Out of this World

# Space Unit

* Day and Night, season caused by Earth’s rotation (301-19)

Demonstrate how Earth’s rotation causes the day and night cycle and how Earth’s revolution causes the yearly cycle of seasons (301-19)

* Position of Earth and Moon cause tides, moon phases and eclipse (301-20)

Observe and explain how the relative positions of Earth, the moon, and the sun are responsible for the moon phases, eclipses, and tides (301-20)

* Components of the Solar System (300-23)

Describe the physical characteristics of components of the solar system (104-8, 300-23)

# Components of the Solar System

Lesson 2 – How big is the solar system?

Read pg 6 & 7

Sun

Mercury

Venus

Earth

Mars

Jupiter

Saturn

Uranus

Neptune

Pluto

**Terms**

Solar system – the family of planets and other, smaller space objects that move around the sun.

1. Which is the largest planet? Which is the smallest planet? How do they compare?

2. Which planet is closest in size to Earth?

Task – Draw a scaled model of the solar system.

Lesson 3 – What is in the solar system?

Read pg 8-11

**Terms**

Astronomers – Scientists who studies objects in the solar system.

Comet – A small, icy object that orbits the sun. The centre, or nucleus, of a comet is a ball of ice and dust. A tail of gas and dust spreads away from the comet when it approaches the Sun, making it visible to the naked eye.

Meteoroids – Dust or a small chunk of rock which orbits the Sun. A meteoroid that travels through Earth’s atmosphere becomes a meteor. A meteor that hits the Earth’s surface is called a meteorite.

Asteroids – A small, rocky object orbiting the Sun. Thousands of asteroids exist in an area called the asteroid belt, between Mars and Jupiter.

Atmosphere – A thin layer of gases surrounding Earth and protecting it from harmful radiation in space.

1. Pictures of Earth from space show us three different colors in the view, white, blue and brown. Explain what each of these colors represents to our Earth?

2. Could you add meteoroids or asteroids to the diagram of the solar system? Why or why not?

Lesson 9 – What are Constellations?

Read Pg 30-33

**Terms**

Stars – A large ball of gas that gives off light and heat because of nuclear reactions deep inside it.

Constellations – A pattern found among the stars. Ancient peoples named many constellations after animals and mythological characters

1. Why do you think people made up so many stories about the stars and the star patterns they saw?

2. In the Northern Hemisphere were we live, we can use the North Star to find out geographic location at night. Could people in the southern hemisphere use the North Star at night to find their location?

# Earth’s Rotation causing day and night and the different seasons.

Lesson 5 – How does the Sun affect the Earth?

Read Pg 16-19

**Terms**

Sun – The only Star in the Solar System

Rotates – Spin around a centre point. For example, the Earth rotates on its axis.

Axis – The imaginary line around which a spinning object, such as a planet rotates.

Revolves – Move around an object. For example, the Earth revolves in a near circle around the Sun.

# Notes

## Seasons

Spring, summer, fall and winter are most noticeable in the temperate zones of the earth. At the North Pole and South Pole, there are only two seasons: polar day and polar night. Seasons are often determined by drought and periods of precipitation.The earth's axis is inclined by 23.5° towards its orbit.In a period of 24 hours, it rotates once on its axis.During the earth's 365.25-day orbit around the sun, the angles at which sunrays reach the earth change (position of the sun). In winter, the sunrays arrive at a low angle to the surface. The heat is spread over a larger area and it is colder than in summer. The astronomical seasons for the northern hemisphere are as follows: March 21 to June 20: **spring** June 21 to September 22: **summer** September 23 to December 20: **fall** December 21 to March 20: **winter**On March 21 and September 23, day and night are of equal length. June 21 is the longest day with the shortest night period (summer solstice). In the southern hemisphere, it is fall when it is spring in the north, while the northern summer coincides with the season of winter in the south. There is no abrupt change of season on the astronomically defined dates. As the position of the sun is not the only factor that determines the climate, there is a gradual change from one season to the next.Day and night

Day is the time between sunrise and sunset.Only at the equator are day and night of equal length (12 hours). Towards the North and South Pole, the difference between day and night becomes more prominent. At the poles, there is daylight during summer and night during winter.Day and night are caused by the earth's rotation on its own axis. On the side facing the sun it is day, while it is night on the side facing away from the sun.

1. When it is summer in the Northern Hemisphere, what season is it in the Southern Hemisphere?

2. Why is 365.25 days in a calendar year?

3. How many times in one day is Canada facing the sun?

4. Describe what a typical year would look like (based on seasons) if the Earth did not rotate on its axis?

5. China and Canada are on opposite sides of the Earth. When the sun is rising in Canada, what is it doing in China at that time?

Task- Draw a time-lapse of Canada’s position in space in one day. Draw a bi-hourly account of the change to Canada’s position relative to the sun.

Task – Draw a time-lapse of Canada’s position in space over the course of a year. Demonstrate the 4 seasons and how the axis that Earth rotates on creates the seasonal affects (cold in winter).

# Position of Earth and Moon cause tides, moon phases and eclipse

## The Tides

Sea levels are subject to the tides.The tides are caused by the gravitational forces of the sun and moon combined with centrifugal forces resulting from the rotations within the earth-moon system.The gravitational pull of the moon and the centrifugal force of the earth-moon rotation cause high tides on both sides of the planet. High and low tide follow a 28-day cycle. The greatest difference between high and low tide occurs when the sun and moon are in line with each other.When the sun and moon are at right angles to each other, the forces are less effective; high tides are rather low.As a moon day is 50 minutes longer than a day on earth, the time of tides vary daily.The gravitational effect of the sun upon the earth is only approximately half of that of the moon. These forces not only affect the tides, but also raise and lower the earth’s crust by up to 60 cm (23.6 inch).

Lesson 8 – How does the Moon affect the Earth? (Tides)

Read Pg 28 & 29

Moon Phases

The sun dominates the daytime sky, but the Moon resigns over the night. The Moon is the largest and brightest object in the night sky. Unlike the sun, the Moon does not give off its own light. **The Moon reflects sunlight.**

To us on Earth, the Moon appears to change shape over the course of several nights. We call the different shapes the phase of the Moon.

The Moon revolves around the Earth in an orbit, and it rotates on its axis.

The Moon takes about 29.5 days to make one complete revolution around the Earth.

This phenomenon is referred to as the phases of the moon. At new moon, the moon cannot be seen at all because no sunlight falls onto the side facing the earth. In other words, it turns its dark side to us. Then the moon waxes for 14 days and wanes again for 14 days. Full moon is when the earth is exactly between the moon and the sun. The side facing us is fully illuminated.





Lesson 7 – How does the Moon Move? (Moon Phases)

Read Pg 24 & 25

## Eclipse

As the Moon and the Earth move in space, they sometimes block each other from the Sun’s light. When this happens, we see an eclipse. During a solar (Sun) eclipse, the moon blocks the Sun’s light from reaching Earth. During a Lunar (Moon) eclipse, the Earth blocks the Sun’s light from reaching the Moon.

Lesson 8 – How does the Moon Affect the Earth? (Eclipse)

Read Pg 26 & 27

## Mass and Weight

Mass is measure of how much matter in an object. Regardless of where you are in the solar system mass does not change.

Weight is a measure of how much gravity pulls on an object or a body. Weight will change depending on the gravity of where you are in the solar system.

Mass on Earth 96.6kg

Weight on Earth = Mass on Earth x Gravity on Earth

Weight on Earth = 96.6kg x 1.00

**Weight on Earth = 96.6kg**

Mass on Earth 96.6kg

Weight on Moon = Mass on Earth x Gravity on Moon

Weight on Moon = 96.6kg x 0.16

**Weight on Moon = 15.456kg**

|  |  |
| --- | --- |
| Planet | Surface Gravity |
| Mercury | **0.38** |
| Venus | **0.88** |
| Earth | **1.00** |
| Moon | **0.16** |
| Mars | **0.40** |
| Jupiter | **2.39** |
| Saturn | **1.17** |
| Uranus | **0.92** |
| Neptune | **1.23** |
| Pluto | **0.08** |

**Terms**

Tides – The changing level of water in Earth’s oceans and seas, and they are caused by the moon.

Eclipse – The total or partial blocking of light from one object in space to another

Solar Eclipse – The moon passes in front of the Sun and its shadow falls on the Earth

Lunar Eclipse – The Earth passes in front of the Sun, and its shadow falls on the moon.

Moon – The ball of rock which orbits the Earth; the Earth’s only natural satellite.

Gravity – A pulling force that acts between all objects in the universe. The Moon is attracted to the Earth by gravity.

Mass – The amount of matter in an object.

Weight – A measure of how much gravity pulls on an object or a body.

1. What correlation does the amount of surface gravity have to the change in weight experienced on different planets in the solar system?

2. From your mass, determine what your weight would be on three different planets?

Task – Draw 2 different pictures. The first should be the Moon position relative to Miramichi causing a high tide. The second should be the Moon position relative to Miramichi causing a low tide.

Task – Draw the relationship of the Sun, Moon and Earth creating either a Lunar Eclipse or a Solar Eclipse.