



Conditions on Mars: Temperatures, seasons, climate

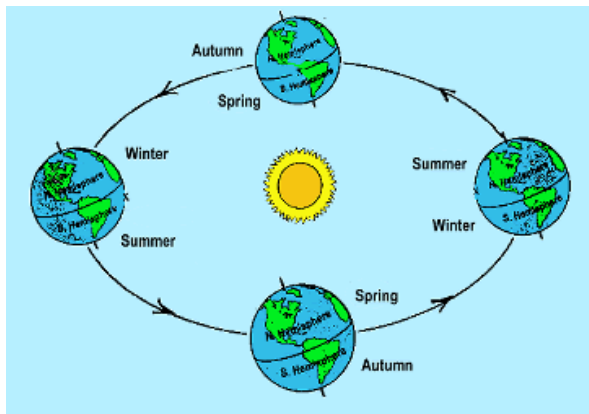
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The average surface temperature on Mars ranges from 180 to 270 K, or –93 degrees C to –3 degrees C (-135 degrees F to 26 degrees F). Daytime temperatures range from 216-226 K (-57 to -47 degrees C, or –71 to –53 degrees F), and nighttime temperatures range from 153-208 K (-120 to –65 degrees C, or –184 to –85 degrees F).

Like Earth, Mars experiences changes of seasons. On any planet, changes of season are caused by the tilt of the planet's axis. As a result of a planet's axial tilt, the north pole of a planet's axis points toward the Sun at times in its orbit around the Sun, and at other times, it points away from the Sun.

As an example, when the north pole of Earth's axis is pointing toward the Sun, the northern hemisphere receives the most direct rays of sunlight. The Sun travels very high in the sky during this time, and the number of daylight hours per day is increased. With longer days and more direct sunlight, the northern hemisphere is heated, causing summer. At the same time, the opposite is true for the southern hemisphere. That part of the Earth receives the least amount of direct rays of sunlight, the sun is very low in the sky, and the days are very short. This causes the southern hemisphere to experience winter.

Conversely, when the north pole of the Earth's axis is pointing away from the Sun, the northern hemisphere receives the least direct rays of sunlight. The Sun travels is very low in the sky during this time, and the number of daylight hours per day is decreased. With shorter days and less direct sunlight, the northern hemisphere is cooled, causing winter. At the same time, the opposite is true for the southern hemisphere. That part of the Earth receives the most amounts of direct rays of sunlight, the sun is very high in the sky, and the days are very long. This causes the southern hemisphere to experience summer.



The axial tilt of a planet causes seasons.

The length and severity of seasons on a planet are determined by the amount of the planet's axial tilt. A planet with no axial tilt would have no seasons, while one with a 90 degree axial tilt (such as Uranus!) would have very extreme seasons. Seasons on Earth are moderate because Earth's axis is tilted by 23.45 degrees. Mars has seasons that are very similar to Earth's because Mars' axis is tilted by 23.98 degrees.

On Earth, the axial tilt is the only reason we have seasons. The Earth's orbit is very nearly circular, so the seasons are not influenced by the small amount that the Earth is closer to or farther from the Sun over the course of a year. (If Earth's distance from the Sun was what caused the seasons, the entire Earth would experience the same season at the same time, which, of course, isn't true!)

Seasons on Mars are a little more complicated. Mars has a more elliptical orbit than Earth, so the small amount that the planet is closer to or farther from the Sun over the course of a year do make a difference in the amount of sunlight that reaches Mars. However, for the most part, the seasons are caused by the tilt of Mars' axis.

In terms of Mars' climate history, Mars is much colder now than it was in its early days. More than 2 billion years ago, Mars was much warmer, and consequently, wetter.

The Benchmark Lessons were developed with the help of the following sources:

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Zeilik, Michael, Gregory, Stephen A., and Smith, Elske v. P. *Introductory Astronomy and Astrophysics*. Saunders College Publishing, Harcourt Brace Jovanovich College Publishers, Austin, 1992.

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College of Education, University of Texas at Austin,
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