What Causes a Solar Eclipse?

Studyladder

What is a solar eclipse?

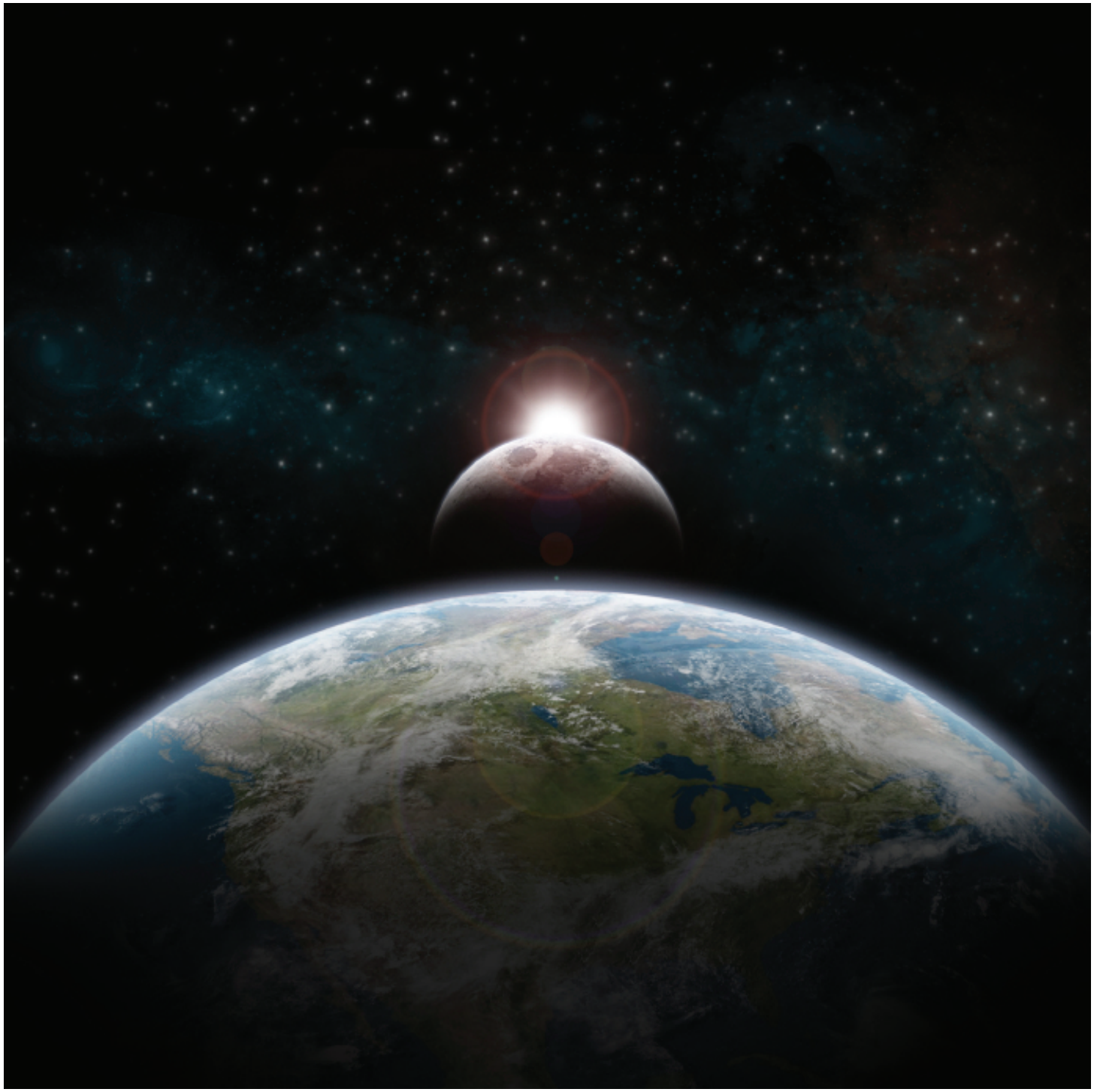
A solar eclipse occurs when the Moon passes directly between the Sun and the Earth.

The Moon blocks out some of the Sun's light, casting a shadow on the Earth called an umbra.

Only a small area of the Earth will experience a total solar eclipse.

As the Moon starts to cross between the Earth and the Sun it begins to cast a shadow on the Earth. The sky gradually darkens. When the Moon reaches the point where it covers our view of the Sun completely it looks as if it is almost night time. Then, as the Moon continues its path across the Sun, daylight gradually returns again.

A solar eclipse is an event that usually occurs about two times a year.



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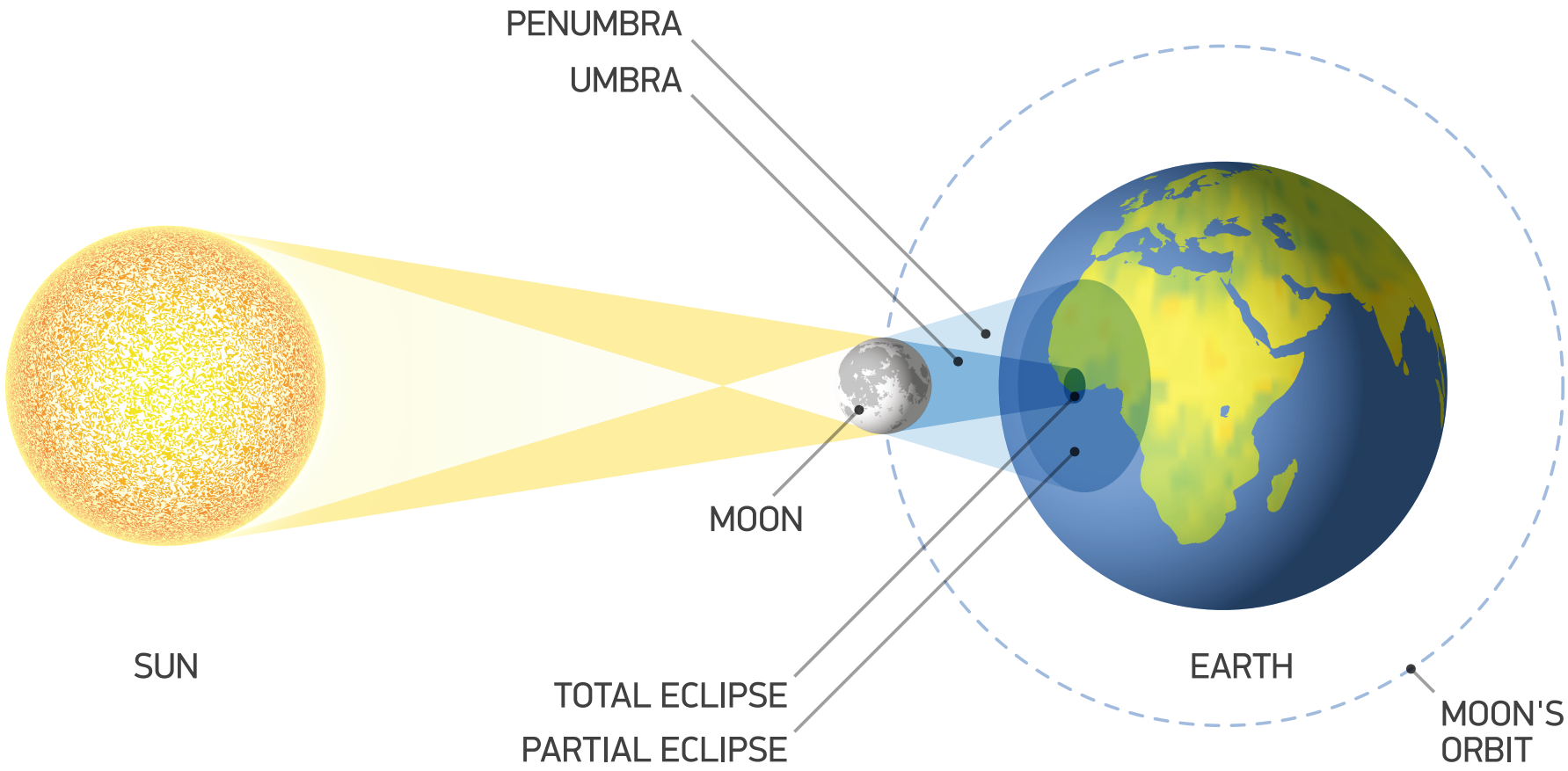


Only a small area of the Earth will experience a total solar eclipse. The darkest part of the Moon's shadow generally only covers a expanse of land on Earth that is about 150 km wide. The shadow sweeps across about a third of the globe in a few hours.

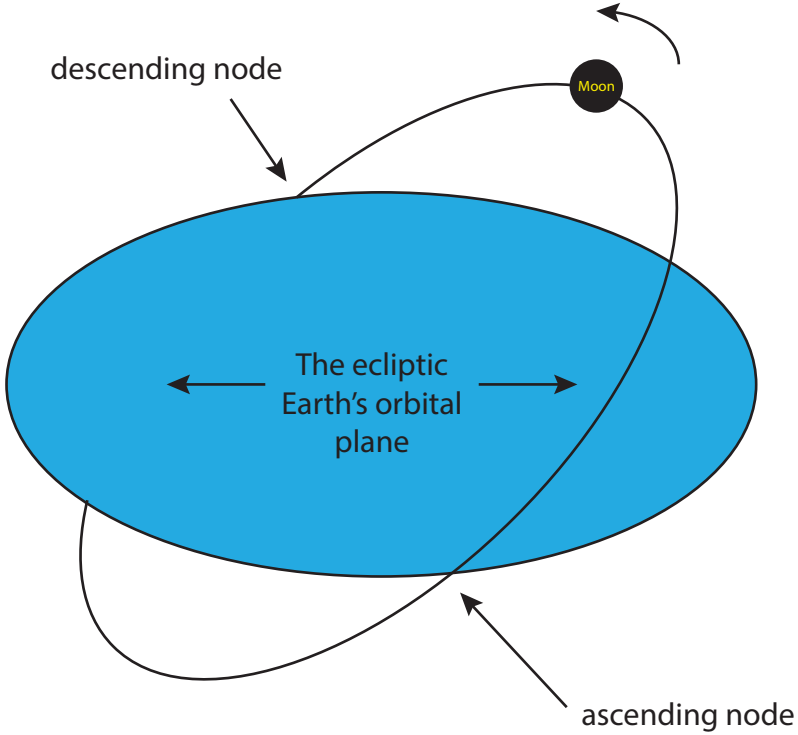
Why doesn't a solar eclipse happen every month?

The Moon orbits the Earth once every lunar month. This takes 27 days, 7 hours, 43 minutes and 11.6 seconds.

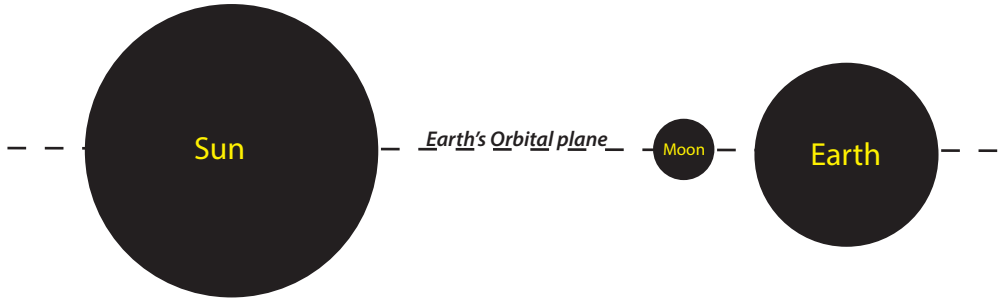
It passes between the Earth and the Sun every month so why isn't there a solar eclipse every month?

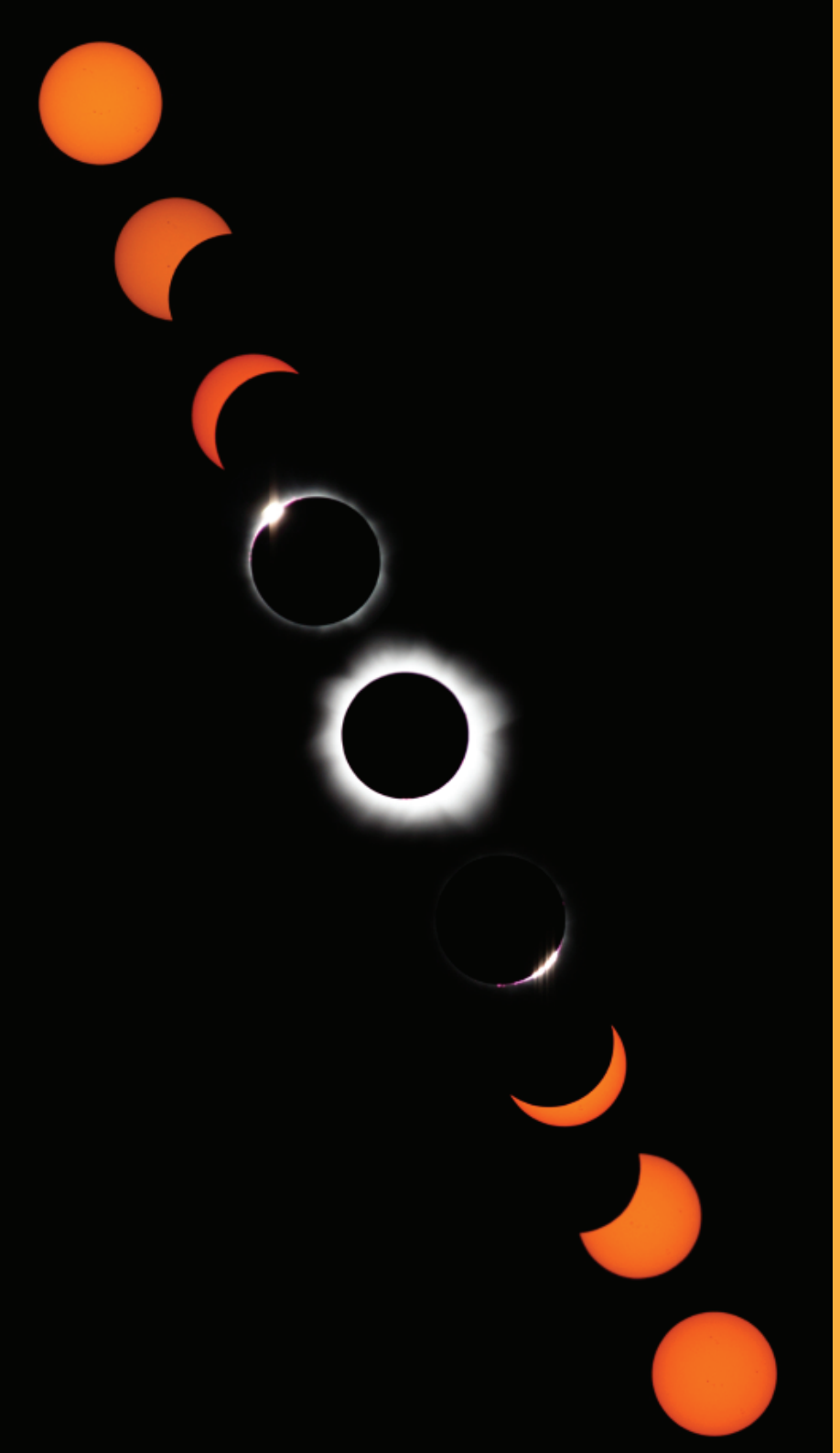
The reason is because the Moon's orbit is tilted at an angle of 5 degrees. Therefore it generally passes above or below the Earth's line of sight of the Sun.

When the Moon passes directly between the Earth and the Sun at a point that lines up with the Earth's orbital plane (a node) then a solar eclipse will take place.



The ascending and descending nodes are the points when an orbiting body (the Moon) crosses the ecliptic (Earth's orbital plane). If this point lines up between the Sun and the Earth a solar eclipse will occur.





Types of Solar Eclipses

As the Moon passes between the Earth and the Sun it blocks out some of the light reaching the Earth.

The shadow of the Moon will not reach all areas of the Earth. This is why only some locations are able to see a solar eclipse.

Total Solar Eclipse

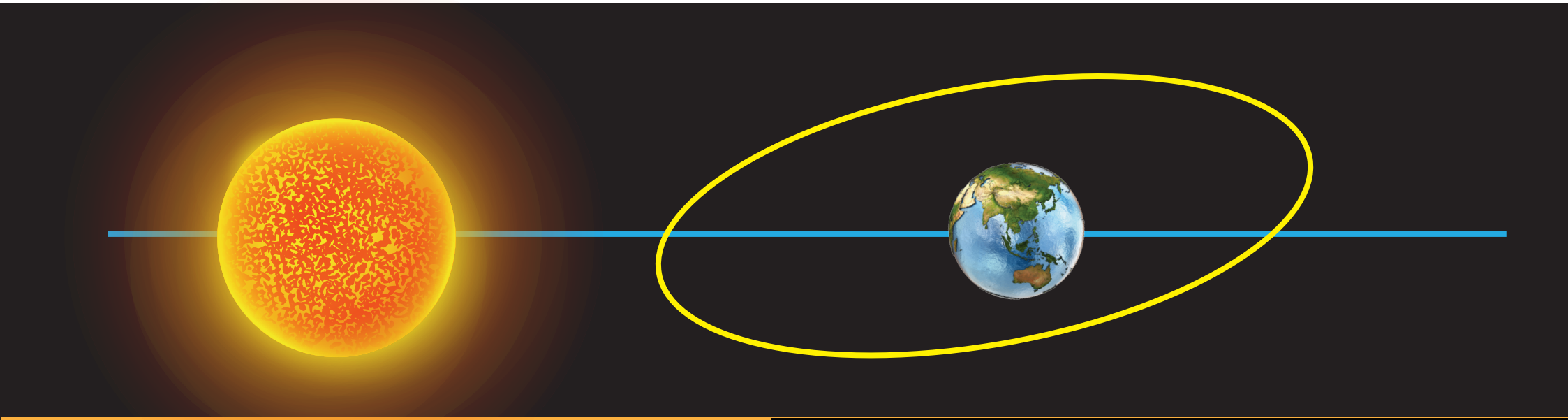
If your viewing location is directly under the darkest part of the shadow (the umbra) you will see the Moon cover the Sun. The day will temporarily turn dark until the Moon moves past the Sun and daylight will once again be restored.

Partial Solar Eclipse

If your viewing location is further away you may be in the path of the lighter part of the shadow called the penumbra. You will still see some of the Sun as the Moon passes across. The day may only darken a little as your location will be receiving more light from the Sun. The further you are away from the umbra the lighter it will be.

If your viewing location is outside the penumbra you will not be affected by the shadow of the Moon and you will not see a solar eclipse.

The distance from the Moon to the Earth is variable



The Moon travels around the Earth in an elliptical path. Sometimes it is closer to us and looks bigger. At other times it is further way and looks smaller.

When the Moon is at its furthest distance away from the Earth, and lines up with the Sun at a node, a special type of solar eclipse will occur.

Annular Solar Eclipse

The apparent smaller size of the Moon means that not all of the Sun will be covered when the Moon crosses in front of the Sun. The outer border of the Sun will be visible during the eclipse.