



MARS: DESCRIPTION

Mars is the fourth planet from the Sun in the solar system after Earth and before Jupiter [2]. It is often called the “Red Planet” because of its orange-red color visible from Earth [4]. Mars is one of the four terrestrial, or earthlike, planets. It is made up of rocky layers enclosing a metal core, and layers of gases, or an atmosphere, surrounding it [5:4]. The thin, cold Martian atmosphere consists mainly of carbon dioxide [4]. Underneath this carbon dioxide dominant atmosphere, ice caps form at the north and south poles [5:4]. The numerous earthlike surface features include enormous volcanoes, large canyons, and eroded channels. The following paragraphs describe the size, mass, distance, surface, and climate of the dry planet Mars.

Mass and Size

The equatorial diameter, or distance across Mars is 4,220 mi (6,792 km) as shown in Figure 1. Half of the diameter of Mars from pole to pole is known as its polar radius. The polar radius of the Red Planet is 2,098 mi (3,376.2 km). The equatorial circumference, or measurement of the distance around the equator, is 13,259 mi (21,339 km). The measurement of the amount of matter Mars contains is 642 sextillion kg (6.4169×10^{23} kg). The volume, or amount of space occupied by Mars, is 39 billion mi^3 (163 billion km^3) [6].



Figure 1. The equatorial diameter of Mars [6].

Distance and Orbital Characteristics

Figure 2 shows the location of Mars in the solar system. As mentioned previously, it is the fourth planet from the sun, and lies between Earth and Jupiter [2]. A ring of rocky bodies, or asteroid belt, lies between Mars and Jupiter [5:6]. The distance of Mars from the Sun varies based on its orbit and axial tilt. However, the average distance is about 142 million mi (229 million km). The closest distance between the Sun and Mars is 128,409,598 mi (206,655,215 km). The farthest distance is 154,865,853 mi (249,232,432 km) [6].

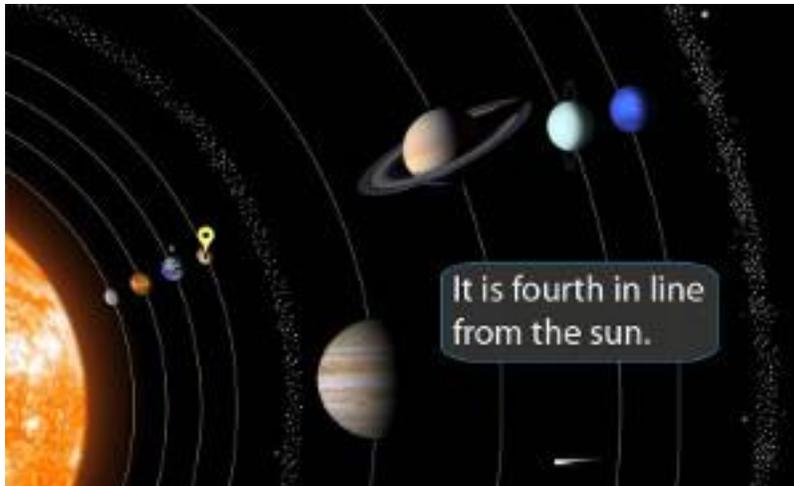


Figure 2. The location of Mars in our solar system [7].

Mars orbits the Sun at a rate of 53,858 mi per hour (86,677 km per hour). The Red Planet travels 887,992,283 mi (1,429,085,052 km) in its orbit around the Sun. Mars makes a full orbit around the Sun in 687 Earth days, the length of the Martian year. Because Mars's year is longer, its seasons are also longer. The planet's elliptical orbit causes some seasons to be longer than other seasons. The southern hemisphere has a longer autumn and winter, while the northern hemisphere has a longer spring and summer. It takes 1.029 Earth days, or 24 hours and 37 minutes, for Mars to make one rotation on its axis. Mars has an axial tilt of approximately 25.2° as shown in Figure 3. Due to the varying orientation of the tilt, changes occur in the amount of sunlight reaching different latitudes [6].



Figure 3. The axial tilt of Mars [6].

Composition

The density of Mars is 3.9 g/cm³ (3,933 kg/m³), less than that of any other terrestrial planet. This mass divided by Mars's volume gives an idea of how much metal it contains, as well as whether it is a solid or gas [6].

Planet. The planet's composition consists of a crust, mantle, and core. The thick crust, or hard outer layer, is 125 mi (220 km) deep [5:7]. The crust is mostly made up of iron-rich basaltic rock similar to Earth's crust [6]. It covers a 1,360 mi (2,190 km) thick layer of heavier rock called the mantle [5:7]. The mantle consists of silicate rock [6]. Scientists are

uncertain of whether the core is cooled metal, hot liquid, or in two distinct layers. More than likely, the core is iron, nickel, and sulfur [6].

Soil. The surface of Mars is blanketed in a fine sand and dust that is rich in iron oxide, or rust. The sand and dust are picked up by winds, which create sandstorms, filling the atmosphere with iron oxide. The iron oxide absorbs green and blue light, and reflects yellow, orange, and red. This is what gives Mars its orange-red hue that is visible from Earth as seen in Figure 4 [3].



Figure 4. The view of Mars from a telescope on Earth [8].

Atmosphere. The atmosphere of Mars is notably thin, which prevents the insulation of heat [4]. The surface pressure averages approximately 6.5 millibars (650 Pa). The Martian atmosphere contains 96% carbon dioxide, 1.93% argon, 1.89% nitrogen, 0.145% oxygen, less than 0.01% carbon monoxide, and other trace gases. The mean temperature of the atmosphere is 81°F (-63°C). The typical minimum and maximum surface temperature varies between day and night and among seasons. The surface temperature of Mars varies between -284 to 86°F (-140 to 30°C) [6].

Geology and Geography

The features of the rocky surface of Mars include volcanoes, deep basins, networks of channels, and frozen polar caps. The northern hemisphere looks very different from the southern hemisphere. The terrain of the southern hemisphere is densely cratered. Surface rocks in the southern hemisphere are mostly basaltic, or silicon-poor, in mineralogy. Alternatively, many lava-covered plains with few impact craters dominate the northern hemisphere. Typically, the mineral compositions are andesitic, or silicon-rich [1].

Impact crater basins. Many impact crater basins can be found in the southern hemisphere of the Martian surface. Hellas, the largest of these deep depressions, is centered at 290°W, 40°S. It is approximately 2,500 mi (4,000 km) across, and 6 mi (9 km) deep. Hellas ranks as the largest known impact structure in the solar system [1].

Volcanoes. Some of the largest volcanoes in the solar system rise on the northern hemisphere of Mars. As the volcanoes erupted, the lava spread over the Martian surface. The lava cooled and formed the planet's northern plains. The four largest volcanoes on

Mars are wide with gently sloping sides [5:14]. Three of these volcanoes rise on the Tharsis bulge. The Tharsis bulge, or ridge, is an enormous tectonic and volcanic edifice that affects one-quarter of the Martian surface. At the highest point of these volcanoes is a complex of collapsed craterlike features that once served as vents for lava. Scattered mostly in the northern hemisphere, volcanoes of different states of preservation measure up to 60 mi (100 km) high [1].

Canyons. Deep canyons dominate Mars near the equator. The Valles Marineris is a massive canyon stretching one-fourth of the way around Mars. It begins near the Tharsis bulge and continues east along the equator. The length of the Valles Marineris is about 2,500 mi (4,000 km), 120 mi (200 km) wide, and 4 mi (7 km) deep [5:17].

Channels. Places where rivers may have flowed over the Martian surface may have eroded to form networks of winding channels. These channels range in size1width? from 300 ft (100 m) to 40 mi (60 km) [1]. Some of the channels start in high ground and slowly widen as they stretch to lower ground. Others are more narrow and have smaller branches of channels extending from them [5:18].

Polar caps. Large bright polar caps that change in size on a seasonal cycle are located on the north and south poles of Mars. Mars's polar caps are made up of frozen carbon dioxide and water ice [1]. The polar caps are largest in winter and smallest during summer when more ice melts. Because the seasons of the north and south of Mars are opposite, one ice cap is at its smallest when the other is at its largest. The northern polar cap has a prominent spiral pattern, likely caused by swirling winds [5:20]. At the end of winter, the polar caps cover a large area extending down to latitude 60° in the southern hemisphere and 70° in the northern hemisphere. When the caps are at their smallest, they can reach minimum diameters of approximately 400 and 250 mi (650 and 400 km) [1].

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