

Name: _____

Date: _____

Lesson 4: Answer Key

Key for Modeling the Sun-Moon-Earth System Assessment

Total Solar Eclipses and the Moon

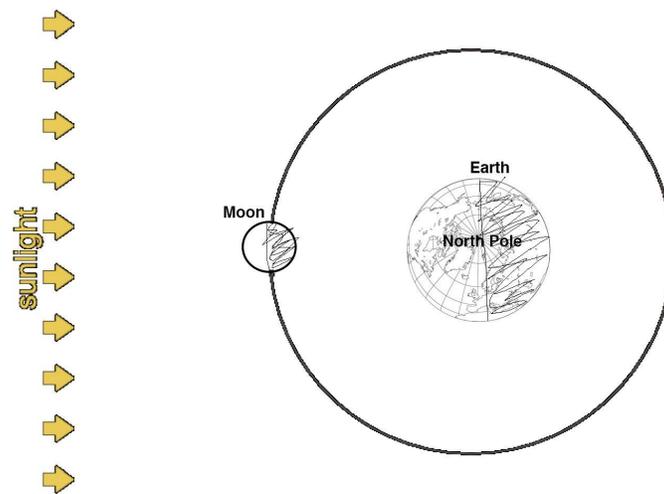
Since 2010, there have been 10 total solar eclipses viewable from Earth. A total solar eclipse occurs when light from the Sun is blocked out by the Moon--usually for a couple of minutes--making everything dark.

Here are the dates of the eclipses and the stage of the Moon during each total solar eclipse.



Date of Total solar eclipse	Stage of the Moon
July 11, 2010	new Moon
November 13, 2012	new Moon
March 20, 2015	new Moon
March 9, 2016	new Moon
August 21, 2017	new Moon
July 2, 2019	new Moon
December 14, 2020	new Moon

The data show that a total solar eclipse always happens when the Moon is new, as in the diagram below.



1. Add to this model to show where the Sun's light would be shining on both the Moon and Earth given their positions in the system.

Student responses should include

- + shading on the Earth-side of the Moon to indicate the light is on the half of the Moon facing the Sun and
- + shading on the side of Earth opposite the Sun to indicate the light is on the Sun-facing side of Earth.

2. Describe using pictures and words what portion of the Moon, if any, a person on Earth would be able to see an hour before the solar eclipse and why it would look that way.

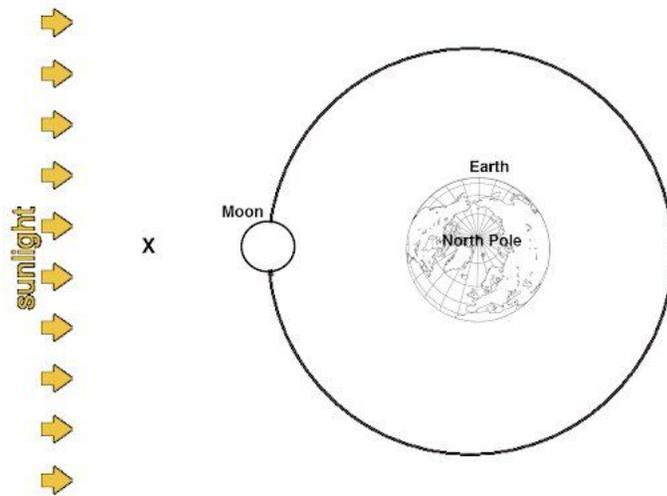
Ideal student response: "You would not be able to see it at all because you are just looking at the nighttime side of the Moon that is not sunlit, which has no light reaching it to be able to bounce off and reach your eyes" or "You wouldn't be able to see it because it is a new Moon, and you can't see a new Moon."

Student responses should include these ideas:

+ A person on Earth will not be able to see the Moon.

+ A person on Earth can't see the Moon because it is a new Moon, or the person is looking at the nighttime side of the Moon that is not sunlit.

3. Describe using pictures and words what the Moon would look like if you were in a spacecraft floating between the Moon and the Sun (in the location of the X below) and why it would look that way.



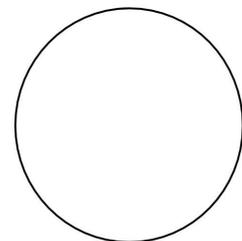
Ideal student response:

"It would look like a full Moon, where you can see the whole thing because you are looking at the side of the Moon that is lit up by the Sun (or, the daytime side of the Moon)."

Student responses should include these ideas:

+ The Moon will look like a full Moon or a Moon where you can see the whole thing.

+ The person in the spacecraft is looking at the side of the Moon that is lit up by the Sun (or, the daytime side of the Moon).



4. A full Moon will appear to be a fully lit circle from Earth, while no part of the Moon is visible from Earth when it is a new Moon. Use the model of the Sun-Moon-Earth system to explain why total solar eclipses only occur when the phase of the Moon is a new Moon.

Ideal student response: The Moon blocks the sunlight because it is in between Earth and the Sun. When the Moon is in between Earth and the Sun, the lit part is facing the Sun so we can't see it, which is a new Moon. So whenever there is a solar eclipse, it must be a new Moon.

Student responses should include these ideas:

- + The Moon blocks the sunlight because of its position in between Earth and the Sun.
- + When the Moon is between Earth and the Sun, the light from the Sun hits the Moon on the side facing the Sun.
- + From Earth, we cannot see the Moon in this phase because we are looking at the nighttime side of the Moon.
- + When there is a solar eclipse, it must be a new Moon because the Moon has to be between Earth and the Sun.