

GEOLAB: THE SOLAR SYSTEM

Mrs. Côté

Value = 28 Marks

Physical Geography 110

Directions:

Read part A: "The Solar System" found below and answer questions 1 and 2 on a piece of loose leaf and label it as Part A.

Part A: The Solar System:

The sun makes up about 99 percent of the total mass of our solar system. The rest of the solar system is made up of at least eight planets, 55 smaller moons, and countless smaller objects consisting of comets, asteroids, meteoroids, and meteorites that all revolve around this sun and make up our solar system.

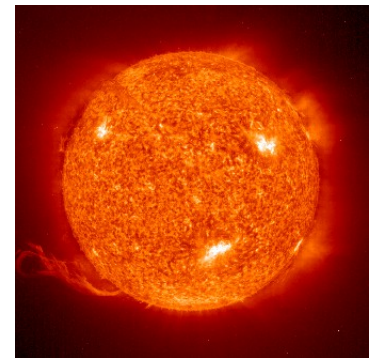


The Center of the solar System

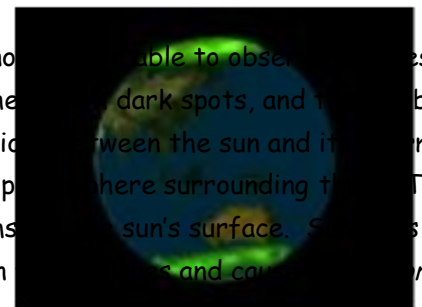
The sun is a huge, glowing ball at the center of our solar system and is composed largely of hydrogen gas with a lesser amount of helium. The sun's energy comes from nuclear fusion which originated when the process known as the *nebular hypothesis* occurred creating our solar system. The energy that is made during the fusion of matter found in the sun provides light, heat and other energy to Earth.

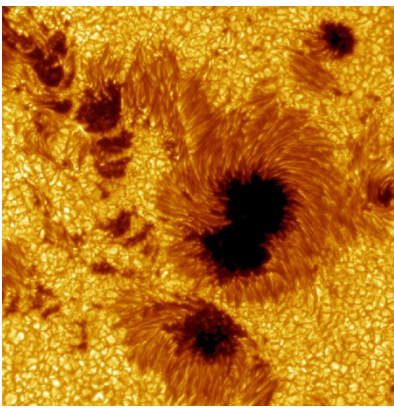
The sun and its atmosphere consist of several zones or layers;

- **Core.** The core extends from the center of the sun to about one-fourth of the way to the surface. Almost all the fusion in the sun takes place in the core. The temperature can reach 15,600,000 °C here.
- **Radiative zone.** Surrounding the core is a huge spherical shell known as the radiative zone. The outer boundary of this zone is 70 percent of the way to the solar surface. The radiative zone gets its name from the fact that energy travels through it mainly by radiation. The temperature can reach 8,000,000 °C here.
- **Convection zone.** The highest level of the solar interior, the convection zone, extends from the radiative zone to the sun's surface. Huge and violent currents exist here and carry the energy towards the surface. The temperature can reach 1,500,000 °C.
- **Photosphere.** The lowest layer of the atmosphere is called the photosphere. This zone emits the light that we see, and most of the energy that reaches the sun. The photosphere is about 500 kilometers thick. Astronomers often refer to this part as the sun's surface. The temperature can reach 6,000 °C there.
- **Chromosphere.** The next zone up is the chromosphere. Solar clouds of material can erupt off this part of the sun's surface. The temperature can reach 20,000 °C.
- **Corona.** Corona is the outer atmosphere of the sun where temperatures can reach 1,000,000°C. *Solar flares* can also occur here when the temperature reach very high degrees.
- **Solar wind.** Beyond the corona is the solar wind, which is actually an outward flow of coronal gas made up of protons and electrons. The Earth's magnetic field deflects most of the solar wind around the planet; however some particles become trapped within the Earth's magnetic field and interact with the Earth's atmosphere near the poles forming what we call the *Aurora Borealis*.

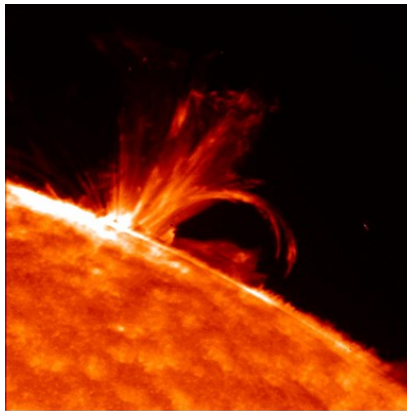


The sun is about 150 million km away from Earth however despite this distance; astronomers are able to observe changes on the sun's surface such as the *sunspot cycle*. **Sunspots** are known to mark the photosphere as dark spots, and the number of visible sunspots changes from day to day. They are caused by the complex interaction between the sun and its magnetic fields. Sunspots are 1000 to 20 000 km in diameter and are cooler than the plasma here surrounding them. They frequently generate **solar flares** (fountains of hot gasses) that are the "thunderstorms" of the sun's surface. Solar flares violently blast energy in the form of radiation at high speeds into space. The radiation can be harmful to humans and cause damage to satellites.





Sunspots found on the sun



Solar flares from the sun.



Auroras found at Earth's Poles

1. The sun has weather occurring on it just like our Earth does. At times the sun has what we would associate a thunderstorm to be. What is a "thunderstorm" on the sun, and what happens during them? (2)
2. What are the Aurora Borealis and how are they formed? (2)

Directions:

Collect a computer and follow the steps below in part B: "What Makes up our Solar System" to complete questions 3 to 8. Numbers 1, 6 and 9 are to be completed on the geolab worksheet provided and all other ones are to be put on your loose leaf, make sure to label the numbers for each.

Part B: What makes up our solar system?

- Visit the NASA website at <http://solarsystem.nasa.gov/> or google "NASA solar System Exploration".
- Using the drop down menu called "planets" click on each of the planets you would like to investigate and fill out the table found in question #3 on the worksheet.

NOTE: You only have to investigate 4 planets, you DO NOT have to do all 8!!

3. (4)

Name of Planet	Orbital Period (length of year or portion of)	# of Moons	2 Other Facts about Planet
Pick 4 of the 8 planets you would like to investigate and name them...			

- At the bottom of the drop down menu "Planets" you will see the links called "Kuiper Belt" and "Oort Cloud" use these to answer questions 4 to 6 on your own piece of paper.

4. What is the Kuiper Belt and what is found there? (2)

5. How far away from the Sun is the Kuiper Belt? (1)
6. What is the Oort Cloud and what is found there? (2)
7. How far away from the Sun is the Oort Cloud? (1)
8. Create a drawing that describes what and where the Kuiper Belt is and the Oort Cloud is in reference to the Sun. (2)
9. Fill in the diagram labeled "figure 1" provided on your geolab worksheet by labeling the sun, each of the planets, the asteroid belt, the Kuiper Belt and the Oort Cloud" on the lines below the diagram. (6)

Directions:

Read the section below called Part C: "Other Objects in our Solar System" and complete questions 10 and 11 using the worksheet to do question 10 and your own paper for question 11.

Part C: Other Objects in our Solar System

Some of the smaller objects that exist in our solar system can effect Earth. One is **comets** which have been described as dirty snowballs. They are made of dust particles trapped in a mixture of water, carbon dioxide, methane, and ammonia. Comets spend most of their time far out beyond Neptune's orbit in the cold region of our solar system called the *Edgeworth-Kuiper Belt*. A few comets, however, move in highly elliptical orbits that take them closer to the sun. When this happens they can become visible in Earth's night sky. When a comet moves close enough to the sun (around the orbit of Jupiter), energy from the sun heats the comet's icy surface, causing it to form a coma (a cloud of gas and dust) that expands into space. The solar wind pushes material from the coma far out into space, forming dramatic tails. Both the coma and tail are illuminated by the sun and may be seen from Earth.

Asteroids are small bodies of rock that orbit the sun between Mars and Jupiter in what is called the *asteroid belt*. More than 2000 asteroids have diameters greater than 10 km, and are sometimes known as "*minor planets*". At times asteroids can have a wide orbit and become removed from the asteroid belt when it collides with close by planets. Many scientists believe that an asteroid collided with Earth 65 million years ago, leading to the extinction of the dinosaurs.

In addition, there are untold billions of **meteoroids**. Meteoroids are very small bodies of rock or icy fragment moving through space in orbit around the sun. When meteoroids enter the earth's atmosphere, they burn up and appear as streaks of light, sometimes known as "*shooting stars*". A *meteor shower* occurs when Earth passes through the tail of a comet, and particles from the tail plunge through the atmosphere. **Meteorites** are parts of a large meteoroid that survive the passage through earth's atmosphere and collide with the Earth's surface.

10. Complete the following chart found on the worksheet provided to you. (4)

Small Objects Found in the Solar System

	Description/Fact(s)	Where are they found?
Comets		
Asteroids		
Meteoroids		
Meteorites		

11. Explain what a shooting star is and what causes a meteor shower to occur. (2)