

Activity I6: Planets And Their Features

Mercury

Mercury is an extreme planet. It is the fastest of all the planets. It is one of the hottest planets, and it is also one of the coldest! It may be the site of the largest crash in the history of the solar system. Mercury may also have the strangest view of the sun in the whole universe!

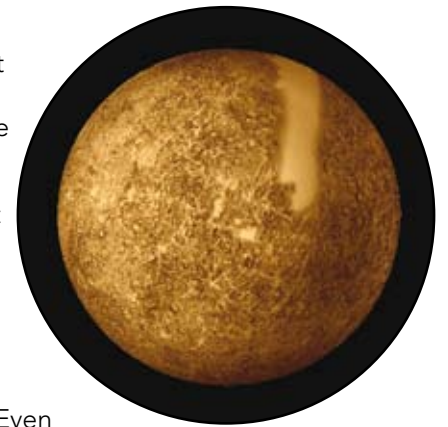
Mercury zooms around the sun at a speed of 48 kilometres per second, or half as fast again as the Earth travels.

At certain times and places, Mercury's surface temperature can rise to twice the temperature inside an oven when you are baking a cake. On the other hand, in the shadow of its North Pole craters, Mercury has ice like our North Pole does.

Since Mercury is so close to the sun, we have never been able to see it in any detail. Even with the most powerful telescope, Mercury looks like a blurry white ball. It wasn't until 1974 that we really began to learn about Mercury. In 1974 and 1975, Mariner 10 flew by Mercury three times and sent back about 12,000 images.

These pictures combined to give a map of about 45% of Mercury's surface, and what they show us is a planet covered with craters, much like our moon. Mercury's largest land feature is the Caloris Basin, a crater formed by a collision with a meteorite long ago. The size of the Caloris Basin, about 1350 kilometres in diameter, suggests that this may have been the largest impact ever. In fact, the impact was so intense, that scientists think it sent shock waves through the center of Mercury, causing strange landforms to appear on the opposite side of the planet. These landforms, nicknamed "weird terrain," look like nothing we have seen anywhere else except on the moon.

Around some of Mercury's larger craters are secondary craters, formed when rocks from Mercury's surface were thrown up by the impact, and then fell back to Mercury, causing craters of their own.



- Mercury is the ____ planet.
 - Hottest
 - Fastest
 - Largest
 - None of the above
- Scientists used a powerful telescope to discover the Caloris Crater on Mercury.
 - False
 - True
- The landforms on Mercury called "weird terrain" are located ____.
 - Around large craters
 - On the side of the planet opposite a large crater
 - At the North Pole
 - In the Caloris Crater
- Messenger is the name of one of Mercury's moons.
 - False
 - True
- Mercury has an "extreme" view of ____.
 - The sun
 - Pluto
 - The moon
 - Earth
- Which happened last.
 - Scientists tried to see Mercury through telescopes.
 - The spacecraft Messenger explored Mercury.
 - The spacecraft Mariner 10 explored Mercury.
 - The planet Mercury was formed.
- This article is mainly about ____.
 - A planet that is more like earth than any other planet
 - An unusual planet and what we can learn from it
 - Planets and stars
 - The Messenger spacecraft
- The word collision in paragraph 5 means about the same thing as ____.
 - Crash
 - Planet
 - Crater
 - Landing

Mercury Word Search

Find each of the following words

SECOND SMALLEST

ROCKY

88 DAYS

REVOLUTION

CRATERS

HYDROGEN

IRON CORE

NO SEASONS

NO MOON

58.6 DAYS ROTATION

ELLIPTICAL ORBIT

MERCURY

HELIUM

THIN ATMOSPHERE

CLOSEST TO SUN

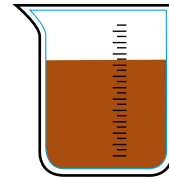
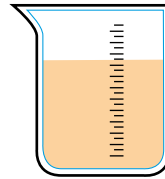
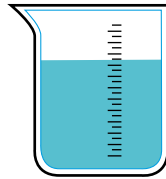
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World of Water

The Earth's surface is over 2/3rd Oceans. All of this water affects Earth's weather in many ways - especially the temperature.

Materials

Three clear beakers of the same size
 Water, loose sand, and topsoil
 Thermometer
 Access to a freezer



Activity

In three beakers of the same size, place equal volumes of water, loose sand and moist topsoil. Allow the three beakers to sit in a warm room until all three substances are at the same temperature. Place all three beakers in a freezer for five minutes. Record the temperature of the contents of each beaker while still in the freezer. Leave the beakers in the freezer until they are at the same temperature.

Then return them to room temperature and record their temperatures after five minutes. List your data below.

Beaker	Temperature In room	Temperature after 5 min in freezer	Temperature after 5 min in room
Water-filled	_____	_____	_____
Sand-filled	_____	_____	_____
Soil-filled	_____	_____	_____

Which substance cools off the most quickly? _____

Which substance cools off the most slowly? _____

Which parts of the Earth have very rapid changes in temperature? _____

Why do you predict this? _____

Which substance warms up the most slowly? _____

Which substance warms up the most quickly? _____

Which parts of the Earth have very rapid changes in temperature? _____

How do you predict this? _____

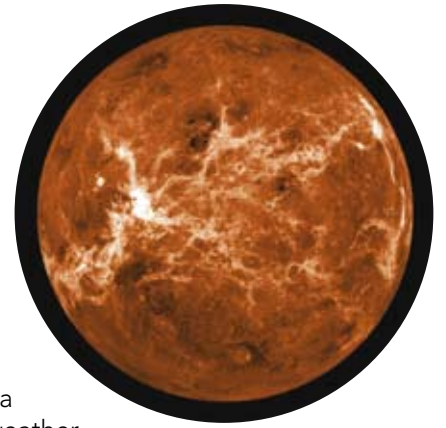
Which parts of the Earth experience less daily temperature change? _____

How do you know this: _____

Venus

People love to complain about the weather, and they love to blame the weatherman. Weather forecasters give us the bad news about rain, snow, and sleet. They report summer weather that is too hot to have fun in the sun, and winter weather that is so cold you just want to stay inside wrapped up in an old quilt. Of course, they also get to report sunny days, blue skies with puffy little white clouds, rain to make the crops grow, spectacular thunderstorms and tornadoes, and snow holidays. Being a weather forecaster here on Earth is really not a bad job. Weather forecasters report beach weather, ski weather, and travel weather too. Overall the weather here on Earth is really pretty good, especially compared to the weather on, say, Venus.

Being a weather forecaster on Venus would be a totally different matter. Being a weather forecaster on Venus might just be the worst job of them all. Just for starters, a day on Venus lasts as long as 117 days on Earth. How would you like to prepare the weather report for one of those days? Just take a look at some of the weather conditions you would have to report.



Sunshine: None. Even though Venus is a hot planet, it never, ever, gets a nice sunny day. Its dense atmosphere filters out most of the sun, letting only very weak sunlight through.

Sunrise/Sunset: On Venus the sun rises in the West and sets in the East, but not very often. Remember, one Venusian day is the same length as 117 Earth days.

Storms: Thunder and lightning are an everyday thing in Venus' atmosphere, but on the surface Venus is a dry planet with no rain or snow.

Clouds: Venus has a thick atmosphere with several layers of clouds. In fact, it is always cloudy on Venus. In the upper atmosphere the clouds, containing poisonous sulfuric acid, give Venus its pale yellow colour.

- Venus has _____.
 - Mountains
 - Oceans
 - Short days
 - Comfortable temperatures for humans
- This article is mainly about _____.
 - Conditions on Mars
 - Whether Venus has any water
 - How to be a weather forecaster
 - Conditions on Venus
- The temperature on Venus does not become cool at night because of _____.
 - Its rotation
 - The bright sunlight
 - Its revolution
 - The dense atmosphere
- From the facts in the article, you can infer that the temperature on Venus is _____ degrees Fahrenheit.
 - Approximately 100
 - Over 2000
 - Over 250
 - Below zero
- Spacecraft that have landed on Venus have only lasted for a few hours there. This is probably because of _____.
 - Lightning
 - Falling in craters
 - Aliens
 - The harsh atmosphere
- At one time, people thought that Venus might be much like Earth. Now we know that that is not true because Venus has _____.
 - An atmosphere that is way too harsh for humans
 - Five moons
 - Many forms of precipitation
 - Clouds in its atmosphere
- The meaning of the word atmosphere is most like _____.
 - Air
 - Water
 - Temperature
 - Land
- Where do you think would be the best places for a weather forecaster to work? The worst?

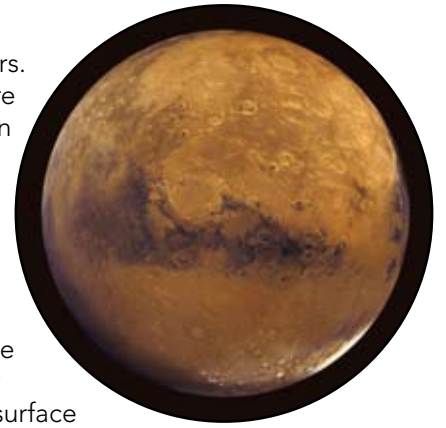
Mars

There is a story called *The War of the Worlds*. It's about an invasion of aliens from Mars. At one time, *The War of the Worlds* was made into a radio play. As people everywhere turned on their radios and heard what sounded like a news broadcast about a Martian invasion, they began to panic. For a long time, people had wondered whether there was life on Mars, and now suddenly it seemed that not only were there creatures living on Mars, but the creatures were coming to attack us here on Earth.

Well, that was only a story, but people do have good reasons to wonder whether there might have been life forms on Mars at one time. Mars is next to the earth in the solar system, and may be more like Earth than the other planets. It has some of the same chemicals that Earth has on its surface and in its atmosphere. It has some water vapour in its air, and ice caps at the poles. Mars gets lots of sunlight, and has a solid surface to walk on.

However, in other ways, Mars is very different from our planet. Its atmosphere is very thin; it gets so much solar radiation that any creatures on Mars would get an instant sunburn. It is a dry and dusty planet, much of it coated with red, rusty Martian dust. The average surface temperature on Mars is about -60 degrees centigrade, way below freezing. The biggest difference of all is that Mars has no water on its surface.

Scientists believe that water may be one of the best signs of life on another planet, and so Mars explorations have focused on finding out whether there is, or was, any water on Mars' surface. In 1971, a spacecraft named Mariner 9 orbited Mars and found out that Mars had valleys and channels on its surface. Perhaps they were carved out by water a long time ago. In 1975, the Viking landers, Viking I and Viking II, searched for any signs of life on Mars' surface. Their results were inconclusive; they weren't able to prove whether or not there had ever been life on Mars.



- This article is mainly about _____.
 - The solar system
 - The chemicals in Mars' soil
 - The Viking spacecrafts
 - The search for life on Mars
- "Spirit" is _____.
 - A rover
 - An astronaut
 - A booster rocket
 - An orbiting spacecraft
- Mars is _____.
 - A giant planet like Jupiter
 - The smallest planet in our solar system
 - A planet with a solid surface like Earth
 - Covered by oceans
- The word inconclusive means _____.
 - False
 - Negative
 - Positive
 - Giving no definite proof
- If Mars never had any _____, it most likely never had any life forms as we know them.
 - Volcanoes
 - Clouds
 - Trees
 - Water
- Which happened first?
 - Mariner 9 orbited Mars
 - Viking I landed on Mars
 - The rover Spirit landed on Mars
 - The War of the Worlds aired on radio
- At the time this article was written, Spirit _____.
 - Was on Mars and ready to explore
 - Was on its way back to Earth
 - Had not been heard from
 - Was on its way to Mars
- What do you think scientists might learn from the rocks and dust that Spirit is exploring. List several ideas.

Jupiter

When I put on my shoes to take a walk, I know that I'll be walking on the nice solid surface of planet Earth. When I look up and see clouds and blue sky, I know that they make up the atmosphere that surrounds Earth. At night, I can see our one moon in the sky. I can't see the ocean from here, but I know that if I take a drive to the beach, it will be there. This is what makes up a planet -- a good solid surface under my feet, bodies of water, atmosphere up there in the sky, and one moon in orbit.

At least that is what I thought a planet was, back when the only planet I knew about was Earth. But soon I learned that there were other planets out there.

People on Earth have known that there were other planets visible in the sky since ancient times. Since Earth was the only planet they had seen up close, they probably imagined that the other ones were similar to Earth too. As astronomers learned more about Mercury, Venus, and Mars, the three planets closest to Earth, they found out that there were differences as well as similarities.

In the 1600's, when Galileo used his telescope to look up at the next planet, Jupiter, he began to notice that Jupiter was very different from the four planets closest to the sun. Jupiter had four moons! This seemed like such a fantastic discovery that many people didn't believe Galileo. Some other astronomers refused to take him seriously. Now we know that the four moons discovered by Galileo -- Europa, Callisto, Ganymede, and Io -- were just the beginning.

In the centuries after Galileo's discoveries, astronomers developed better and better telescopes. With each improvement, they were able to see Jupiter in better detail. These early astronomers discovered Jupiter's great red spot, a storm as big as two Earths that has been going on for hundreds of years. They were also able to measure Jupiter's diameter and figure out its mass. Jupiter's diameter at its equator is about 143,000 kilometres. Its mass is about 318 times the mass of earth.

Once scientists knew the size and mass of Jupiter they could calculate its density. This is when Jupiter began to get even more interesting. Its density is extremely low, so low in fact that Jupiter is not a solid planet at all. Jupiter does not have a surface in the way that a planet like Earth does. Jupiter's surface consists of gas, much like its atmosphere, only more compacted.



- Jupiter is the _____ planet from the sun.
 - Fifth
 - Fourth
 - Third
 - Seventh
- From the article, you can tell that Jupiter was first discovered _____.
 - After 1700
 - In the 1930's
 - In 1600 BC
 - In the 1600's or earlier
- _____ discovered the first four of Jupiter's moons.
 - Wildt
 - Galileo, the spacecraft
 - Galileo, the astronomer
 - Voyager
- Io is a _____.
 - Planet
 - Moon
 - Spacecraft
 - Sun
- Jupiter's surface is _____.
 - Similar to Earth's
 - Very different from Earth's
 - All water
 - Very rocky
- A telescope is used to _____.
 - Travel in space
 - Look at things too small to see with the eye
 - Take photographs in space
 - Make far away things appear closer
- Planets _____ are discussed in this article, but the article is mainly about _____.
 - Jupiter and Mars, Mars
 - Callisto and Ganymede, Callisto
 - Jupiter and Io, Io
 - Jupiter and Earth, Jupiter
- Explain one way that Jupiter is like a planet, and one way that it is like a star.

Saturn

Saturn is a favourite of people who have a telescope to look at the sky. Other planets are visible through a telescope on Earth, and so is the moon, but Saturn always seems to be the most popular.

Saturn is a lot like Jupiter and Uranus, the other two giant gas planets. It is the second largest planet, with a diameter of 119,300 kilometres. It rotates very fast on its axis and revolves very slowly around the sun. It is the least dense of all the planets, even less solid than Jupiter. In fact, the density of Saturn is less than the density of water, which means that it could float if it had a big enough pond to float in. Like Jupiter, Saturn has a solid, rocky core surrounded by a layer of liquid metallic hydrogen. Beyond that is the giant outer layer of mostly ordinary hydrogen.

Saturn was named after the god of agriculture. Our word Saturday comes from the same root word.

But why does everyone like to look at Saturn? Saturn is a lot like some of the other planets, but it also has something the others don't -- those beautiful rings. Saturn's many colorful rings, made up of many more ringlets, are what keep people coming back for another look. Like the wide brim on a colorful Easter hat, Saturn's rings are something to see.

The rings around Saturn are made up of particles of ice and ice-covered rock. Some particles are just tiny specks, and some may be elephant-sized. Some rings have more ice, and some have more rock; some have more space between the particles. This means that some rings let more light through than others. This is part of the reason why the rings appear to be different colors. Saturn's rings show up bright in the sky, while other planets have either thin, faint rings or no rings at all.



Scientists think that the rings may have been formed from bits of a moon that exploded in space.

- 1 Saturn is similar to _____.
 - A. Jupiter
 - B. Uranus
 - C. Mars
 - D. Both (a) and (b)
- 2 Saturn has _____.
 - A. One ring and one moon
 - B. Many rings and one moon
 - C. Many rings and many moons
 - D. One ring and many moons
- 3 According to this article, people like to look at Saturn because _____.
 - A. Of its rings and moons
 - B. Of its orbit
 - C. It is close to Earth
 - D. It is the largest planet
- 4 This article names _____ spacecraft that landed on Saturn.
 - A. No
 - B. One
 - C. Two
 - D. Three
- 5 The unusual metal found on Saturn is _____.
 - A. Iron
 - B. Metallic oxygen
 - C. Steel
 - D. Metallic hydrogen
- 6 The meaning of the word density is most similar to the meaning of _____.
 - A. Weight
 - B. Size
 - C. Brightness
 - D. Color
- 7 Two synonyms for huge are _____.
(Choose two of the best answers.)
 - A. Enormous
 - B. Bright
 - C. Vast
 - D. Thick
- 8 There are other planets with rings.
 - A. False
 - B. True

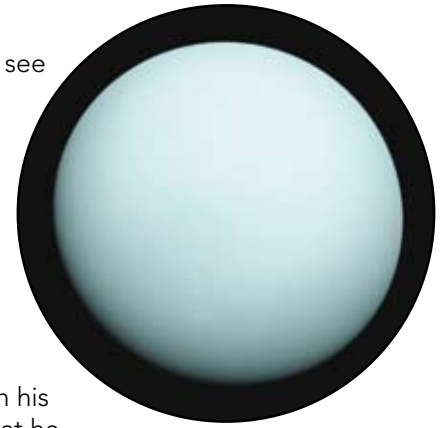
Uranus

As long as people have lived on Earth, they have been able to look up in the sky and see planets. Prehistoric people looked up and saw Mars and some of the other planets; they just didn't know that they were planets. By the time of the ancient Greeks, some logically-minded people had figured out that not everything up there was a star. Stars stayed in one place, but other heavenly bodies, such as planets, moved. In this way, they discovered the planets closest to Earth: Mercury, Venus, and Mars, and also two of the giant planets, Jupiter and Saturn.

It wasn't until the age of astronomy and telescopes that people were able to learn much more about the solar system.

William Herschel was an astronomer in the 18th century who enjoyed looking through his telescope to see what he could see. In fact, he became so interested in astronomy that he began to build his own telescopes. In 1781, Herschel was looking through one of his own telescopes in his hometown of Bath, England. It was a seven-foot long telescope with a seven-inch lens. When he noticed an interesting dot in the sky, he reset his telescope to a higher magnification and looked again. The dot was bigger. At an even higher magnification, the dot was bigger still. Since stars always look about the same size because they are so far away, this told him that what he was looking at must be something else. At first he thought he had sighted a comet.

As astronomers did at that time, he quickly shared his discovery so that others could observe it too. They were not convinced that it was a comet. Most comets have a tail and get brighter. Herschel's discovery didn't fit this description. For a while they weren't sure what it was. Finally, an astronomer from Russia named Anders Lexell determined that it must be a planet by calculating its orbit.



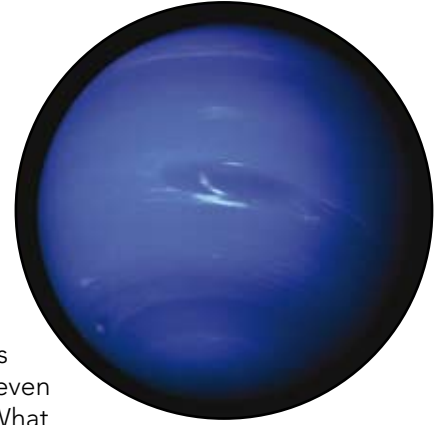
- William Herschel discovered _____.
 - Mars
 - Uranus and its rings
 - Mercury
 - Uranus and two of its moons
- When Herschel increased the magnification on his telescope and noticed that the size of the object he was viewing became larger, he knew that it was _____.
 - A planet
 - A star
 - A comet
 - Not a star
- Uranus was discovered _____ Jupiter.
 - Behind
 - Before
 - After
 - At the same time as
- Which happened first?
 - Voyager 2 explored space
 - Telescopes were invented
 - Uranus was discovered
 - Mars was discovered
- William Herschel was _____.
 - The first person to use a telescope
 - An astronomer in Bath, England
 - An ancient Greek astronomer
 - A prehistoric person
- Herschel _____.
 - Discovered Uranus
 - Made telescopes
 - Studies the sky with his telescope
 - All of the above
- From the article, you can infer that astronomy means _____.
 - Traveling in spacecrafts
 - All branches of science
 - Studying the stars and planets
 - Making telescopes
- Draw a picture of the planets orbiting the sun. Label Earth's north and south poles. Label Uranus' north and south poles.

Neptune

The story of Neptune's discovery is a story about Math and Chemistry. Neptune was discovered because of the predictions of two mathematicians. Later, Voyager 2 gave us some clues as to Neptune's chemical makeup. Scientists have put all of these mathematical and chemical clues together to learn as much as they can about planet Neptune.

Neptune Math

In the 1840's, astronomers were interested in the planet Uranus, the most recently discovered planet. Since it was so far away, one of the best ways they had to learn more details about Uranus was through math. Mathematicians were studying Uranus's orbit when they noticed something strange. Uranus didn't travel along its path at an even speed. It sped up sometimes, and sometimes it slowed down. What did this mean? What was causing Uranus to change its speed at certain times? The scientists had a theory. They thought the cause might be a pull from the gravity of another planet even farther out. In England, a mathematician named John Couch Adams worked on the problem. He was able to calculate Uranus's orbit and then predict where the gravitational pull should be coming from. In France another mathematician, Urbain Leverrier, studied the same problem and came up with a similar solution. Then two German astronomers, Johann Galle and Heinrich D'Arrest, began looking through their telescopes for the mystery planet. They used Adams's and Leverrier's calculations to tell them just where to look. This is how they discovered Neptune.



Mathematical calculations have also made it possible for scientists to discover Neptune's moons. Its largest moon, Triton, was discovered in 1846, the same year that Neptune was discovered. In 1949 a second moon, Nereid, was discovered. Then, in 1989, six more moons were discovered when the Voyager 2 spacecraft flew by Neptune. Only by precise mathematical calculation was this voyage even possible. Exact calculations of speed, time, distances, gravities, and orbits guided Voyager 2.

- 1 According to this article, math and chemistry
 - A. Were Urbain Leverrier's favorite subjects
 - B. Are no longer necessary subjects
 - C. Were used to discover all of the planets
 - D. Made it possible to discover Neptune
- 2 Neptune was discovered in _____.
 - A. 1949
 - B. 1846
 - C. 1800
 - D. 1989
- 3 The article names _____ spacecraft that flew by Neptune.
 - A. One
 - B. No
 - C. Five
 - D. Two
- 4 Neptune was discovered by _____.
 - A. Neither
 - B. Mathematicians
 - C. Astronomers
 - D. Both
- 5 From this article, we know that _____.
 - A. Neptune is the last planet in the Solar System
 - B. Neptune is the last planet visited by Voyager 2
 - C. Pluto is the last planet in the solar system
 - D. It does not say.
- 6 The Voyager 2 spacecraft used math to guide its journey.
 - A. False
 - B. True
- 7 Parts of Neptune appear very bright, even though Neptune is far away from the sun. This may be because sunlight reflects from _____ in Neptune's atmosphere.
 - A. Water vapor
 - B. Dust storms
 - C. Methane gas
 - D. Ice crystals
- 8 Compare Neptune to one of the other planets. Tell how they are similar and how they are different.