Lesson 03

Earth's Moon
Part 2
Phases of the Moon

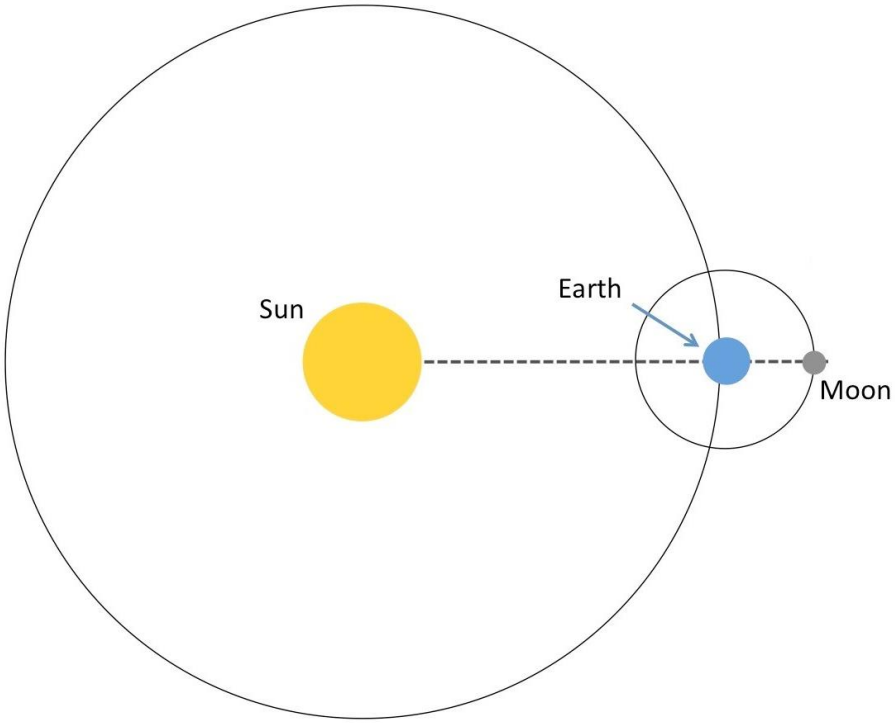
The moon is not a luminous object. The moon cannot make its own light.

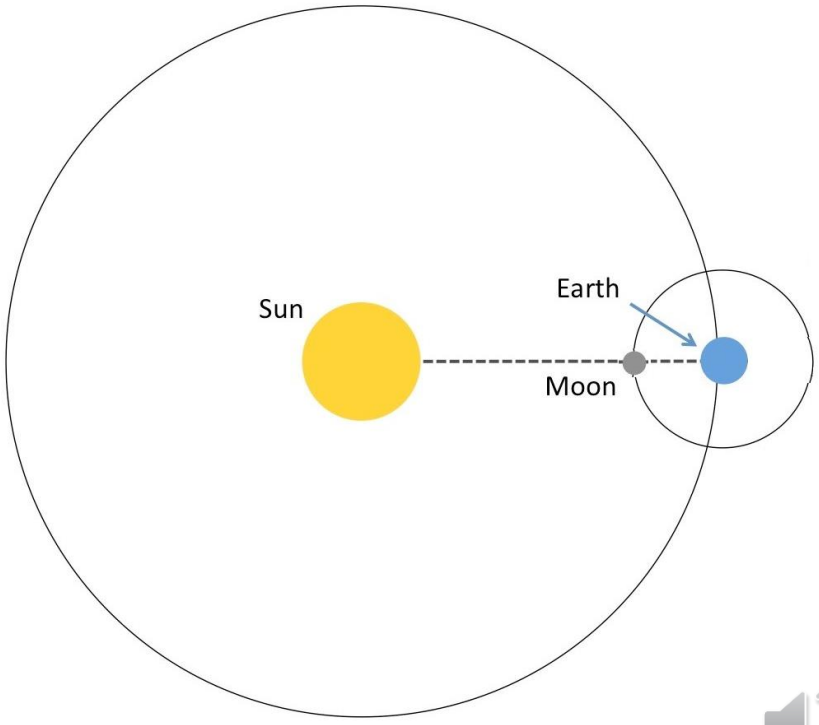
We see the moon in the sky from Earth because the moon's surface reflects sunlight to the Earth.

Syzygy: Alignments of the Sun, Earth, and moon.

Opposition is the order Sun-Earth-Moon. The moon and the Sun are on opposite sides of the Earth.

Conjunction is the order Sun-Moon-Earth. The moon and the Sun are on same side of the Earth.

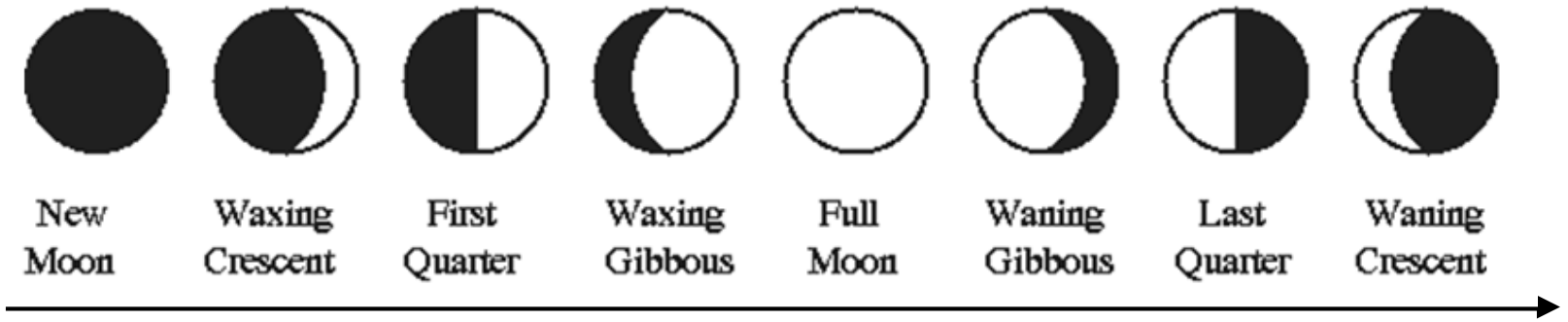




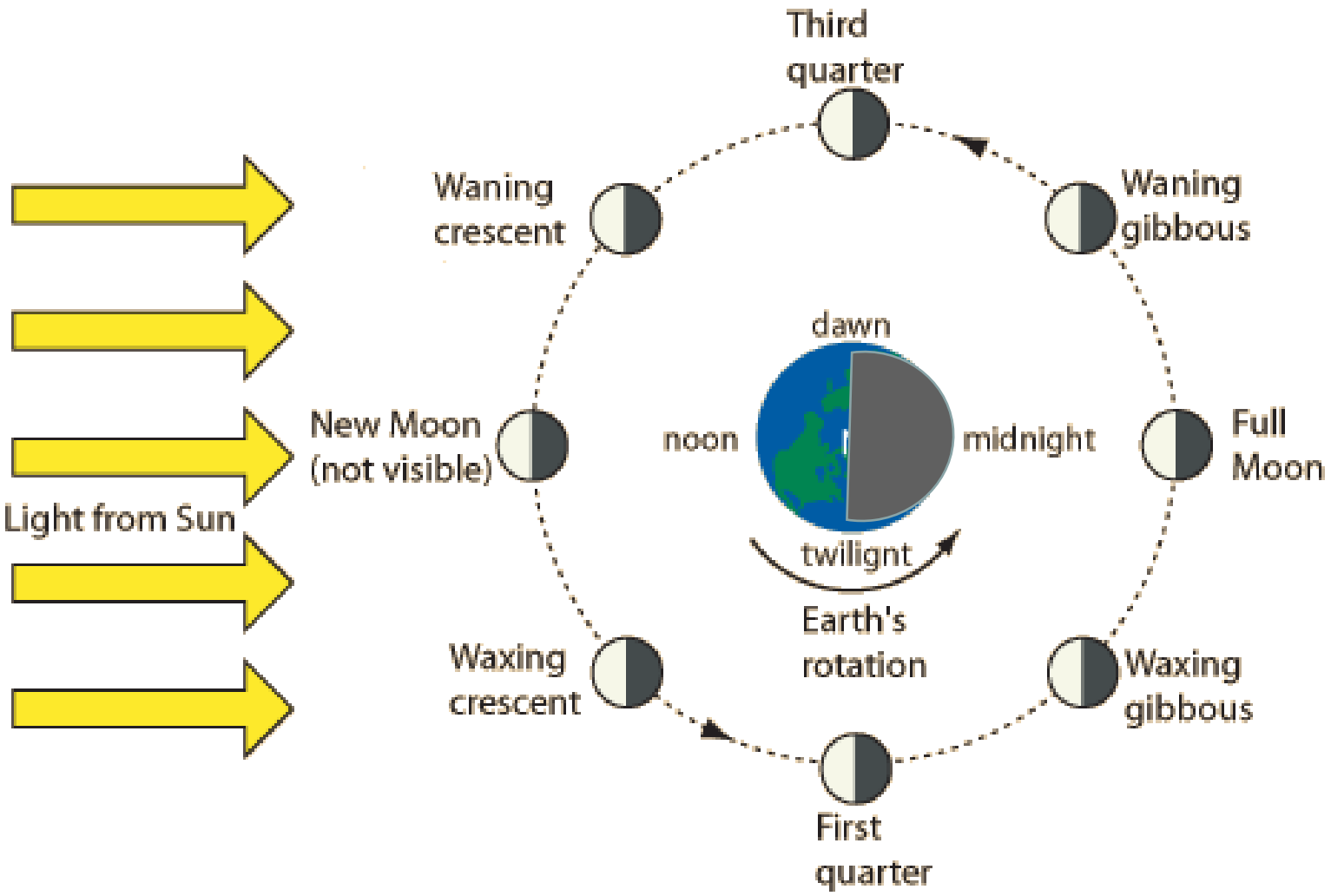
The **moon's phases** are a progressive sequence of illuminated and shadowed surfaces of the moon that are seen from the Earth's surface.

The amount of surface area on the moon's visible disk that is illuminated by sunlight changes from day to day because of the moon's position in its orbit relative to the Earth and sun.

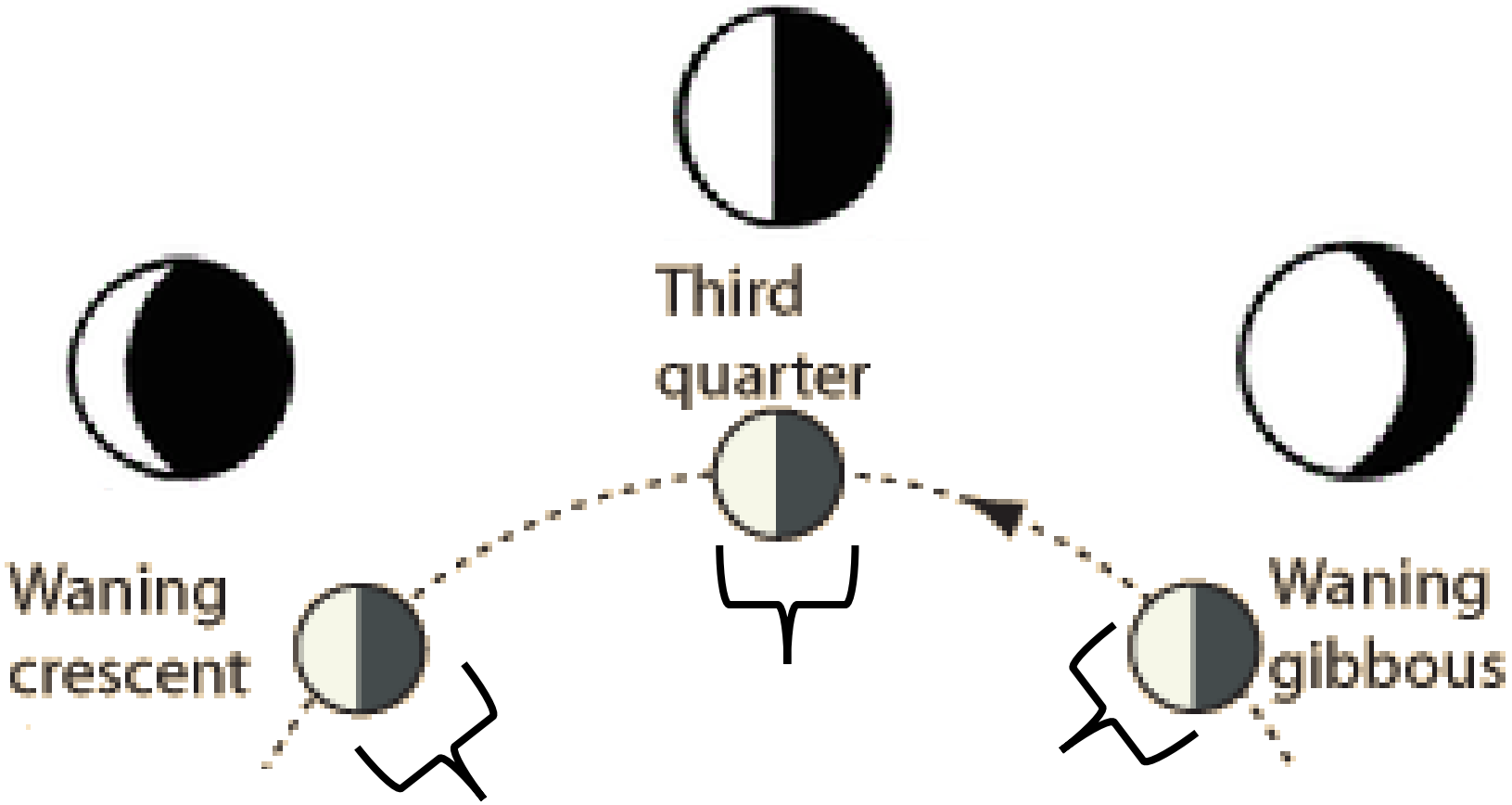
The lunar phase cycle repeats itself every 29 Earth days



The side of the moon facing the Sun is illuminated with sunlight (white half). The side of the moon facing away from the Sun is shadowed (black half).



The visible disk of the moon as seen from Earth is the area of the moon inside the moon's orbit (the dashed curved line) facing the Earth.

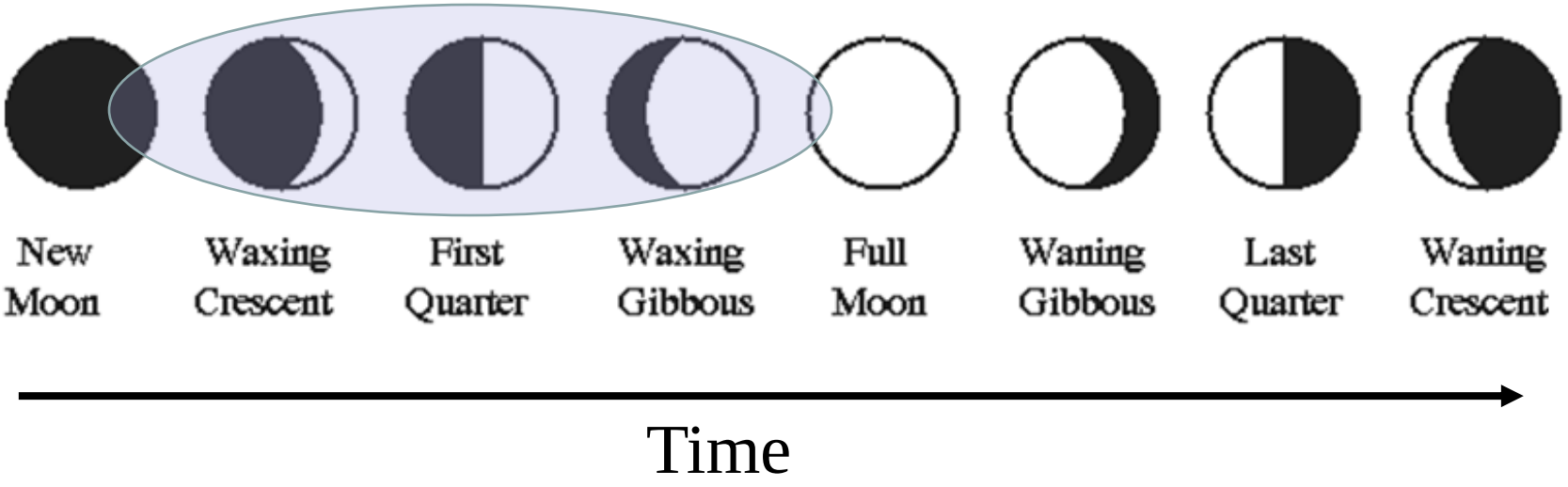


Seen from the Earth's surface

Waxing moon phases: "Growing" The amount of illuminated surface area on the moon as seen from Earth is increasing with time.

Waxing phases happen between the new moon phase and the full moon phase. Day 2-13 of the lunar phase cycle.

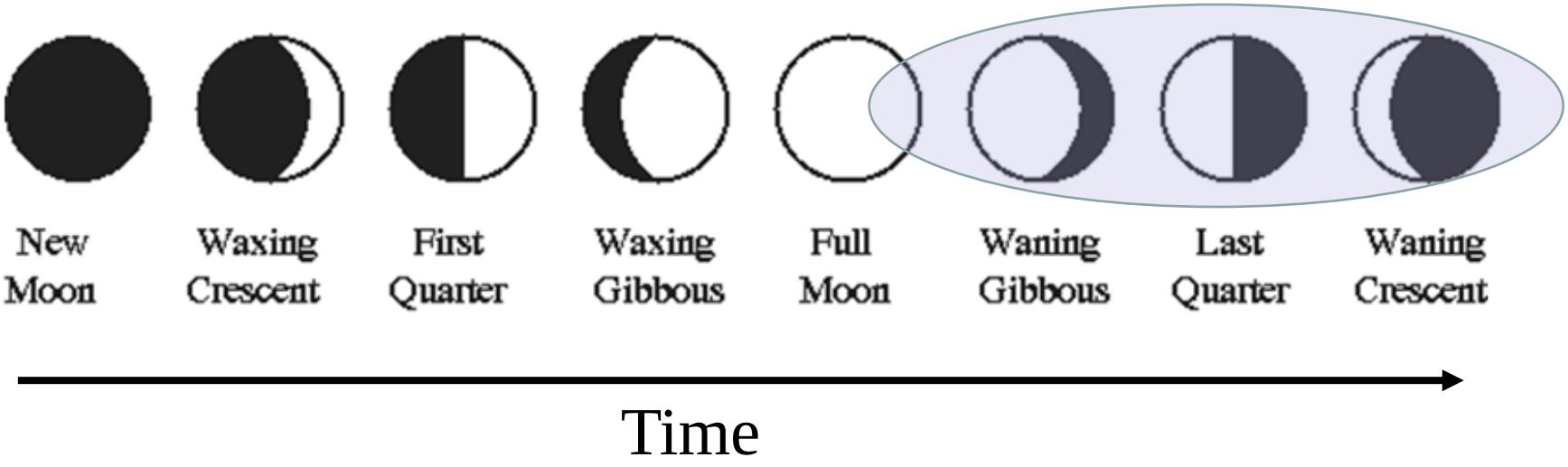
The moon's position in its orbit is moving from **conjunction** to **opposition**.



Waning moon phases: "Shrinking" The amount of illuminated surface area on the moon as seen from Earth is decreasing with time.

Waning phases happen between the full moon phase and the new moon phase. Day 15-27 of the lunar phase cycle.

The moon's position in its orbit is moving from **opposition** to **conjunction**.



Crescent moon: Phases of the moon when the moon's visible disk from Earth has less then 50% area illuminated by sunlight.

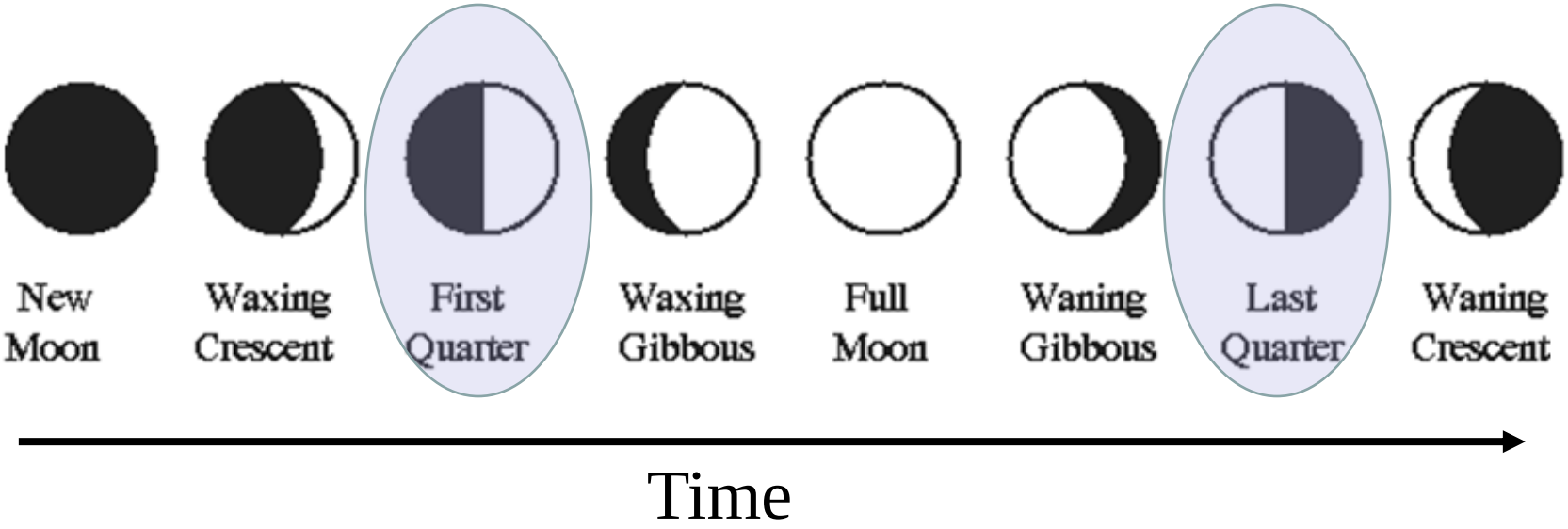
Gibbous moon: Phases of the moon when the moon's visible disk from Earth has greater than 50% area illuminated aby sunlight.

Waning crescent moon

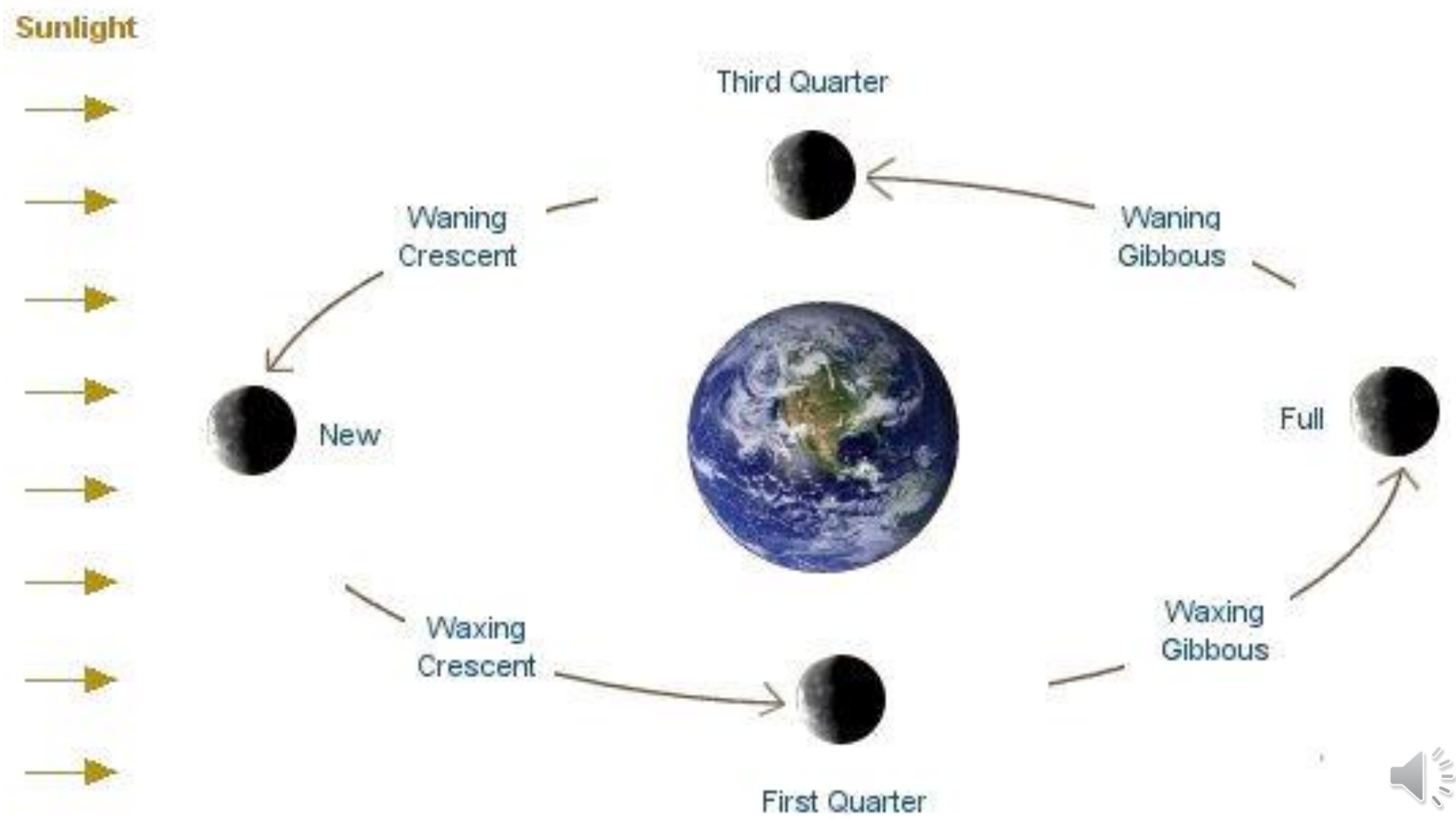
Waxing gibbous moon

Quarter moon: ½ of the moon's disk is illuminated as seen from the Earth's surface. The moon is perpendicular (90º) to the sun relative to Earth.

- **First quarter: happens 7-8 days after new moon.**
- **Third quarter: happens 7-8 days after full moon.**

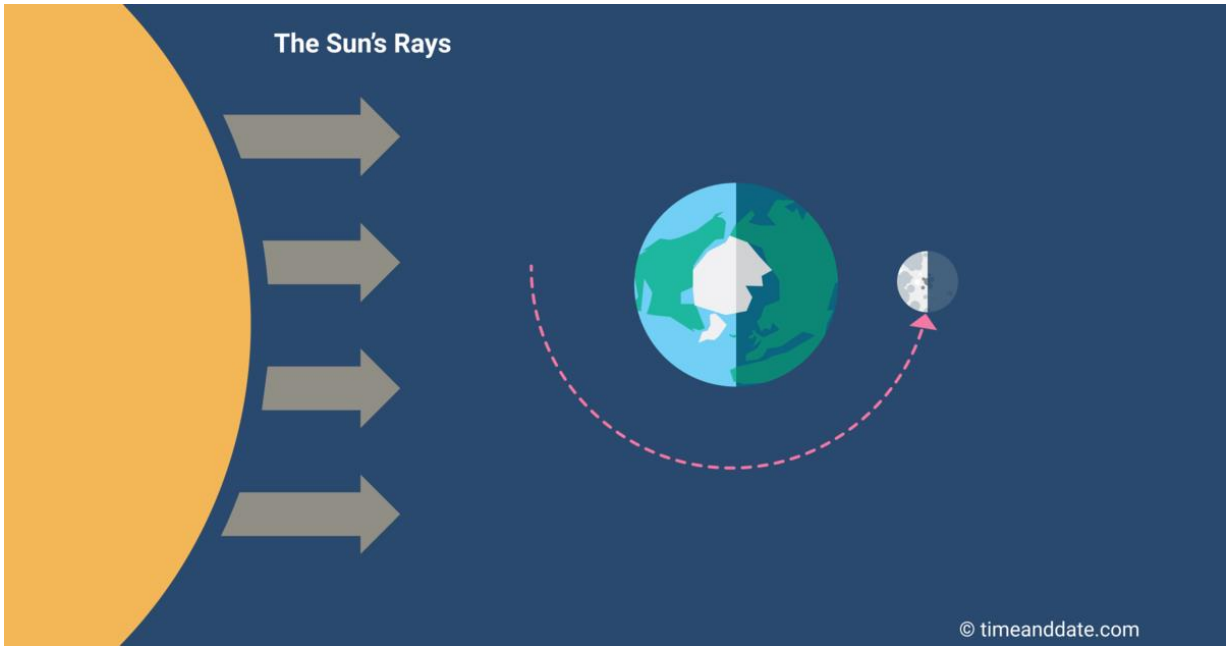


The quarter moons are at 90º positions relative to the Sun and Earth. First quarter moon is a waxing phase. Third quarter moon is a waning phase.



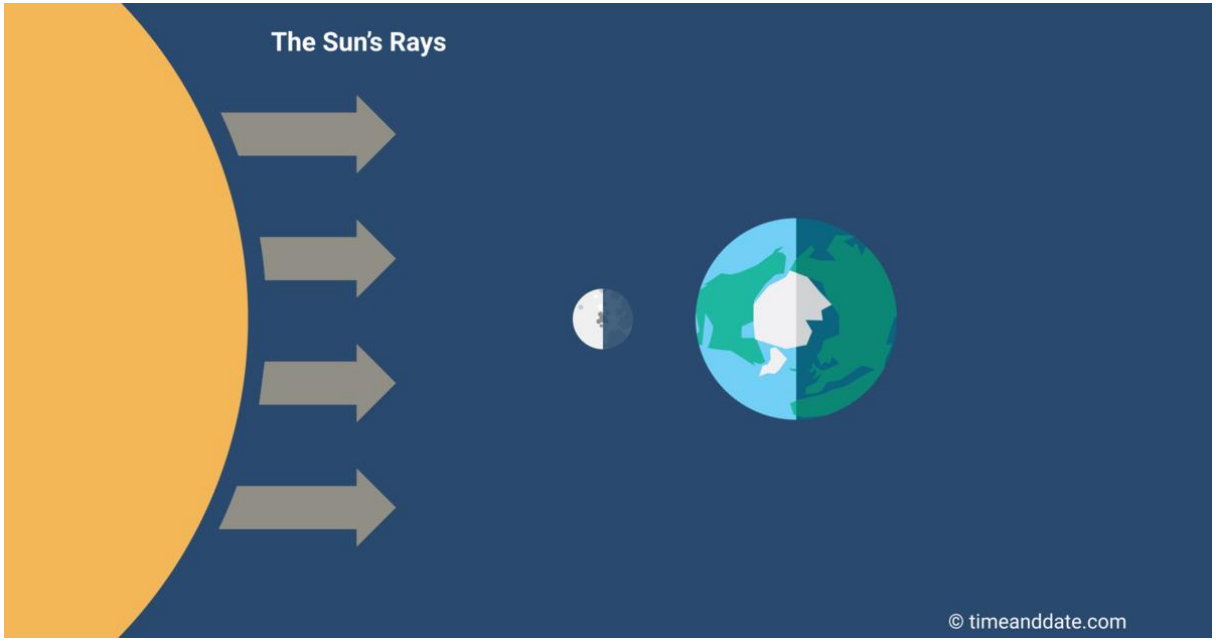
Full moon: 100% of the surface area of the nearside of the moon is illuminated by sunlight.

- Full moons happen when the moon is at opposition to the Sun.
- The shadow side of the Earth (facing away from the Sun) will view the full moon.



New moon: 100% of the surface area of the nearside of the moon is obscured and unseen in the daytime sky at solar noon.

- New moons happen when the moon is at conjunction with the Sun.
- The daylight side of the Earth (facing the Sun) will view the shadow or dark side of the moon..



During ***waxing moon phases***, the illuminated surface increases across the surface of the moon in the west to east direction.

During ***waning moon phases***, the shadow surface increases across the surface of the moon in the west to east direction.

E Waning moon Full moon Waxing moon W

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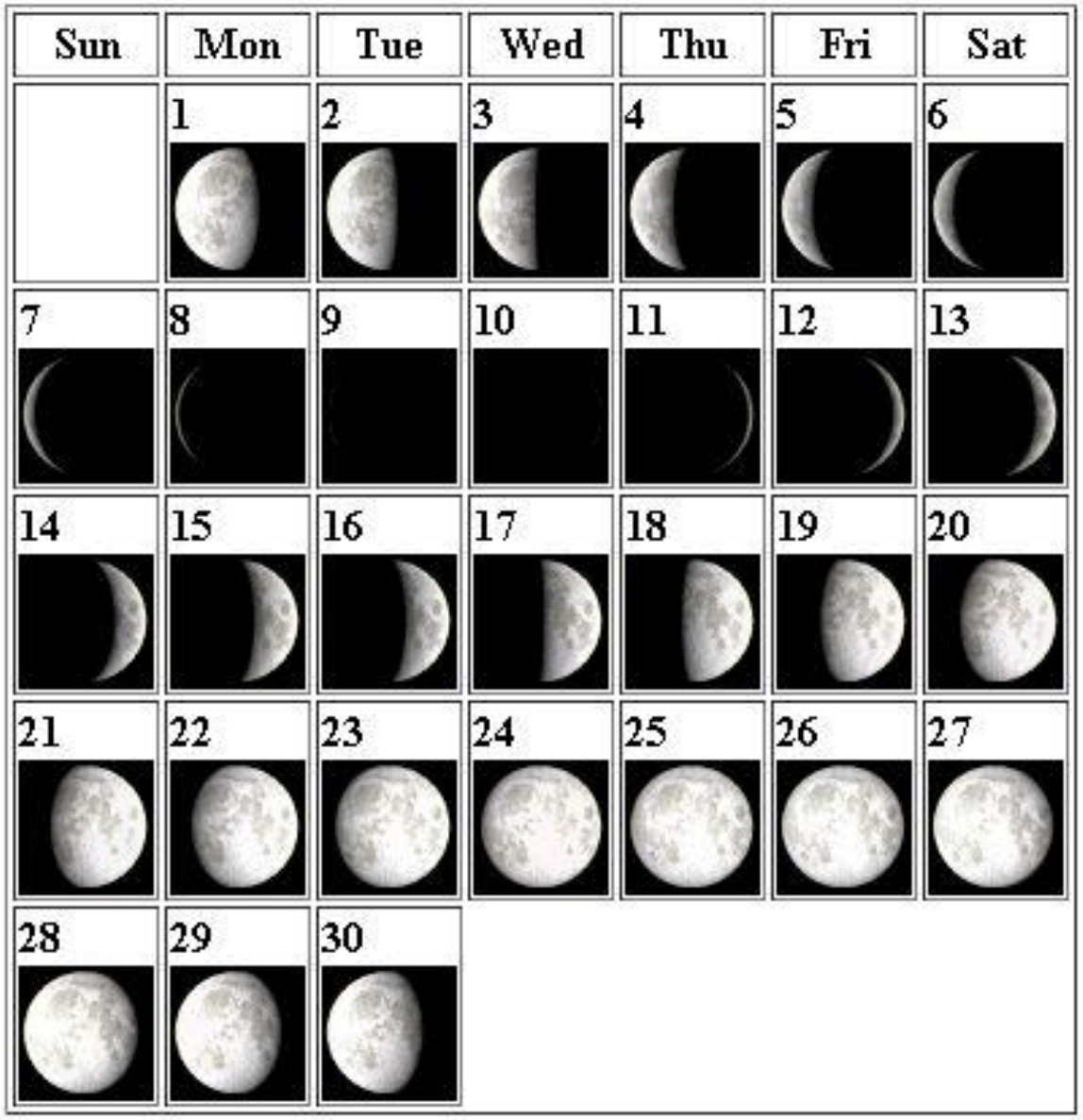


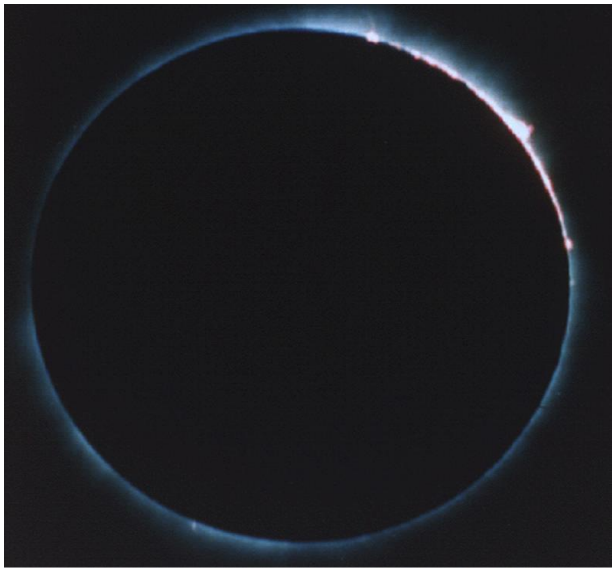
Lunar phase calendar indicates the lunar phases and dates.

A full suite of lunar phases from new moon to new moon takes 29.5 days.

Waxing gibbous moon

Waxing crescent moon

New moon



Waning crescent moon

Waning gibbous moon

Full moon