

Eye lab - Can You See What I Do?

INTRODUCTION:

Organisms from bacteria to giant redwoods and from protists to whales all respond to light. But the compound eyes of insects and the image-forming eyes of the vertebrates represent the most sophisticated use of light to gather information about the environment. The eyes are a very complex sense organ with many working parts, each with their own function. The eyes collect and focus light as well as help the organism respond to both internal and external changes in its environment.

PURPOSE:

The purpose of this lab is to observe the parts of the eye and how each works as well as to become familiar with several tests used to determine how well your eyes function.

MATERIALS: Snellen Charts, Astigmatism Charts

PROCEDURE:

1. Examine your lab partner's eye and identify the following:
a) **lids** b) **tear, lacrimal, ducts** c) **cornea** d) **sclera** e) **iris** f) **pupil**
Draw you lab partner's eye and label the above parts on you diagram (a space in the data section has been provided for this).
2. **Snellen test** for visual acuity. Acuity or sharpness of vision can be tested with a Snellen chart which consists of black letters of various sizes printed on a white card. Beside each line of letters is printed the distance at which the letters of that line can be read by the normal eye. Seat your partner 20 feet from the chart and ask her (or him) to read the letters in the line marked "20 feet". If she can read this line, she has 20/20 vision; that is, her vision is within the normal range.

Ask her to cover one eye with her hand or a card and check each eye separately, with and without glasses or contact lenses. If she is able to read the 20 foot line at 20 feet, see if she can read smaller letters at the same distance; if not, ask her to read larger letters. If your partner can read the line of letters that can ordinarily be read at only 15 feet, then her visual acuity is 20/15, which is better than normal; however, is she can only read the line which should be read at, for example, 50 feet, her acuity is 20/50, which is below normal.

Record your findings in the data section and explain (for each eye) whether the vision is normal, less than normal or better than normal.

3. Demonstration of the **blindspot**. Note the large plus sign and dot that appear on the last page. Hold this figure about 18 inches away, so that the plus sign is straight in front of the right eye. Close the left eye. Now slowly move the figure toward you while staring at the center of the plus sign with your right eye. At a certain point, the dot will disappear, showing that it is now positioned over the blindspot. Have your lab partner measure the distance (from your eye to the diagram) at which his happens as you continue to hold the book in front of your face. Record the distance in the data section provided.

4. **Near point.** The near point is the closest distance at which sharp focus is attained. Determine the near point of your own eyes by focusing with one eye on the letter "D" at the beginning of this sentence. Move the book toward your open eye and away from it until the letter appears sharp and clear. Have your lab partner measure and record the measurement in the data section. Repeat this process with the other eye. The distance of near point accommodation increases with age, due to the loss of elasticity of the lens. The average near point in various age groups is as follows:

Age (Years)	Near point (inches)
20	3-1/2
30	4-1/2
40	6-3/4
50	20-1/2
60	33

5. **Astigmatism.** Astigmatism is a blurring of vision caused by abnormal shape of the cornea or lens. To determine whether you have astigmatism, look at the astigmatism chart first with one eye and then the other. If all radiating lines appear to be equally black and are in sharp focus, you do not have astigmatism; but if some of the lines are blurred or do not appear to be so black as others, at least some degree of astigmatism is present. Test yourself and see if you have astigmatism in the right eye, left eye, both, or neither eye. Indicate the results of your test in the data section provided. Use yes and no answers.

DATA: 1. Eye Diagram with labels

2. Snellen test for visual acuity

Right eye _____

Left eye _____

3. Distance of your blindspot:

_____ inches

4. Near Point:

Right eye _____ inches

Left eye _____ inches

5. Astigmatism:

Right eye _____

Left eye _____

ANALYSIS:

1. If a person has 20/40 vision, is it better or worse than normal?
2. What does the iris do?
3. What portion of the eye does astigmatism affect?
4. What causes the blind spot phenomenon?
5. As people age, the tissue that makes up the lenses in their eyes becomes less flexible. How would this factor affect near point accommodation?

CONCLUSION:

Why is it necessary for organisms living in the wild to have eyes that are working properly? (Be sure to use the following words: predators, food, mates)

Which of the following organisms (dog, bat or human) do you think uses their eyes as their primary sense organ? Be sure to explain your answer.

COLORCUBE

Blind Spot and the "Filling-in" phenomenon.

Did you know that your eyes have blind spots (and not just at the back of your head)? Each of your eyes contains an area that has no photoreceptors because it is occupied by the optic nerve. You may not have noticed these areas because they are on opposite sides of your visual field. However, this exercise is designed to isolate your blind spot and you will be amazed at the results.

Instructions: Close your left eye and fixate your right eye on the cross in the first diagram. **What happens to dot?** Move the paper closer to your eye. If your eye is about 12 inches (30 cm) away from the monitor, you should notice that the round dot disappears. This distance may vary according to the screen resolution you have set.

You may be surprised to see that the dot is replaced, not by a black region, but rather blank white space. The brain simply "fills in" the most probable stimulus (in this case, a uniform white area) where there is none.

The following examples demonstrate the "filling-in" phenomenon in greater detail. Apply the same instructions as given above and you should notice the red markings each time are replaced by the most



probable pattern that your brain is able to perceive. Close left eye and look at cross, what happens to "X"?



