

Lab 8: Reflection and Mirrors

LEARNING GOALS OF THE LAB:

- 1) To learn how to evaluate somebody's opinion experimentally
- 2) To understand that each point of a source of light radiates light in all directions (sends an infinite number of rays)
- 3) To understand that drawing a normal to the surface at the point of incidence is crucial for finding the path of a reflected ray in a mirror

I. Testing experiment: where is the image formed in a plane mirror?

Your friend Noelle says that the image of an object in a plane mirror is formed on the surface of the mirror. Design an experiment to test Noelle's idea.

Available equipment: Plane mirror, object, masking tape, ruler.

Describe an experiment that you plan to design. Make a prediction of the outcome of the experiment based on Noelle's opinion. Then perform the experiment, record the result, and explain it using a ray diagram. Discuss whether you agree or disagree with Noelle and if you disagree, how would you convince her in your opinion?

II. Testing experiment: does the size of the image depend on the size of the mirror?

Your friend Joshua says that if you cover half of the mirror, you will always see half of the image. Design an experiment to test Joshua's opinion.

Available equipment: Plane mirror, object, masking tape, paper, ruler.

Describe an experiment that you plan to design. Make a prediction of the outcome of the experiment based on Joshua's opinion. Then perform the experiment, record the result and explain it using a ray diagram. Discuss whether you agree or disagree with Joshua and if you disagree, how would you convince him in your opinion?

III. Application experiment: saving money while buying a mirror

You just moved into a new apartment and need to buy a mirror. You do not have any housemates so the only person who is going to use the mirror is you. What is the smallest size of a plane mirror that you can buy to see yourself from head to toe? At what height from the ground should you mount it on the wall?

Available equipment: Large mirror, paper to cover parts of the mirror, meter stick.

In this experiment you need to first answer these questions and then check whether your answers were reasonable by performing the experiment – actually putting the mirror of the size that you calculated on the wall the way you calculate. To successfully perform this task you can:

- a) Draw a ray diagram to help you figure out how the size of the mirror and the location are related to your height or some other measurable quantities. (Remember, you need to be able to see the top of your head and your feet simultaneously). What are the assumptions that you used to draw the diagram?
- b) Decide what quantities you need to measure and what quantities you can calculate. Collect the data and perform the calculations.

- c) Estimate your experimental uncertainties. Decide how big the mirror is and where you will place it on the wall.
- d) Perform the experiment and record the result. Make sure your assumptions are satisfied. Were you able to see your entire body? If not, try to explain why. For example, check if your assumptions were satisfied.

IV. Why did we do this lab?

- a) Write a short paragraph describing how today's experiments addressed the learning goal number 2.
- b) Discuss whether it makes sense to you that the size of the mirror that you need to buy does not depend on how far you are from the mirror. Why does this result seem to contradict your every day experience?
- c) Imagine that you have an explanation of why something happens and you want to assess it experimentally. List the steps that you will take to do it.