Earth and Space Conceptual Flow

The universe contains all matter and space, and was created 13 billion years ago by the Big Bang.

Everything is pulled together by gravity.

A galaxy is a system of stars, gas, dust, and planets. There are 100 billion galaxies in the universe.
MS-ESS1-3

Galaxies are in motion and are rotating around the galaxy's center of mass.
MS-ESS1-2

A solar system is a collection of planets and small objects (Ex: moons, comets, etc.) that orbit a star(s). Many solar systems make up a galaxy. We are located in the Milky Way Galaxy.
MS-ESS1-3

A star is a gaseous body where nuclear fusion occurs and light is given off.

Some stars are brighter than others due to their size and composition.

How bright stars appear to us is a combination of the star's brightness and distance from Earth.
5-ESS1-1

The Sun is a star.

The Sun is 1.3 million times the size of planet Earth and is 99.86% of the mass in our solar system.
MS-ESS1-3

Planets orbit stars because stars are much more massive than planets. In our system, planetary orbits are almost circular.
MS-ESS1-2

The closer the planet is to the Sun, the less time it takes to complete 1 revolution (orbit) around the Sun. For the Earth, one revolution takes ~365.25 days.

The orbit of planets causes different stars to be seen at different times of the year.
1-ESS1-1

Seasons and the amount of daylight in a given day are caused by the tilt of the Earth and where the Earth is in its revolution around the Sun.
1-ESS1-2, 3-ESS2-1, MS-ESS1-1

When it is winter in the southern hemisphere, it is summer in the northern hemisphere.
3-ESS2-2 (F)

Each planet rotates on its axis at different rates. For the Earth, one rotation takes ~24 hours.

The rotation of planets causes the Sun to appear to move across the sky, stars to move across the sky, and causes day and night.
1-ESS1-1

The Sun "moving" across the sky changes the shadows seen on Earth.
5-ESS1-2

Planets have sufficient mass for self-gravity.

There are gaseous planets and rocky planets.

Gaseous (Jovian) planets were formed from gases condensing to icy fragments that accumulate due to gravity.

Gaseous planets are found farther from stars than rocky planets.

Gaseous planets' distance from Sun:
Jupiter: 778,570,000 km
Saturn: 1,433,530,000 km
Uranus: 2,872,460,000 km
Neptune: 4,495,060,000 km
MS-ESS1-3

Rocky (Terrestrial) planets were formed from gases condensed to rocky fragments that accumulate due to gravity.

Earth is a rocky planet.

Rocky planets are found closer to stars than gaseous planets.

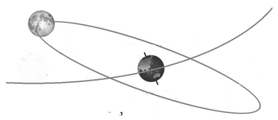
Rocky planets' distance from Sun:
Mercury: 57,910,000 km
Venus: 108,210,000 km
Earth: 149,600,000 km
Mars: 227,920,000 km
MS-ESS1-3

Planets (much larger) are sometimes orbited by moons (much smaller).

The Earth has one moon.

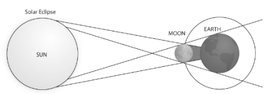
There is a cyclic pattern of lunar phases that repeats approximately every 29 days.
MS-ESS1-1

The Moon/Earth orbit is not in plane with the Earth/Sun orbit.



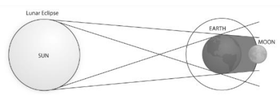
1-ESS1-1, MS-ESS1-1

When the Moon is positioned between the Earth and Sun, there is a solar eclipse, seen only during the day.



MS-ESS1-1

When the Earth is positioned between the Moon and Sun, there is a lunar eclipse, seen only at night.



MS-ESS1-1