Chapter 1 The Solar System

May 4 - May 8

Key Content/Modeling
Assignment 1. Use the April Packet to complete Lessons 1.9, 1.10, 1.11, and 1.12 in the Science section, pages 135-150. (8th Grade Packet)

Assignment 2. Read and complete the probe How Long Is A Day On the Moon? (Activity 1)

Assignment 3. Complete a Frayer model for each of the vocabulary words. (You Try)

Assignment 4. Read the three selections, Mercury, Venus, and Mars then follow the directions and write Cornell notes or Mark the Text. (Activity 2)

You Try Create a Frayer model for each of the words. Remember to identify some of the characteristics and attributes of the word, give some examples, illustrate the word, and use the word in a sentence.

Mercury Venus Moon maria terrae Mars crater atmosphere spacecraft rotate axis telescope

Show me what you know (Proof of learning)
Email your teacher your completed work in whatever format you are comfortable with. We have been receiving your work in many ways!

Self-Assessment
Why is it important to study the objects in the solar system? Why did humans go to the moon? Why do humans plan on travelling to Mars?

Extra Learning Opportunities—Activity 1: Read How Long Is A Day On the Moon? and follow the directions to complete the probe. Activity 2: Read the informational texts Mercury, Venus, and Mars and write Cornell Notes on a separate piece of paper or print out a copy of the reading and Mark the Text.

SCIENCE STANDARD: DCI
ESS1.B The solar system consists of the sun and a collection of objects, the planets, their moons, and asteroids that are held in orbit around the sun because of it’s gravitational pull on them. (MS-ESS1-2), (MS-ESS1-3)

What am I learning?
How are the craters on Mercury and Venus different?
What is the difference in the moon’s terrae and maria?
How do we know that Mars had flowing water in the past?
Where did the two moons of Mars come from?

How do I know I learned?
Describe the difference in the craters on Mercury and Venus.
Explain why terrae and maria on the moon look different.
Describe the evidence that shows how Mars once had flowing water.
Describe the possible origins of Mars’s two moons.
ACTIVITY 1: Read How Long Is A Day On the Moon?, decide which student has the best idea, and explain your thinking and describe any evidence that supports your answer.

How Long Is A Day On the Moon?

Four students were designing a moon base for a science project. Planning the moon base was the easy part. But deciding what a day-night cycle on the moon base would be like was hard! All four students had different ideas about how long a day was on the moon. Here is what they said about a day on the moon:

Frank: “I think the length of the day night-cycle is the same as earth, 24 hours.”

Hannah: “It depends on where the moon base is. If it is on the dark side of the moon there will never be daytime.”

Miranda: “I think there would be about two weeks of sunlight and then two weeks of darkness.”

Ravi: “It depends on the moon phase. In a crescent moon, daylight would be much shorter. When there is a full moon, daylight would be much longer.”

Which student do you think has the best idea? _________________

Explain your thinking and describe any evidence that supports your answer.

MERCURY

The smallest planet in our solar system and nearest to the Sun, Mercury is only slightly larger than Earth’s Moon. From the surface of Mercury, the Sun would appear more than three times as large as it does from Earth, and the sunlight would be as much as 11 times brighter. Mercury is the fastest planet, zipping around the Sun every 88 Earth days.

With a radius of 1,516 miles (2,440 kilometers), Mercury is a little more than 1/3 the width of Earth. If Earth were the size of a nickel, Mercury would be about as big as a blueberry.

From an average distance of 36 million miles (58 million kilometers), Mercury is 0.4 astronomical units away from the Sun. One astronomical unit (abbreviated as AU), is the distance from the Sun to Earth.

Mercury's highly eccentric, egg-shaped orbit takes the planet as close as 29 million miles (47 million kilometers) and as far as 43 million miles (70 million kilometers) from the Sun. It speeds around the Sun every 88 days, traveling through space at nearly 29 miles (47 kilometers) per second, faster than any other planet.

Mercury spins slowly on its axis and completes one rotation every 59 Earth days. Mercury's axis of rotation is tilted just 2 degrees with respect to the plane of its orbit around the Sun. That means it spins nearly perfectly upright and so does not experience seasons like many other planets do.
Mercury formed about 4.5 billion years ago when gravity pulled swirling gas and dust together to form this small planet nearest the Sun. Like its fellow terrestrial planets, Mercury has a central core, a rocky mantle and a solid crust.

Mercury is the second densest planet, after Earth. It has a large metallic core with a radius of about 1,289 miles (2,074 kilometers), about 85 percent of the planet's radius. There is evidence that it is partly molten, or liquid. Mercury's outer shell, comparable to Earth's outer shell (called the mantle and crust), is only about 400 kilometers (250 miles) thick.

Mercury's surface resembles that of Earth's moon, scarred by many impact craters resulting from collisions with meteoroids and comets.

Very large impact basins, including Caloris (960 miles or 1,550 kilometers in diameter) and Rachmaninoff (190 miles, or 306 kilometers in diameter), were created by asteroid impacts on the planet's surface early in the solar system's history. While there are large areas of smooth terrain, there are also cliffs, some hundreds of miles long and soaring up to a mile high. They rose as the planet's interior cooled and contracted over the billions of years since Mercury formed.

Most of Mercury's surface would appear greyish-brown to the human eye. The bright streaks are called "crater rays." They are formed when an asteroid or comet strikes the surface. The tremendous amount of energy that is released in such an impact digs a big hole in the ground and crushes a huge amount of rock under the point of impact. Some of this crushed material is thrown far from the crater and then falls to the surface, forming the rays. Fine particles of crushed rock are more reflective than large pieces, so the rays look brighter.

Temperatures on the surface of Mercury are extreme, both hot and cold. During the day, temperatures on Mercury's surface can reach 800 degrees Fahrenheit (430 degrees Celsius). Because the planet has no atmosphere to retain that heat, nighttime temperatures on the surface can drop to minus 290 degrees Fahrenheit (minus 180 degrees Celsius).

Mercury may have water ice at its north and south poles inside deep craters, but only in regions of permanent shadow. There it could be cold enough to preserve water ice despite the high temperatures on sunlit parts of the planet.

Instead of an atmosphere, Mercury possesses a thin exosphere made up of atoms blasted off the surface by the solar wind and striking meteoroids. Mercury's exosphere is composed mostly of oxygen, sodium, hydrogen, helium and potassium.

Mercury's environment is not conducive to life as we know it. The temperatures and solar radiation that characterize this planet are most likely too extreme for organisms to adapt to.

VENUS

Venus is the second planet from the Sun and our closest planetary neighbor. Similar in structure and size to Earth, Venus spins slowly in the opposite direction from most planets. Its thick atmosphere traps heat in a runaway greenhouse effect, making it the hottest planet in our solar system with surface temperatures hot enough to melt lead. Glimpses below the clouds reveal volcanoes and deformed mountains.

Venus is named for the ancient Roman goddess of love and beauty, who was known as Aphrodite to the Ancient Greeks.

With a radius of 3,760 miles (6,052 kilometers), Venus is roughly the same size as Earth — just slightly smaller.

From an average distance of 67 million miles (108 million kilometers), Venus is 0.7 astronomical units away from the sun. One astronomical unit (abbreviated as AU), is the distance from the sun to Earth. It takes sunlight 6 minutes to travel from the sun to Venus.

Venus' rotation and orbit are unusual in several ways. Venus is one of just two planets that rotate from east to west. Only Venus and Uranus have this "backwards" rotation. It completes one rotation in 243 Earth days — the longest day of any planet in our solar system, even longer than a whole year on Venus. But the sun doesn't rise and set each "day" on Venus like it does on most other planets. On Venus, one day-night cycle takes 117 Earth days because Venus rotates in the direction opposite of its orbital revolution around the sun.

Venus makes a complete orbit around the sun (a year in Venusian time) in 225 Earth days or slightly less than two Venusian day-night cycles. Its orbit around the sun is the most circular of any planet — nearly a perfect circle. Other planet's orbits are more elliptical, or oval-shaped.
With an axial tilt of just 3 degrees, Venus spins nearly upright, and so does not experience noticeable seasons.

When the solar system settled into its current layout about 4.5 billion years ago, Venus formed when gravity pulled swirling gas and dust together to form the second planet from the Sun. Like its fellow terrestrial planets, Venus has a central core, a rocky mantle and a solid crust.

Venus is in many ways like to Earth in its structure. It has an iron core that is approximately 2,000 miles (3,200 kilometers) in radius. Above that is a mantle made of hot rock slowly churning due to the planet's interior heat. The surface is a thin crust of rock that bulges and moves as Venus' mantle shifts and creates volcanoes.

From space, Venus is bright white because it is covered with clouds that reflect and scatter sunlight. At the surface, the rocks are different shades of grey, like rocks on Earth, but the thick atmosphere filters the sunlight so that everything would look orange if you were standing on Venus.

Venus has mountains, valleys, and tens of thousands of volcanoes. The highest mountain on Venus, Maxwell Montes, is 20,000 feet high (8.8 kilometers), similar to the highest mountain on Earth, Mount Everest. The landscape is dusty, and surface temperatures reach a scalding 880 degrees Fahrenheit (471 degrees Celsius).

It is thought that Venus was completely resurfaced by volcanic activity 300 to 500 million years ago. Venus has two large highland areas: Ishtar Terra, about the size of Australia, in the north polar region; and Aphrodite Terra, about the size of South America, straddling the equator and extending for almost 6,000 miles (10,000 kilometers).

Venus is covered in craters, but none are smaller than 0.9 to 1.2 miles (1.5 to 2 kilometers) across. Small meteoroids burn up in the dense atmosphere, so only large meteoroids reach the surface and create impact craters.

Almost all the surface features of Venus are named for noteworthy Earth women — both mythological and real. A volcanic crater is named for Sacajawea, the Native American woman who guided Lewis and Clark's exploration. A deep canyon is named for Diana, Roman goddess of the hunt.

Venus' atmosphere consists mainly of carbon dioxide, with clouds of sulfuric acid droplets. The thick atmosphere traps the Sun's heat, resulting in surface temperatures higher than 880 degrees Fahrenheit (470 degrees Celsius). The atmosphere has many layers with different temperatures. At the level where the clouds are, about 30 miles up from the surface, it's about the same temperature as on the surface of the Earth.

As Venus moves forward in its solar orbit while slowly rotating backwards on its axis, the top level of clouds zips around the planet every four Earth days, driven by hurricane-force winds traveling at about 224 miles (360 kilometers) per hour. Atmospheric lightning bursts light up these quick-moving clouds. Speeds within the clouds decrease with cloud height, and at the surface are estimated to be just a few miles per hour. On the ground, it would look like a very hazy, overcast day on Earth. And the atmosphere is so heavy it would feel like you were 1 mile (1.6 kilometers) deep underwater.

No human has visited Venus, but the spacecraft that have been sent to the surface of Venus do not last very long there. Venus' high surface temperatures overheat electronics in spacecraft in a short time, so it seems unlikely that a person could survive for long on the Venusian surface.

There is speculation about life existing in Venus' distant past, as well as questions about the possibility of life in the top cloud layers of Venus' atmosphere, where the temperatures are less extreme.

**MARS**

The fourth planet from the Sun, Mars is a dusty, cold, desert world with a very thin atmosphere. This dynamic planet has seasons, polar ice caps, extinct volcanoes, canyons and weather. Mars is one of the most explored bodies in our solar system, and it's the only planet where we've sent rovers to roam the alien landscape. NASA missions have found lots of evidence that Mars was much wetter and warmer, with a thicker atmosphere, billions of years ago.

Mars was named by the Romans for their god of war because its reddish color was reminiscent of blood. Other civilizations also named the planet for this attribute; for example, the Egyptians called it "Her Desher," meaning "the red one." Even today, it is frequently called the "Red Planet" because iron minerals in the Martian dirt oxidize, or rust, causing the surface to look red.
On May 19th, 2005, NASA's Mars Exploration Rover Spirit captured this stunning view as the Sun sank below the rim of Gusev crater on Mars. Image Credit: NASA/JPL-Caltech/Texas A&M/Cornell

With a radius of 2,106 miles (3,390 kilometers), Mars is about half the size of Earth. If Earth were the size of a nickel, Mars would be about as big as a raspberry.

From an average distance of 142 million miles (228 million kilometers), Mars is 1.5 astronomical units away from the Sun. One astronomical unit (abbreviated as AU), is the distance from the Sun to Earth. From this distance, it takes sunlight 13 minutes to travel from the Sun to Mars.

As Mars orbits the Sun, it completes one rotation every 24.6 hours, which is very similar to one day on Earth (23.9 hours). Martian days are called sols—short for "solar day." A year on Mars lasts 669.6 sols, which is the same as 687 Earth days.

Mars' axis of rotation is tilted 25 degrees with respect to the plane of its orbit around the Sun. This is another similarity with Earth, which has an axial tilt of 23.4 degrees. Like Earth, Mars has distinct seasons, but they last longer than seasons here on Earth since Mars takes longer to orbit the Sun (because it's farther away). And while here on Earth the seasons are evenly spread over the year, lasting 3 months (or one quarter of a year), on Mars the seasons vary in length because of Mars' elliptical, egg-shaped orbit around the Sun.

Spring in the northern hemisphere (autumn in the southern) is the longest season at 194 sols. Autumn in the northern hemisphere (spring in the southern) is the shortest at 142 days. Northern winter/southern summer is 154 sols, and northern summer/southern winter is 178 sols.

When the solar system settled into its current layout about 4.5 billion years ago, Mars formed when gravity pulled swirling gas and dust in to become the fourth planet from the Sun. Mars is about half the size of Earth, and like its fellow terrestrial planets, it has a central core, a rocky mantle and a solid crust.

Mars has a dense core at its center between 930 and 1,300 miles (1,500 to 2,100 kilometers) in radius. It's made of iron, nickel and sulfur. Surrounding the core is a rocky mantle between 770 and 1,170 miles (1,240 to 1,880 kilometers) thick, and above that, a crust made of iron, magnesium, aluminum, calcium and potassium. This crust is between 6 and 30 miles (10 to 50 kilometers) deep.

The Red Planet is in reality many colors. At the surface we see colors such as brown, gold and tan. The reason Mars looks reddish is due to oxidization—or rusting—of iron in the rocks, regolith (Martian "soil"), and dust of Mars. This dust gets kicked up into the atmosphere and from a distance makes the planet appear mostly red.

Interestingly, while Mars is about half the diameter of Earth, its surface has nearly the same area as Earth's dry land. Its volcanoes, impact craters, crustal movement, and atmospheric conditions such as dust storms have altered the landscape of Mars over many years, creating some of the solar system's most interesting topographical features.

A large canyon system called Valles Marineris is long enough to stretch from California to New York—more than 3,000 miles (4,800 kilometers). This Martian canyon is 200 miles (320 kilometers) at its widest and 4.3 miles (7 kilometers) at its deepest. That's about 10 times the size of Earth's Grand Canyon.

Mars is home to the largest volcano in the solar system, Olympus Mons. It's three times taller than Earth's Mt. Everest with a base the size of the state of New Mexico.

Mars appears to have had a watery past, with ancient river valley networks, deltas and lakebeds, as well as rocks and minerals on the surface that could only have formed in liquid water. Some features suggest that Mars experienced huge floods about 3.5 billion years ago.

There is water on Mars today, but the Martian atmosphere is too thin for liquid water to exist for long on the surface. Today, water on Mars is found in the form of water-ice just under the surface in the polar regions as well as in briny (salty) water, which seasonally flows down some hillsides and crater walls.

Mars has a thin atmosphere made up mostly of carbon dioxide, nitrogen and argon gases. To our eyes, the sky would be hazy and red because of suspended dust instead of the familiar blue tint we see on Earth. Mars' sparse atmosphere doesn't offer much protection from impacts by such objects as meteorites, asteroids and comets.

The temperature on Mars can be as high as 70 degrees Fahrenheit (20 degrees Celsius) or as low as about -225 degrees Fahrenheit (-153 degrees Celsius). And because the atmosphere is so thin, heat from the Sun easily escapes this planet. If you were to stand on the surface of Mars on the equator at noon, it would feel like spring at your feet (75 degrees Fahrenheit or 24 degrees Celsius) and winter at your head (32 degrees Fahrenheit or 0 degrees Celsius).
Occasionally, winds on Mars are strong enough to create dust storms that cover much of the planet. After such storms, it can be months before all the dust settles.

Scientists don't expect to find living things currently thriving on Mars. Instead, they're looking for signs of life that existed long ago, when Mars was warmer and covered with water.

Mars has two small moons, Phobos and Deimos, that may be captured asteroids. They're potato-shaped because they have too little mass for gravity to make them spherical. The moons get their names from the horses that pulled the chariot of the Greek god of war, Ares. In ancient Greek, Phobos means “flight,” and Deimos means “fear.”

Phobos, the innermost and larger moon, is heavily cratered, with deep grooves on its surface. It is slowly moving towards Mars and will crash into the planet or break apart in about 50 million years.

Deimos is about half as big as Phobos and orbits two and a half times farther away from Mars. Oddly-shaped Deimos is covered in loose dirt that often fills the craters on its surface, making it appear smoother than pock marked Phobos.