

Anatomy and Physiology

Laboratory 4 – Human Eye

1. Name and describe elements of the eye in Fig. 1. Use table 1 in Report.

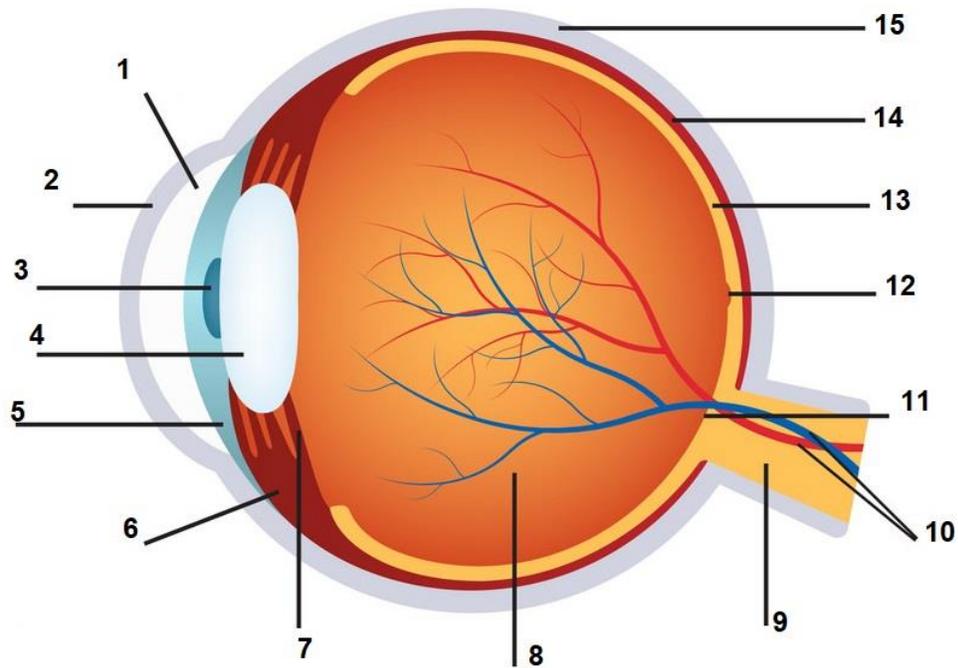


Fig. 1 Eye anatomy

2. Visual acuity

Visual acuity is the sharpness of vision. It is generally tested with a Snellen eye chart, which consists of letters of various sizes printed on a white card. This test is based on the fact that letters of a certain size can be seen clearly by eyes with normal vision at a specific distance. The distance at which the normal eye can lead the line of letters is printed at the end of the line.

- Place yourself 2.8m away from the chart (line marked on the floor)
- Test your visual acuity without correction (glasses or contact lenses if possible)
- Test one eye at a time. Start with right eye, covering the left one without pressing on it.

- Read the letters from the largest to the smallest. To make the examination easier and faster, another person can help you by showing the letters you must read among the lines of letters.
- Write the result in the table (numbers from the end of the line with smallest letters that the person can read without mistakes.)
- Examine the left eye without correction.
- Repeat the procedure for right and left eye with correction (glasses or contact lenses) if possible.
- Store the results in Table 2.
- If you can read the letters of the 8th line, our sight is optimal (visual acuity 20/20). If your visual acuity is less than 20/20 and you have doubts about your sight, visit your ophthalmologist.

3. Name and describe eye muscles in Fig. 2. Use table 3.

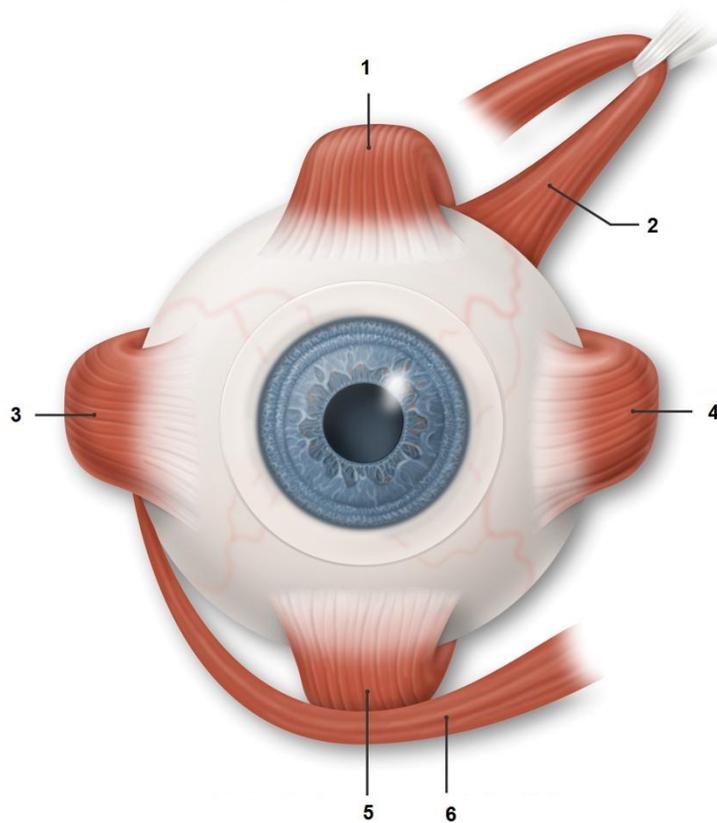


Fig. 2 Eye muscles

4. Visual tracking

Your six extrinsic muscles precisely control eye movements. You can test the effectiveness of these muscles.

- Sit in a chair with your eyes open.
- Have your lab partner move his/her finger slowly from side-to-side while you follow the finger with your eyes.
- Ask your lab partner to tell you if your eye movement was smooth or jerky and record in table 4.

5. Determining the Near Point of Accommodation

The elasticity of the lens is responsible for being able to see clearly far away or close up. The near point of vision, which is how close you can see something clearly, is about 10cm from the eye in adults. It is closer in children and farther in old age.

The elasticity of the lens decreases dramatically with age, resulting in difficulty in focusing for near (or close) vision. You can test the lens elasticity by measuring the near point of accommodation.

- Sit in a chair and hold the page with text at arm's length in front of one eye
- Slowly move the paper toward that eye until the words become distorted.
- Have your lab partner use a metric ruler to measure the distance from your eye to the paper at this point and record the distance in table 5.
- Repeat the procedure for the other eye.

6. Pupillary Light Reflex

The pupil of the eye reacts to light. In response to low light, the pupil will enlarge (to allow more light to enter the eye). In response to brighter light, the pupil will constrict (get smaller to prevent too much light from entering the eye).

Pupils that dilate in response to bright light, or are sluggish to close, are abnormal and may indicate a neurological disorder (such as autism, Alzheimer's disease, etc.), or it may indicate drunkenness.

- Sit in a chair and have your lab partner shine a pen light quickly in your right eye. Record the response of the pupil in Table 6.
- Have your lab partner shine the pen light quickly in your left eye and record the response of the pupil in table 6.

7. Usage of the ophthalmoscope

The ophthalmoscope (also known as a fundoscope) is a tool used in medicine to examine the interior of the eye including the retina, fovea, choroid, macula, optic disc and blood vessels. Optometrists and general practitioners alike can use an ophthalmoscope to diagnose or monitor diseases of the eye as well as conditions like hypertension and

diabetes. The ophthalmoscope is a relatively simple tool that can be mastered if understood properly and with sufficient practice.

- a. Select the appropriate setting. There are several aperture and filter options that can be used for specific goals in an eye examination. The most common setting used is the Medium light source, because most exams are done in a darkened room when the patient has not been treated with mydriatic (dilating) eye drops. Ophthalmoscopes may differ in which settings are available, in this case the possibilities are:
- Small light – for when the pupil is very constricted, like in a bright room
 - Medium light – for highly dilated pupils, like when treated with mydriatic drops
 - Half light – when part of the cornea is obscured, like with a cataract, to direct light into the clear part of the eye
 - Red free light – to visualize the vessels and hemorrhages in better detail by improving contrast. This setting will make the retina look black and white

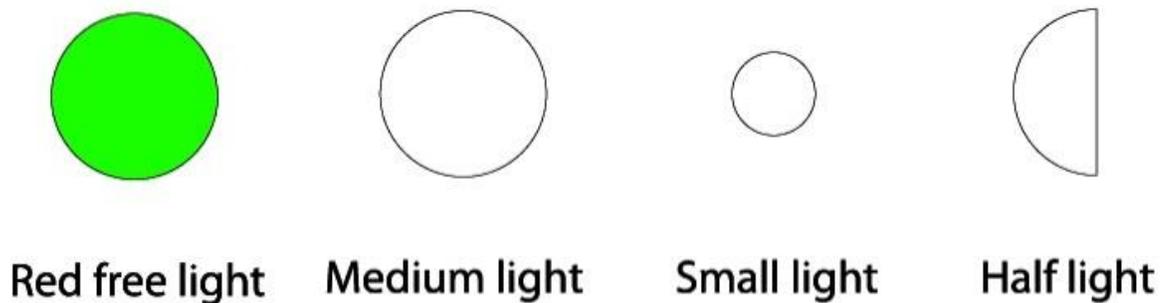


Fig. 3 Ophthalmoscope filter types

The elements of the ophthalmoscope are presented in fig. 4.



Fig. 4Ophthalmoscope elements

- b. Use your right hand and your right eye to look at the patient's right eye. Look through the ophthalmoscope, if you are nearsighted and have taken off your glasses, you may need to adjust the focusing wheel towards the negative/red until what you see at a distance is in focus.
- c. Position yourself in relation to your patient. You want to be eye-level with your patient, so stand straight, bend forward, or sit in a chair in order to be at the appropriate level. Position yourself at your patient's side, and approach them from approximately a 45° angle.
- d. Situate your scope and approach to the patient correctly. Let's say we first want to evaluate the patient's right eye. Wedge the ophthalmoscope against your right cheek with your right hand – when you move, your head, hand, and scope should move as

- one. Place the heel of your left hand firmly on the patient's forehead and spread your fingers out, providing stability. Position your left thumb gently over their right eye and lift the right eyelid open.
- e. Use your right hand and right eye to look at your patient's right eye, and vice versa. Do not worry about getting too close to the patient during this exam. You must be as close as possible to perform a detailed examination.
 - f. Tell your patient where to look. Instruct your patient to gaze straight ahead and past you. Providing your patient with a specific spot to steady their gaze will relax the patient and prevent hurried eye movement that will disrupt your examination.
 - g. Look for the red reflex (fig. 5). Hold the ophthalmoscope, still up to your eye, at about arm's length from the patient. Shine the light into the patient's right eye at about 15° from the center of the eye, and watch for the pupil to shrink. Then check to see if there is a red reflex. The red reflex is the reddish glint of light in the eye's pupil caused by reflection of light off the retina, like what you see in a cat's eye in the dark. Absence of a red reflex can mean there is a problem with the eye. As you look through the scope for the red reflex, you may need to adjust focus a bit depending on your own eyesight.

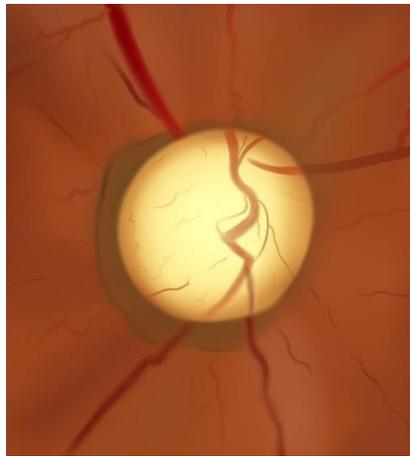


Fig. 5 Red reflex in fundus image

- h. Use the red reflex as a guide to start your exam of the retina. Moving your head, hand and scope as one unit, slowly follow the red reflex in closer to the patient's right eye. Stop moving forward when your forehead comes into contact with your left thumb. Following the red reflex should direct you to being able to visualize the retina. Try to locate blood vessels, fundus and fovea (fig. 6 and fig. 7). Record your observation in the report.

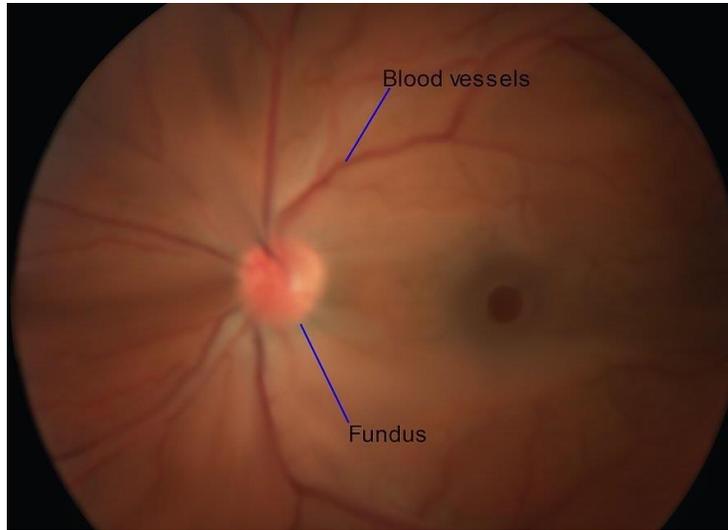


Fig. 6

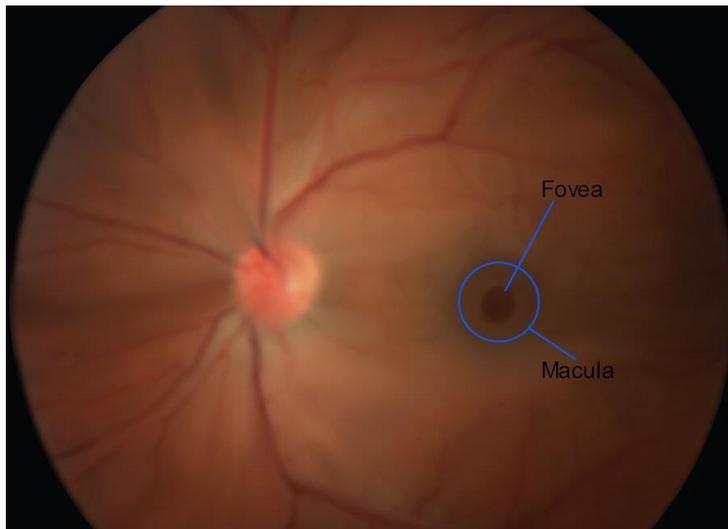


Fig. 7

8. Types of color blindness

Describe the types of color blindness in table 7.



Fig. 8

9. Testing color blindness

People who are colorblind cannot see certain colors. There are color vision tests that can assess if a person has normal color vision or not. Ishihara plates are a common test for color blindness.

- Look at the various Ishihara plates in the booklet in the lab.
- Read the plate interpretation instructions for each plate to see if you have any type of color blindness.
- Record the results in table 8.

10. Retina images

Describe in table 9 changes in the images of the eye from the fundus camera in case of 3 pathological cases: diabetic retinopathy, choroidal melanoma and glaucoma.

Normal retina:

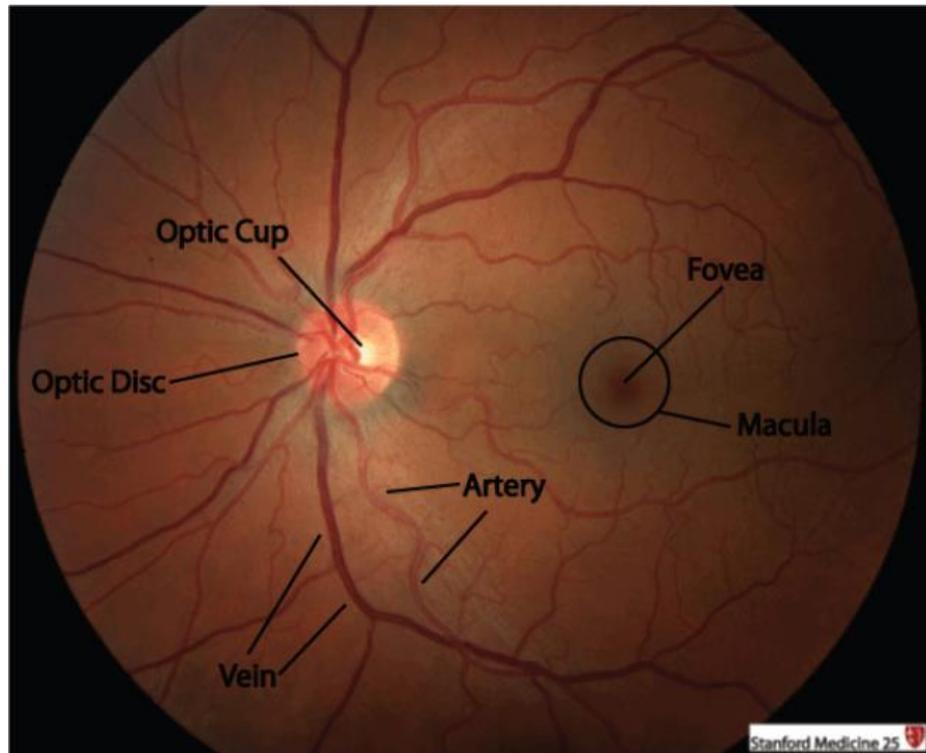


Fig. 9 Human eye in fundus image

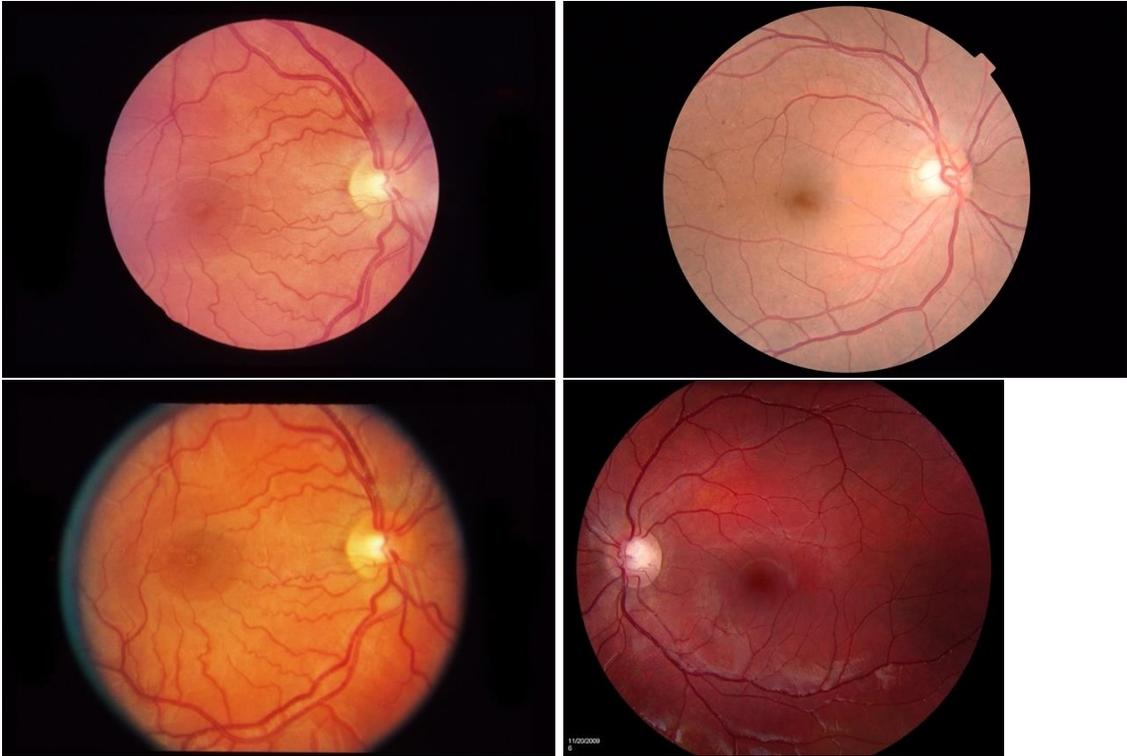


Fig. 10 Normal, healthy eye

Diabetic retinopathy:

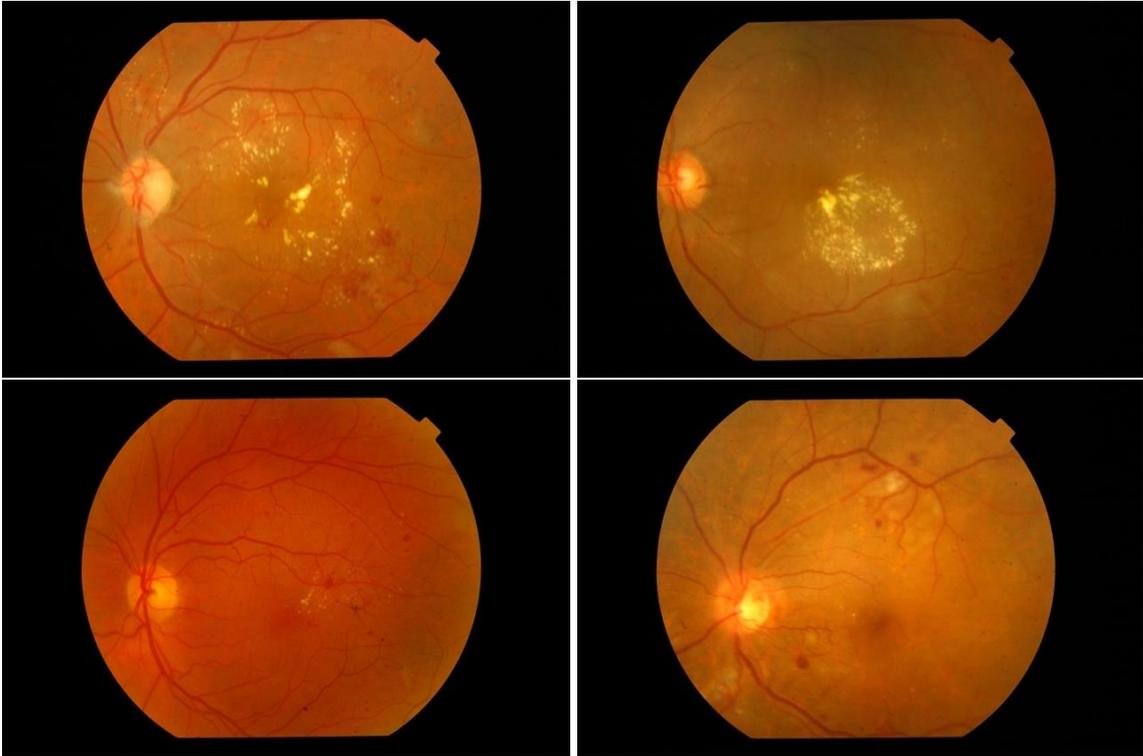


Fig. 11 Diabetic retinopathy

Choroidal melanoma:



Fig. 12 Choroidal melanoma

Glaucoma:



Fig. 13 Glaucoma

Laboratory Report

Question 1

Table 1

No.	Eye element name	Short description
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		

Question 2

Table 2

Group member name	Visual acuity, right eye, without glasses	Visual acuity, left eye, without glasses	Visual acuity, right eye, with glasses	Visual acuity, left eye, with glasses

Observations:

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Question 3

Table 3

No.	Muscle name	Function of the muscle
1		
2		
3		
4		
5		
6		

Question 4

Table 4

Group member name	Smooth eye movement (x is yes)	Jerky eye movement (x if yes)

Question 5

Table 5

Group member name	Near point for the right eye [cm]	Near point for the left eye [cm]

Observations and remarks:

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Question 6

Table 6

Group member name	Pupillary response in the right eye [correct/incorrect]	Pupillary response in the left eye [correct/incorrect]

Question 7

Observations from ophthalmoscope examination

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Question 8

Table 7

Type of color blindness	Description
Deuteranopia	
Tritanopia	
Monochromacy	

Question 9

Table 8

Group member name	Deuteranopia (Yes/No)	Tritanopia (Yes/No)	Monochromacy (Yes/No)

Question 10

Table 9

Disease	Description
Diabetic retinopathy	
Choroidal melanoma	
Glaucoma	