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## My NASA Data - Mini Lesson/Activity

### What is the Difference between a Solar Eclipse and a Lunar Eclipse?

#### Grade Band

- 3-5
- 6-8

#### Time

- 30 minutes

#### Overview

In this activity students will examine NASA data to determine the differences between a solar and lunar eclipse.

#### Student Directions

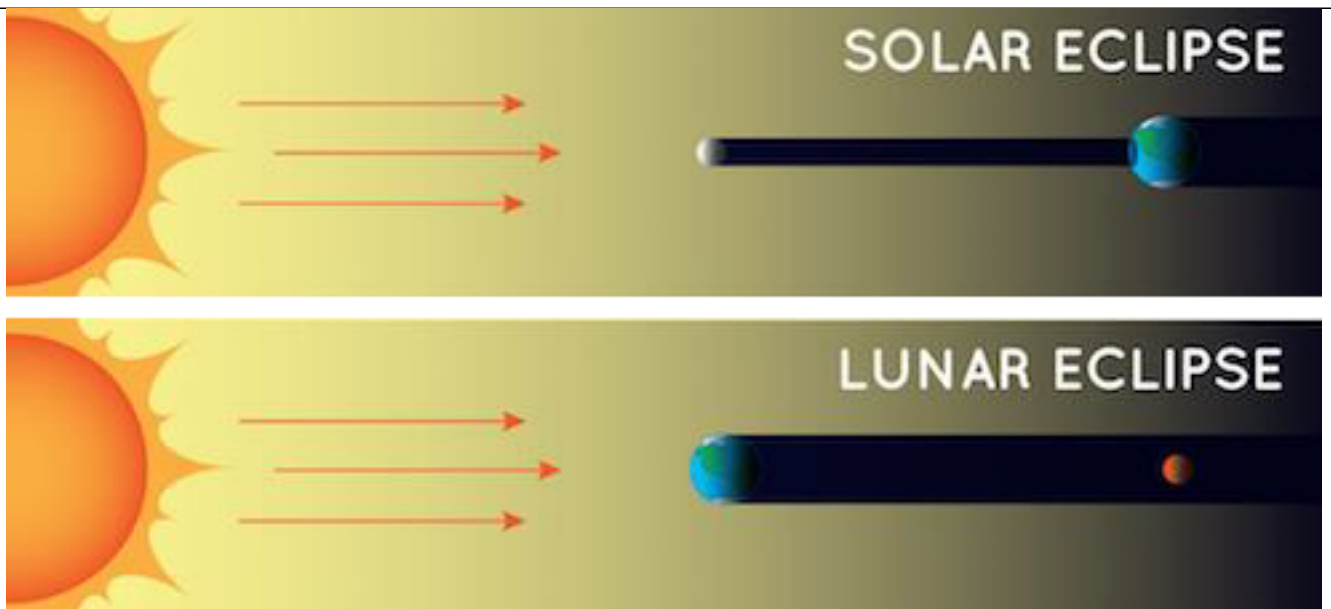
**Remember to never look directly at the Sun without proper safety equipment.**

An **eclipse** happens when a planet or a moon gets in the way of the Sun's light. Here on Earth, we can experience two kinds of eclipses: **solar eclipses** and **lunar eclipses**. A **solar eclipse** occurs when the Moon passes between the Sun and Earth, causing the Moon to cast a shadow on Earth. A **lunar eclipse** occurs when Earth is between the Sun and the Moon, causing Earth to cast a shadow on the Moon.

Check with your instructor on how to submit answers. There are optional student sheets available as a [Google Doc](#) or a [PDF](#).

#### Steps:

1. Examine the diagrams. One shows a solar eclipse. The other shows a lunar eclipse. Answer the following questions:



Solar and Lunar eclipse diagrams. Diagrams not to scale, <https://my.nasa.gov/sites/default/files/inline-images/Solar%20and%20lunar%20eclipse.png>, Credit: NASA Space Place

1. What are the similarities between these two types of eclipses?
  2. What are the differences between these two types of eclipses?
  3. Which object casts a bigger shadow, Earth or the Moon?
  4. Which eclipse can more people on Earth experience at the same time? Support your claim with evidence and reasoning.
2. Predict:
1. Which image is of a solar eclipse taken from Earth? Which image is of a lunar eclipse taken from Earth?
  2. Record your observations about each image.



*Credit: NASA/MSFC/Joseph Matus*



*Credit: NASA SpacePlace*

[One image is a solar eclipse. The other is a lunar eclipse., https://my.nasa.gov/sites/default/files/inline-images/eclipse%20images.png](https://my.nasa.gov/sites/default/files/inline-images/eclipse%20images.png), Credits: [NASA/MSFC/Joseph Matus and NASA SpacePlace](#)

3. Why does the Moon look the way it does during a lunar eclipse? Watch the NASA | Lunar Eclipse Essentials video and answer the following questions:

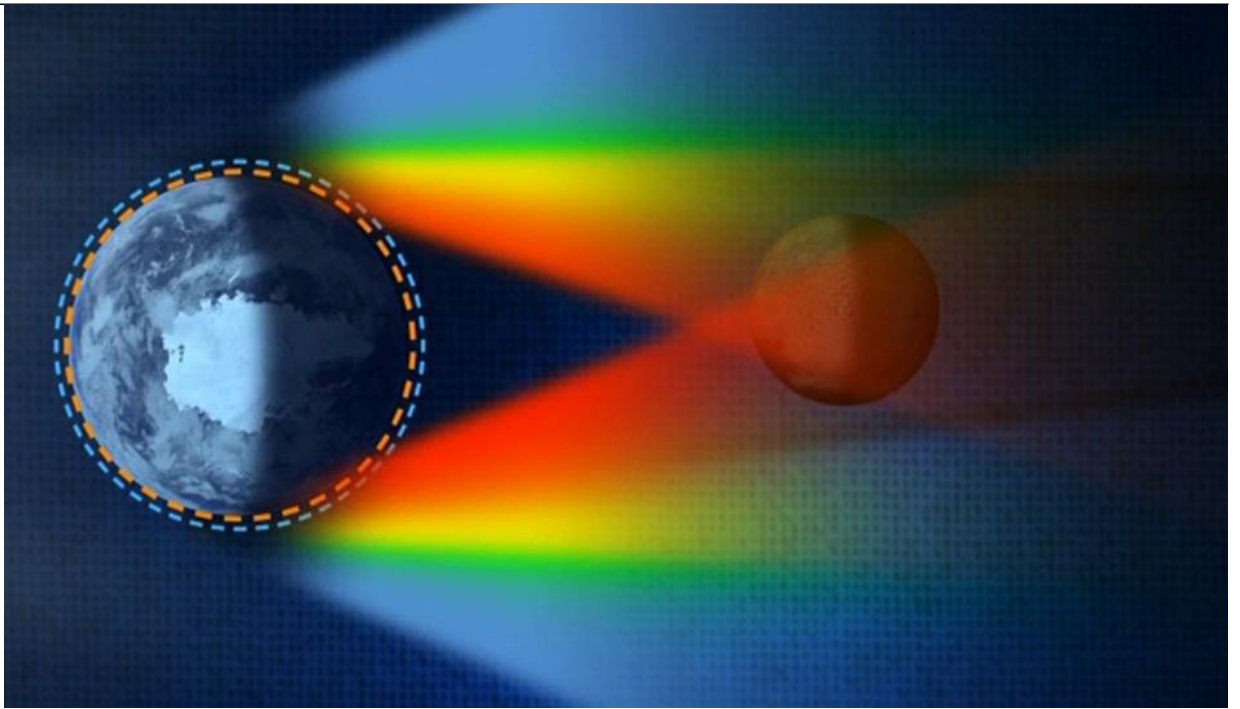
[Video: NASA | Lunar Eclipse Essentials](#)

NASA | Lunar Eclipse Essentials | <https://www.youtube.com/watch?v=wuhNZeJHeBg> | Source: NASA Goddard

1. Watch the video NASA | Lunar Eclipse Essentials

1. ??Why does the Moon appear red during a lunar eclipse?

2. What is another example of sunlight being scattered by Earth's atmosphere?



[Still image from the video showing how Earth's atmosphere scatters sunlight during a lunar eclipse. Credit: NASA Goddard Space Flight Center/Scientific Visualization Studio](#)

[\\*This image is not to scale.](#)

<https://myasadata.larc.nasa.gov/sites/default/files/inline-images/solar%20and%20lunar%20eclipses.png>

2. During a total solar eclipse, the disk of the Moon blocks out the bright light of the **photosphere**. This exposes the Sun's atmosphere, or the **corona**. The corona can only be seen during a total solar eclipse, or using special equipment, like NASA has.

Examine the [Mind-Melting Facts about the Sun](#) graphic and text found on the webpage and answer the following questions.



# MIND-MELTING FACTS ABOUT THE SUN

National Aeronautics and  
Space Administration



MIND - MELTING FACTS

## Temperature vs. Heat

In space, the temperature can be thousands of degrees without "feeling hot" to the touch. Why? *Temperature* measures how fast particles are moving, whereas *heat* measures the total amount of energy that they transfer. Since space is mostly empty, there are very few particles to transfer energy to your hand. Particles may be moving fast (high temperature), but if there are very few of them, they won't transfer much energy (low heat).

## The Solar "Surface"

The Sun does not have a solid "surface" – as a giant ball of plasma, or ionized gas, the density gradually increases as you move towards the core. The layer you can see, called the **photosphere**, is just the layer that emits the most light in the visible part of the electromagnetic spectrum. In fact, there are three layers on top of it, but the visible light they emit is too faint to see. Except during a total solar eclipse, when the corona can be seen by the naked eye!

## The Puzzle of Coronal Heating

As you walk away from a fire, you expect the temperature to go down. The Sun is quite different: the **corona**, the outermost layer of the Sun, is hotter than the layers immediately below it! Exactly how the corona gets so hot is one of the major unsolved puzzles of heliophysics.

## Solar Core

Temperature: More than 27 million °F  
Density: 150 g/cm<sup>3</sup>  
(more than 10 times the density of lead)

## Radiative Zone

Temperature: 3.5 million °F  
Density: From 20 g/cm<sup>3</sup>  
(the density of gold)  
to 0.2 g/cm<sup>3</sup>  
(less dense than water)

## Convection Zone

Temperature: 3.5 million to 10,000 °F  
Density:  $2 \times 10^{-7}$  g/cm<sup>3</sup>  
(.001% the density of air)

## Photosphere (VISIBLE LAYER)

Temperature: 10,000 °F  
Density:  $10^{-9}$  g/cm<sup>3</sup>  
(.00001% the density of air)

## Chromosphere

Temperature: 10,000 °F to  
36,000 °F  
Density:  $10^{-12}$  g/cm<sup>3</sup>

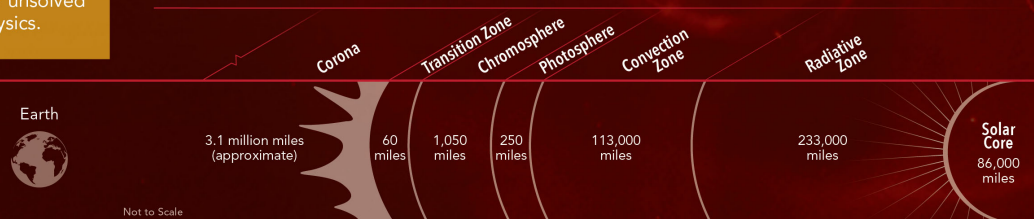
## Transition Zone

Temperature: 40,000 °F to  
1.8 million °F  
Density:  $2 \times 10^{-13}$  g/cm<sup>3</sup>

## Corona (THE SUN'S ATMOSPHERE)

Temperature: 2 to 3 million °F  
Density:  $10^{-16}$  g/cm<sup>3</sup>

## THICKNESS OF EACH LAYER OF THE SUN



For more information,  
please visit:  
<https://science.nasa.gov/heliophysics>



Not to Scale

[www.nasa.gov](http://www.nasa.gov)

Mind-Melting Facts about the Sun, <https://myNASAdata.larc.nasa.gov/sites/default/files/inline->

1. Which layer of the Sun is normally visible on a bright, sunny day?
2. Why are scientists so interested in viewing the corona -What is the "Puzzle of Coronal Heating"?
3. Model: What objects could you use to model a solar eclipse and a lunar eclipse? Draw your plans for each model.



This product is supported by the NASA Heliophysics Education Activation Team (NASA HEAT), part of NASA's Science Activation portfolio.

#### Sources:

1. *Home*. (n.d.). YouTube. Retrieved April 2, 2023, from <https://spaceplace.nasa.gov/eclipses/en/>
2. *GMS: Lunar Eclipse Essentials*. (2011, June 8). NASA Scientific Visualization Studio. Retrieved March 2, 2023, from <https://svs.gsfc.nasa.gov/10787>
3. *NASA Heliopedia*. (2022, September 6). Retrieved March 14, 2023, from [https://www.nasa.gov/mission\\_pages/sunearth/the-heliopedia](https://www.nasa.gov/mission_pages/sunearth/the-heliopedia)

## Teacher Note

Teachers, these mini lessons/student activities are perfect "warm up" tasks that can be used as a hook, bell ringer, exit slip, etc. They take less than a class period to complete. Learn more on the "[My NASA Data What are Mini Lessons?](#)" page.

Teachers who are interested in receiving the answer key, please complete the [Teacher Key Request and Verification Form](#). We verify that requestors are teachers prior to sending access to the answer keys as we've had many students try to pass as teachers to gain access.

## NGSS Three Dimensional Learning

### NGSS Disciplinary Core Ideas

- ESS1B: Earth and the Solar System

### Crosscutting Concepts

- Cause and Effect

### Science and Engineering Practices

- Obtaining, Evaluating and Communicating Information

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## Document Resources

- [What is the Difference Between a Solar Eclipse and a Lunar Eclipse? Student Sheets PDF](#)
- [Mind Melting Facts About the Sun, Credit: NASA](#)

## Google Docs Interactive Files

[What is a Lunar Eclipse? Student Sheets Google Doc](#)