

Name:

Date:

Class:

Telescope Activity Worksheet

Ask

Overview: Telescopes and similar instruments allow us to explore the night sky and see what lies beyond. With different types and sizes, telescopes can capture images of the moon, planets, galaxies, nebulae, and more. In this activity, you will become an astronomical instrument engineer and:

1. Design and build a telescope.
2. Capture images through the telescope using your smartphone.
3. Collaborate with classmates to identify which telescope features produce the best images.

Research

Introduction to Refracting Telescopes

Please watch this video: <https://www.youtube.com/watch?v=5v7bN13PjZ8>) and then answer the questions below:

1. What does long-distance viewing rely on? What part of the telescope can do this?

2. What is the focal point of a lens?

3. What two types of lenses does a telescope use?

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Please watch this video: <https://www.youtube.com/watch?v=abCykcw5os8> and then answer the questions below:

1. How can you make sure the focal lengths overlap?
2. Why do we need to take pictures from the refracting telescope and turn them 180 degrees?
3. How can you determine the magnification of an image from your telescope?

Telescope Diagram

In the space below, draw an accurate diagram of how a refracting telescope works, including the path that rays of light take from one end of the telescope to the other.

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Imagine

Telescope Brainstorming

Sketch your telescope design in the space below. Make sure to label what materials you will be using.

Plan

Maximize Magnification

Before you build your telescope, you need to find the ideal distance between the two lenses to maximize magnification. To do that, follow the directions below:

1. Gather the following materials from the materials table:
 - 1 double convex lens
 - 1 double concave lens
 - several sheets of black paper
 - 1 meter stick
2. Hold the double concave lens (the thick one) in front of your eye, and the double convex lens (the thin one) further out while focusing on the red lightbulb source.
3. Move the double convex lens back and forth until the light source is as big as possible.
4. Have your partner use a meter stick to measure the distance between both lenses.
5. Note the focal length of each lens, as well as the distance measured in the space below.

Lens Specifications

Double Concave Lens Focal Length (mm):

Double Convex Lens Focal Length (mm):

Distance Between Lenses (mm):

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Design and Plan Your Telescope

Draw your telescope design in the space below, incorporating the necessary focal length. Make sure to label what materials you will be using.

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Create

With your partner, spend the remainder of today building your telescope based on your design drawing.

Test

Once built, coordinate with your partner to take the telescope home and take two types of images of the moon:

1. One image with only your smartphone
2. One image with your smartphone aided by the telescope

In the space below, document both sets of images and write a short reflection on your procedure to capture the images.

Images of the Moon With and Without Telescope

Example of Image Without Telescope:

Example of Image With Telescope:

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Based on your testing, answer the following questions:

1. Write your procedure for capturing your images here.
2. Write down specific details about your captured images. What did you observe?
3. What worked?
4. What didn't work?

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Improve/Reflect

For this last part, we are going to be comparing our images class-wide. As we do this, think about the following questions and write your response beneath each question:

1. Who took the best images?
2. How does their telescope differ from yours, or—if this is yours—why did you design it the way you did?
3. If you were to continue refining your telescope design, what might be your next steps for a clearer image of the moon?

Rubric

Not Yet	Proficient	Exceeding Proficiency
<input type="checkbox"/>	<input type="checkbox"/> Demonstrates a solid understanding of telescope components and their assembly (85%).	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/> Aligns the telescope accurately for moon observation, consistently achieving clear views (85%).	<input type="checkbox"/>
<input type="checkbox"/>	<input type="checkbox"/> Captures high-quality pictures of the moon, showcasing good clarity, composition, and detail (85%).	<input type="checkbox"/>
Overall Rating:		