 Part of the eye that contains photoreceptors</td>
<td>A: Sclera</td>
</tr>
<tr>
<td></td>
<td>B: Retina</td>
</tr>
<tr>
<td>5 Converts light stimulus to impulse</td>
<td>A: Rods</td>
</tr>
<tr>
<td></td>
<td>B: Cones</td>
</tr>
</tbody>
</table>

Question 7

Give the correct biological term for each of the following descriptions. Write only the term next to the question number (a to d).

a.) The fluid found in the anterior chamber of the eye
b.) The membrane that protects the cornea
c.) The part of the eye that has circular and radial muscles
d.) The layer of the eye richly supplied with blood vessels
e.) The part of the eye that conducts impulses from the eye to the brain
f.) The jelly like substance that maintains the shape of the eye
g.) The part of the retina where visual acuity is the greatest

Improve your Skills

Question 1

1.1 List FOUR different stimuli that the body responds to.
1.2 Explain what binocular vision means.
1.3 Distinguish between the following disorders of the eye with regards to the nature, causes and possible treatment:
   a) Cataracts
   b) Hypermetropia
Question 2

The following diagrams, I and II, show a section through a portion of a human eye and illustrate how the lens changes its shape when the eye focuses on an object.

2.1. Provide labels for parts A TO E. (5)
2.2 List the functions of parts B, C and D. (3)
2.3 Name the process that accounts for the change from Diagram I to Diagram II. (1)
2.4 Using letters and names of the parts labelled A to E, describe THREE changes that occur during the process named in QUESTION 2.3 (9)
2.5 Which diagram (I or II) represents the state of the eye when a person is reading a book? (1)

Question 3

Study the diagram below and answer the questions that follow.

3.1 Write down the letter of the part (A–G):
   (a) At which the clearest image is formed
   (b) That is responsible for maintaining the shape of the eyeball
   (c) That is responsible for the nutrition of the eye
3.2 State the function of part F. (2)
3.3 Explain how part E functions in dim light. (4)
Question 4

A person sitting in a darkened room covers one eye. A dim electric bulb, positioned at varying distances from the person is switched on and off at one minute intervals for a period of 10 seconds. During this period the diameter of the pupil of the eye is measured. The results obtained are shown in the graph below. Study the graph and answer the questions that follow.

![Graph showing changes in pupil size](image)

4.1 Which structure in the eye controls the size of the pupil? (1)

4.2 Between which TWO consecutive time intervals did the following changes in the diameter of the pupil occur:
   (a) Smallest increase
   (b) Biggest decrease

4.3 Why did the diameter of the pupil remain the same during the third and fourth time interval? (1)

4.4 At which time interval was the electric bulb the greatest distance away from the person? Explain your answer. (4)

4.5 Explain the pupillary mechanism for the period between the 8th and 9th minute. (4)

4.6 Explain how you would improve the reliability of this investigation.

4.7 List two factors, apart from environmental factors, which you would have to keep constant to ensure the results are valid.

Links

- Learn Xtra Live 2013: [https://www.youtube.com/watch?v=aK8tuu8VBq&list=PLoAKtWSHLRVviGcDRDLaefzhQXdLyqU](https://www.youtube.com/watch?v=aK8tuu8VBq&list=PLoAKtWSHLRVviGcDRDLaefzhQXdLyqU)
- Learn Xtra Lessons: [https://www.youtube.com/watch?v=qn5OvdG4jrM&list=PLoAKtWSHLQOqlIPY7QGcEGHpCm9RqY](https://www.youtube.com/watch?v=qn5OvdG4jrM&list=PLoAKtWSHLQOqlIPY7QGcEGHpCm9RqY)
- Functioning of the eye: [https://www.youtube.com/watch?v=5dEO-LRV-g](https://www.youtube.com/watch?v=5dEO-LRV-g)
- Cataract surgery: [https://www.youtube.com/watch?v=Go82c4f1emc](https://www.youtube.com/watch?v=Go82c4f1emc)