

Module 1: What is Astronomy?

Topic 4 Content: Lunar Phases and the Tides Notes

Introduction

Lun

i Introduction

It takes the Moon approximately 29.5 days to orbit the Earth. Within those days, the Moon goes through phases, so that between a particular phase, such as between new moons, there are 29.5 days. All the while, the Moon exerts a gravitational pull on the Earth that greatly influences the ocean's tides.

Click on each icon to learn more about each Moon phase and how it affects the Earth's tidal patterns.

The diagram illustrates the Moon's orbit around Earth. The Earth is shown in the center, with the Moon's path as a circle. Various phases of the Moon are depicted along the orbit, each with a gear icon. To the right, a yellow gradient background with white arrows pointing left represents the Sun's rays, with a gear icon on the Sun.

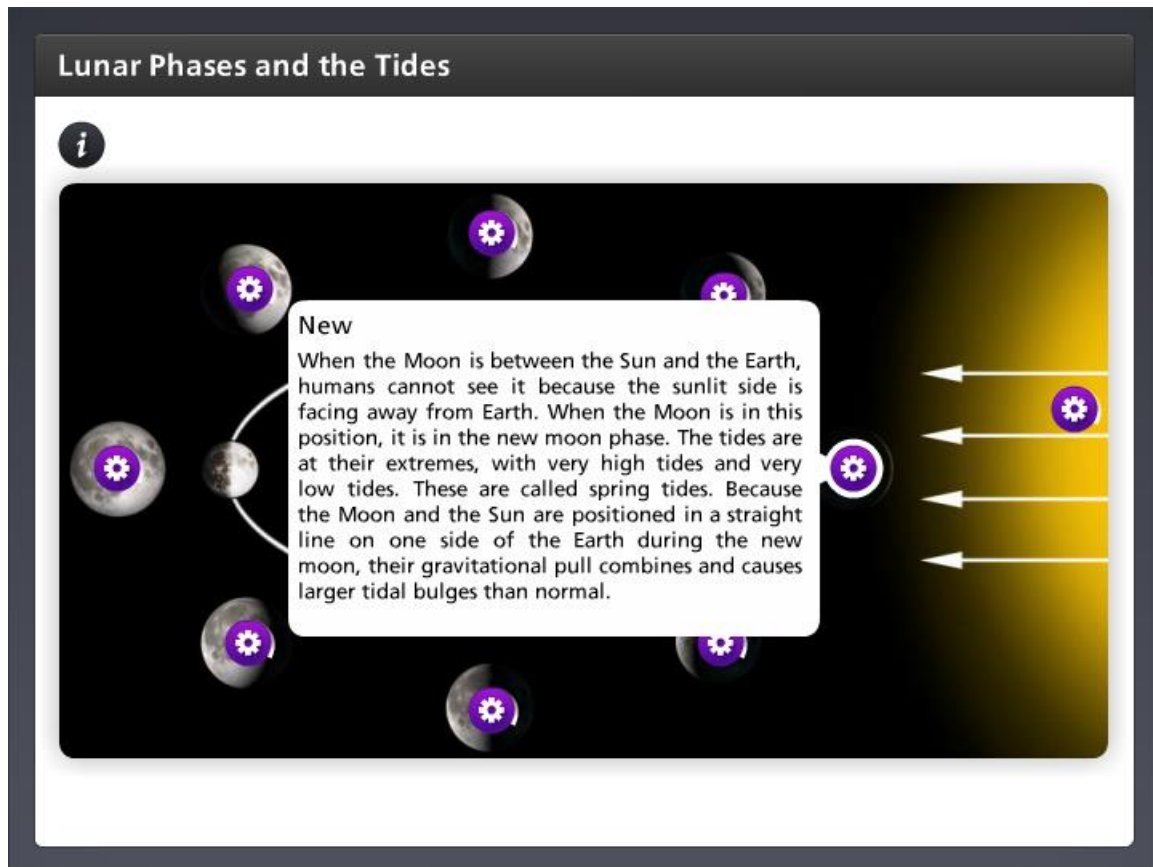
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New



When the Moon is between the Sun and the Earth, humans cannot see it because the sunlit side is facing away from Earth. When the Moon is in this position, it is in the new moon phase. The tides are at their extremes, with very high tides and very low tides. These are called spring tides. Because the Moon and the Sun are positioned in a straight line on one side of the Earth during the new moon, their gravitational pull combines and causes larger tidal bulges than normal.

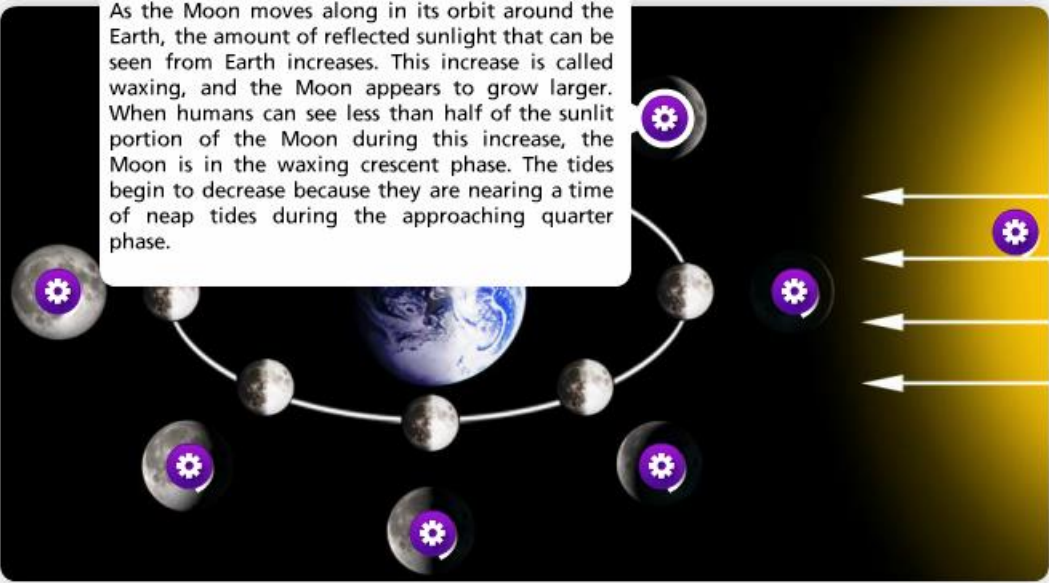
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Waxing Crescent

Lunar Phases and the Tides

i **Waxing Crescent**

As the Moon moves along in its orbit around the Earth, the amount of reflected sunlight that can be seen from Earth increases. This increase is called waxing, and the Moon appears to grow larger. When humans can see less than half of the sunlit portion of the Moon during this increase, the Moon is in the waxing crescent phase. The tides begin to decrease because they are nearing a time of neap tides during the approaching quarter phase.



The diagram illustrates the Moon's orbit around Earth. The Earth is shown in the center, and the Moon is in its orbit. Sunlight comes from the right, creating a crescent moon as seen from Earth. A text box explains the waxing process and its relation to tides.

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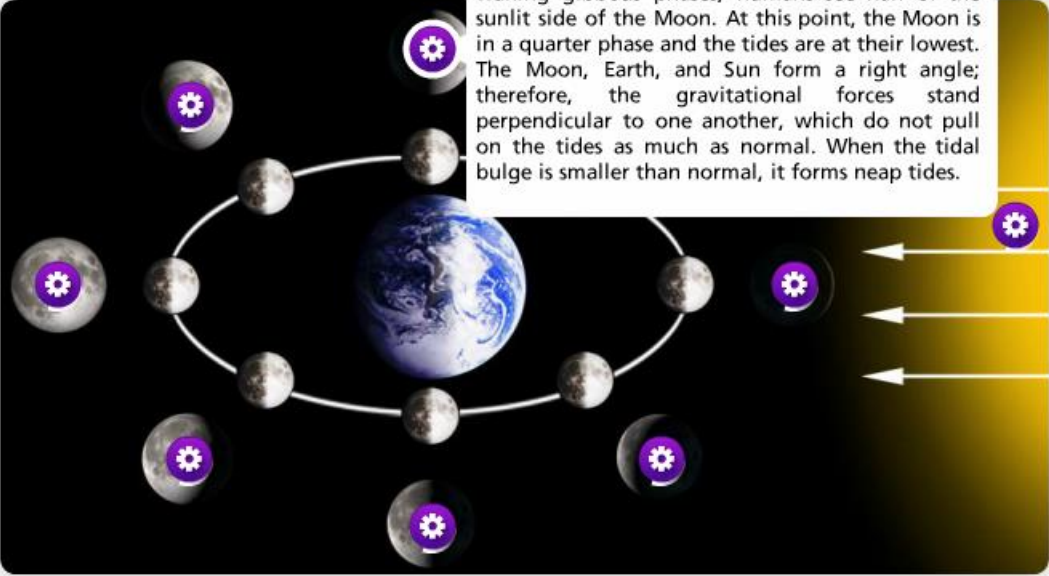
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First Quarter

Lunar Phases and the Tides

First Quarter

Between waxing crescent and waxing gibbous phases and between the waning crescent and waning gibbous phases, humans see half of the sunlit side of the Moon. At this point, the Moon is in a quarter phase and the tides are at their lowest. The Moon, Earth, and Sun form a right angle; therefore, the gravitational forces stand perpendicular to one another, which do not pull on the tides as much as normal. When the tidal bulge is smaller than normal, it forms neap tides.



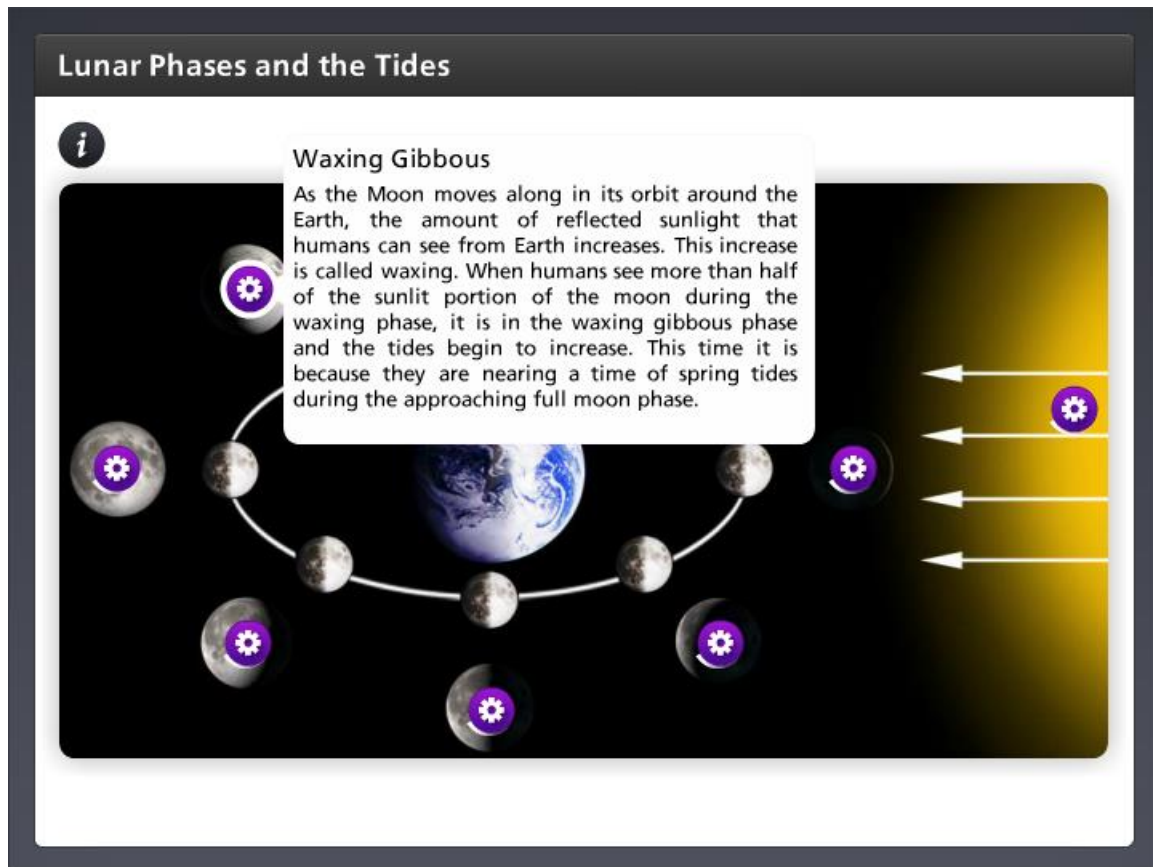
The diagram illustrates the First Quarter moon phase and neap tides. It shows the Earth at the center, with the Moon in a quarter phase (half-illuminated) on the right side. The Sun is positioned at the top, with rays of light hitting the Moon. The Moon, Earth, and Sun form a right angle. The diagram also shows the Moon's orbit around Earth and the resulting neap tides on Earth's surface.

Between waxing crescent and waxing gibbous phases and between the waning crescent and waning gibbous phases, humans see half of the sunlit side of the Moon. At this point, the Moon is in a quarter phase and the tides are at their lowest. The Moon, Earth, and Sun form a right angle; therefore, the gravitational forces stand perpendicular to one another, which do not pull on the tides as much as normal. When the tidal bulge is smaller than normal, it forms neap tides.

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Waxing Gibbous

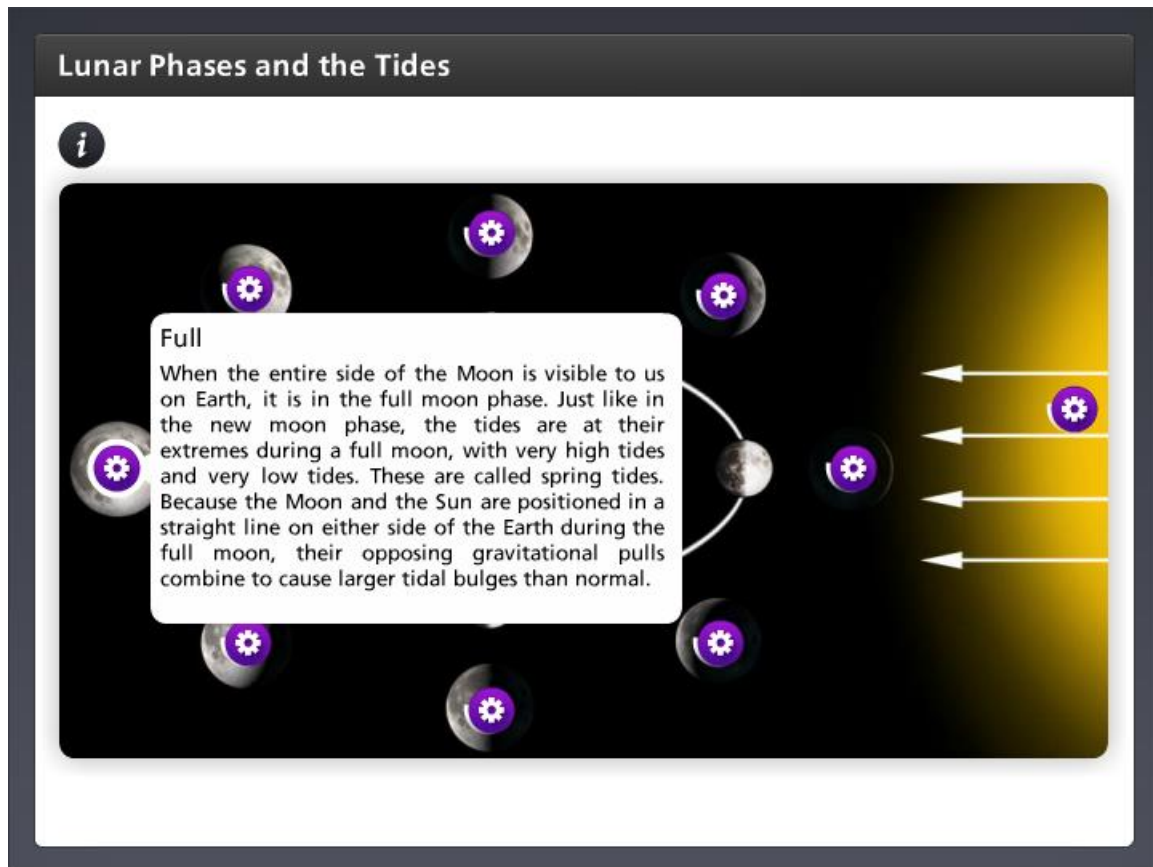


As the Moon moves along in its orbit around the Earth, the amount of reflected sunlight that humans can see from Earth increases. This increase is called waxing. When humans see more than half of the sunlit portion of the moon during the waxing phase, it is in the waxing gibbous phase and the tides begin to increase. This time it is because they are nearing a time of spring tides during the approaching full moon phase.

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Full

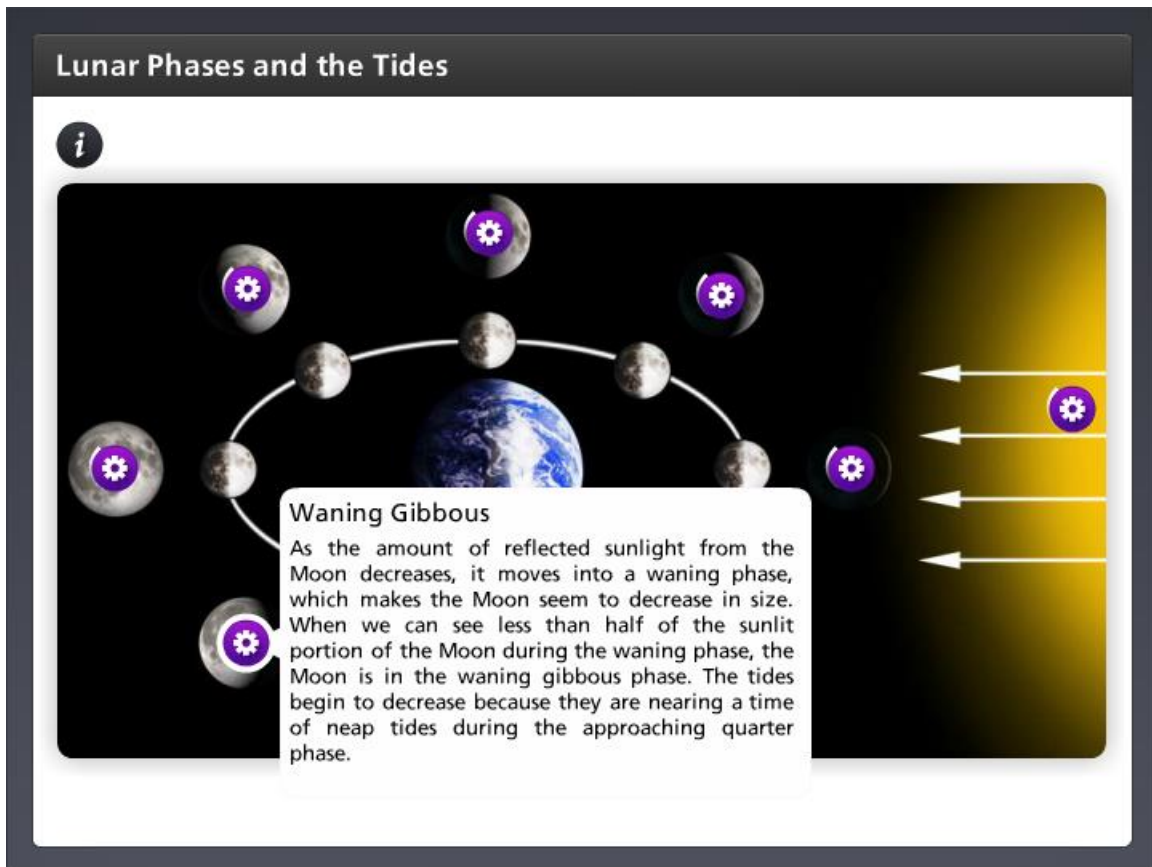


When the entire side of the Moon is visible to us on Earth, it is in the full moon phase. Just like in the new moon phase, the tides are at their extremes during a full moon, with very high tides and very low tides. These are called spring tides. Because the Moon and the Sun are positioned in a straight line on either side of the Earth during the full moon, their opposing gravitational pulls combine to cause larger tidal bulges than normal.

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Waning Gibbous



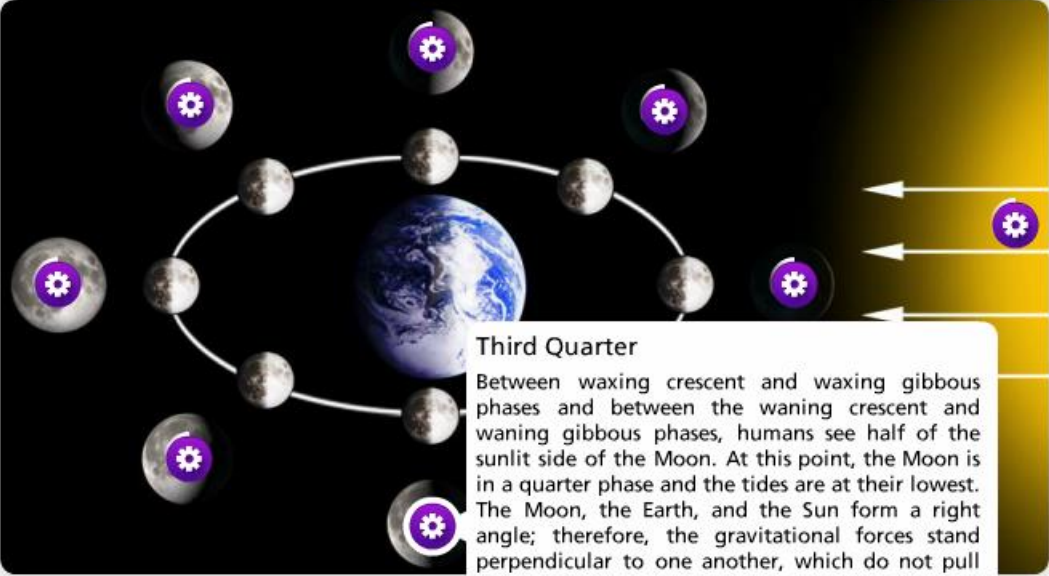
As the amount of reflected sunlight from the Moon decreases, it moves into a waning phase, which makes the Moon seem to decrease in size. When we can see less than half of the sunlit portion of the Moon during the waning phase, the Moon is in the waning gibbous phase. The tides begin to decrease because they are nearing a time of neap tides during the approaching quarter phase.

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Third Quarter

Lunar Phases and the Tides



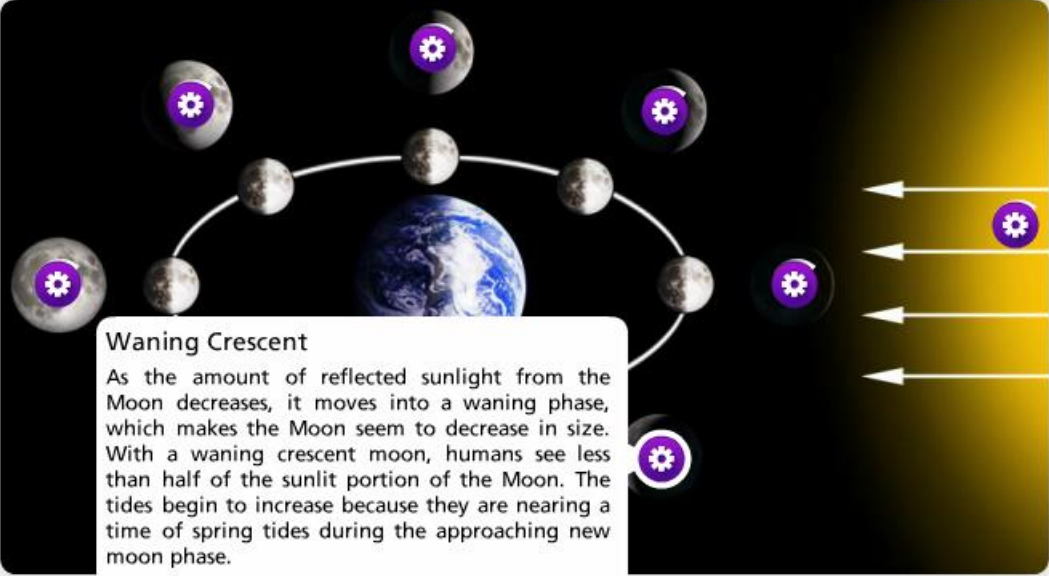
Third Quarter
Between waxing crescent and waxing gibbous phases and between the waning crescent and waning gibbous phases, humans see half of the sunlit side of the Moon. At this point, the Moon is in a quarter phase and the tides are at their lowest. The Moon, the Earth, and the Sun form a right angle; therefore, the gravitational forces stand perpendicular to one another, which do not pull on the tides as much as normal. When the tidal bulge is smaller than normal, it forms neap tides.

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Waning Crescent

Lunar Phases and the Tides



The diagram illustrates the Moon's orbit around Earth. The Earth is shown at the bottom center. The Moon is shown at various positions along its orbit, with a purple gear icon indicating the phase. Sunlight is represented by white arrows coming from the right. The waning crescent phase is highlighted with a white box containing text.

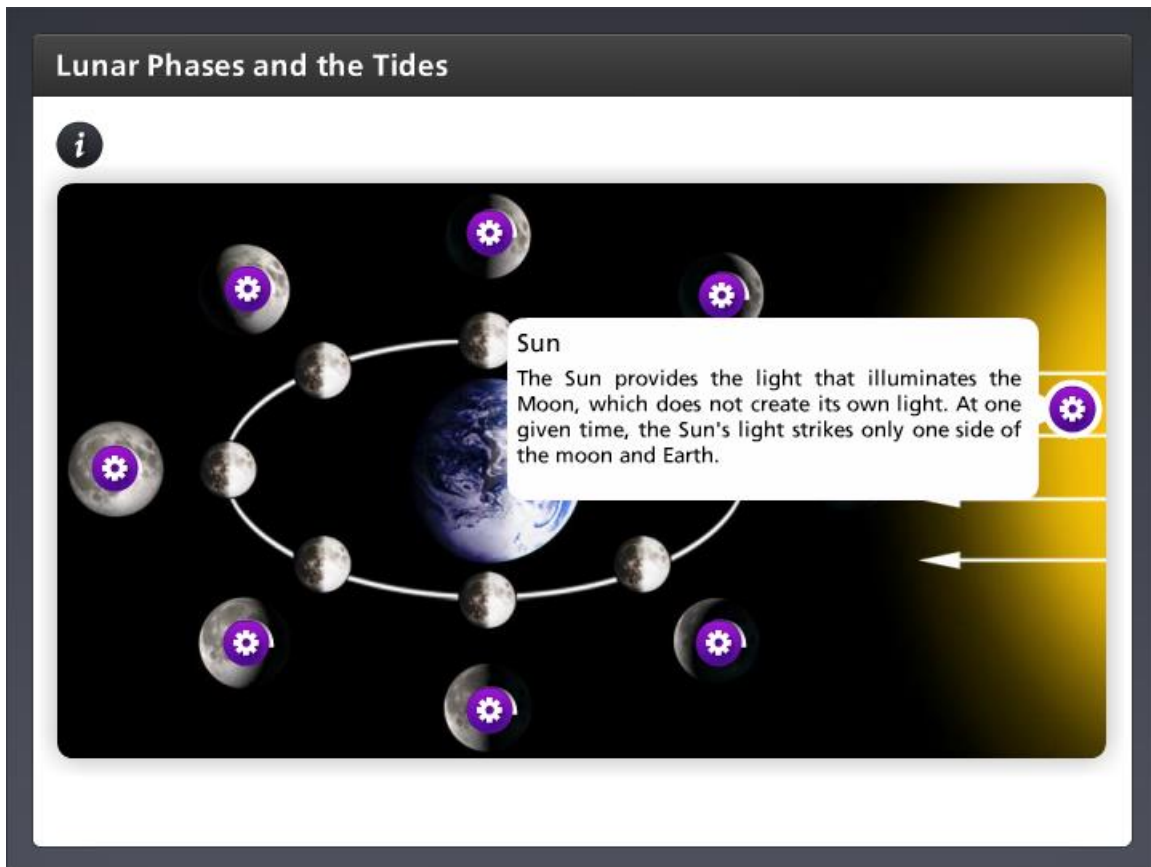
Waning Crescent
As the amount of reflected sunlight from the Moon decreases, it moves into a waning phase, which makes the Moon seem to decrease in size. With a waning crescent moon, humans see less than half of the sunlit portion of the Moon. The tides begin to increase because they are nearing a time of spring tides during the approaching new moon phase.

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Sun



The Sun provides the light that illuminates the Moon, which does not create its own light. At one given time, the Sun's light strikes only one side of the moon and Earth.