



Educational Product
Grades 3 - 6

# Astronomy for Beginners

## A Canadian Space Agency Mini-Package

This mini-package is intended to complement your existing astronomy unit. It includes worksheets describing planets, suns and moons (including the astronomical symbols of the planets of our solar system); a student fact sheet on comets and constellations; and a number of other student activities and worksheets.

### ***INCLUDES:***

- ☆ Planets Fact Sheet
- ☆ Why Do We Need the Moon Worksheet
- ☆ Why Do We Need the Sun Worksheet
- ☆ The “Grapefruit Facts Of The Universe” Fact Sheet
- ☆ Comets Fact Sheet
- ☆ Make a Model Comet Activity
- ☆ Constellations Fact Sheet
- ☆ “My Constellation” Activity
- ☆ Astronomy Investigation Worksheet

This publication may be reproduced without permission, provided the source (Canadian Space Agency) is fully acknowledged.



# Astronomy for Beginners



When you look up in the night sky, what objects do you see? Jot down some of these objects in the box below:

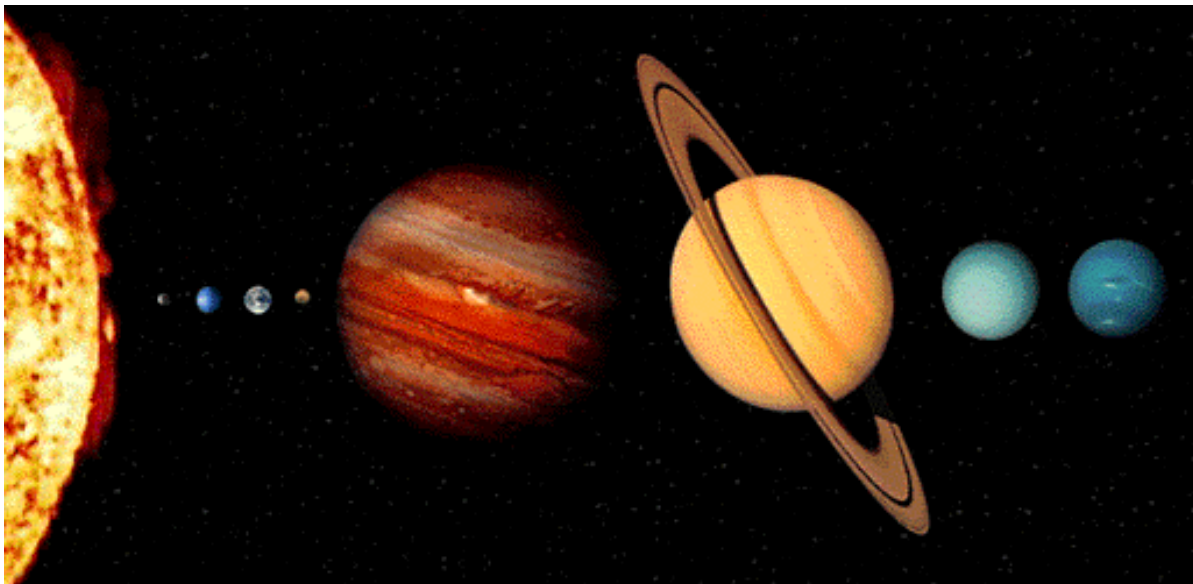


The science that studies these objects is called ***astronomy***. Let's take a closer look at some of these and describe them.

**The Sun** is only a medium sized ***star***, with a diameter of 1,390,000 kilometres. It would take more than a million planet Earths to fill it! It's a huge globe of glowing gases (mainly hydrogen and helium) about 150 million kilometres away. Deep inside its core, the temperature climbs as high as 8,900,000 °C

**The Moon** is Earth's natural ***satellite***, meaning that it revolves around the Earth; and it shines by reflecting light from the Sun. It is 400,000 km from the Earth. The Moon is a lifeless rocky world, with a gravitational attraction of about one-sixth that of the Earth. That means, that if you can jump up 0.3 metre on Earth, you could jump 1.8 metres on the Moon!

**Planets** can be difficult and confusing to describe because their properties can be shared by many other kinds of celestial objects. But in our ***solar system***, planets come in two types. There are the "***terrestrial***" or "***rocky planets***", (those with solid surfaces) and the "***Jovian planets***" or "***gas giants***" which have no solid surfaces. The terrestrial planets are small, dense, rocky worlds, located in the inner part of our solar system. The Jovian planets reside in the outer solar system and are referred to as gas giants; large, rapidly rotating with very low density.

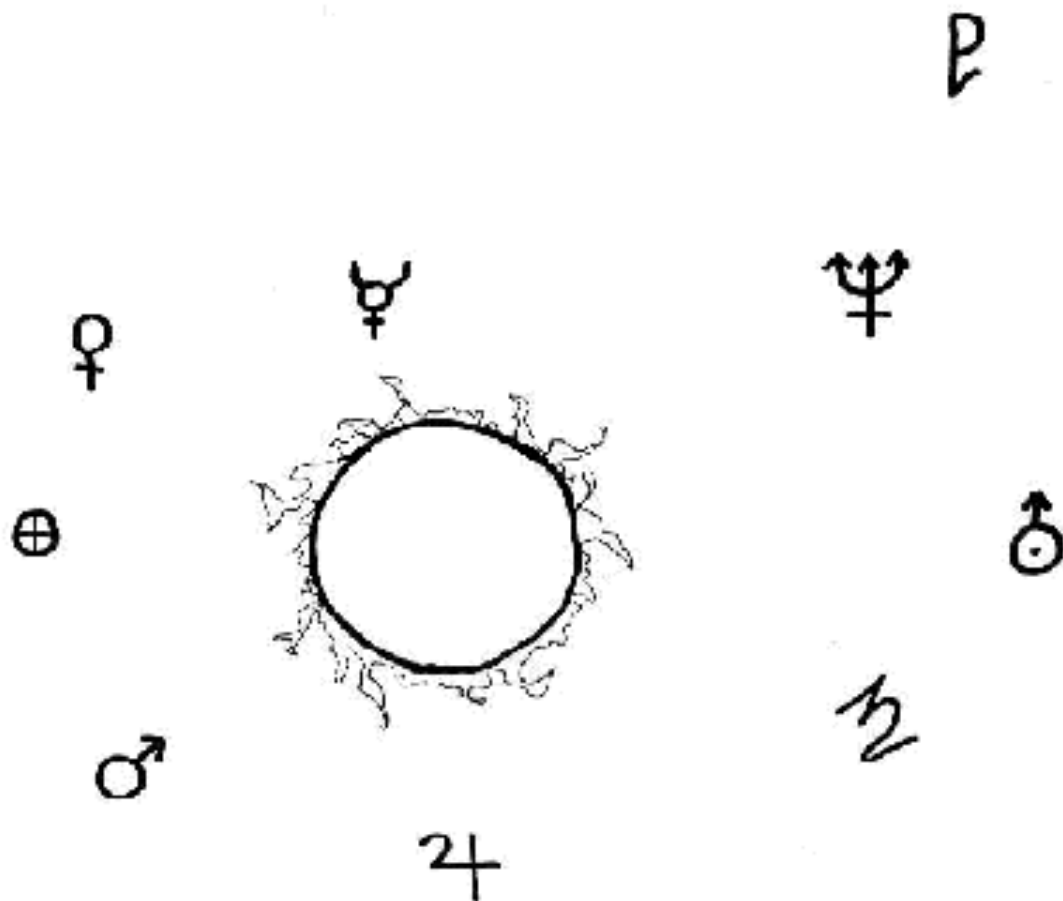




# Planet Facts!

<u>Planet</u>	<u>Distance From Sun</u> (millions of km)	<u>Moon(s)</u>	<u>Length of Day</u>
Mercury $\Delta$	57.9	0	59 days
Venus $\text{E}$	108.2	0	243 days
Earth $\oplus$	149.6	1	23 h 56 min.
Mars $\Gamma$	227.9	2	24 h 37 min.
Jupiter $\text{H}$	778.3	16	9 h 55min.
Saturn	1,427	20	10 h 14 min.
Uranus $\Omega$	2,871	15	24 h
Neptune $\text{E}$	4,497	2	22 h
Pluto	5,914	1	6 days, 9 h

## Planetary Symbols





# Why Do We Need the Moon?



Brainstorm a list of facts about the Moon

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_
9. \_\_\_\_\_
10. \_\_\_\_\_

“Where the telescope ends, the microscope begins. Which of the two has the grander view?”

Victor Hugo

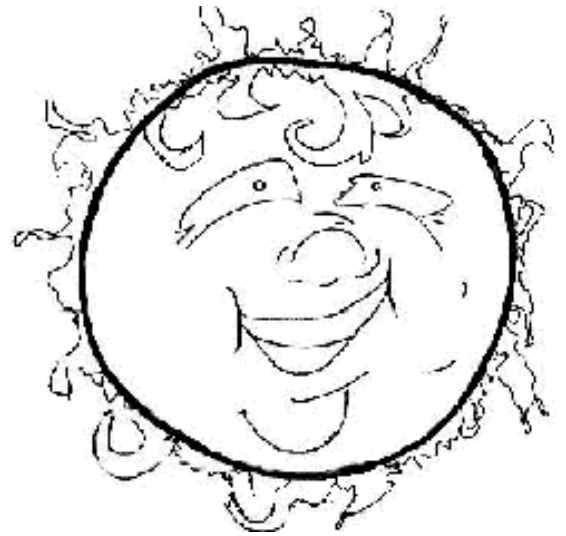




# Why Do We Need the Sun?

Brainstorm a list of all the ways we use the energy from the Sun.

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_
9. \_\_\_\_\_
10. \_\_\_\_\_



“On a clear, moonless night in midwinter or midsummer, a plume of starlight rises motionless behind the scattering of constellations... The Milky Way is our island universe.”

Charles A. Whitney



# "Grapefruit Facts of the Universe"

Here is a neat collection of facts about our Solar System to help you put things into perspective. The Atlantic Space Sciences Foundation Inc provided this list.

- ☆ If the Sun were a cookie jar, it would take 1,000,000 Earth-sized cookies to fill the jar;
- ☆ It would take a row of 110 Earths to make a line across the diameter of the Sun (1.396 million km);
- ☆ If Jupiter were a cookie jar, it would take 1,000 Earth-sized cookies to fill the jar;
- ☆ If the Earth were a 12-inch globe, the Moon would be a baseball 40 feet away. Saturn and its rings would just barely fit in between the two;
- ☆ If the Sun were a basketball, the Earth would be a split pea located 150 feet away from the basketball Sun. The Moon would be a grain of sand located 4 inches away from the split pea Earth
- ☆ The Great Red Spot on Jupiter is a huge storm system that could swallow up 2-3 Earths without even burping;
- ☆ The average sunspot (a magnetically cooled region of the Sun's surface) could also swallow Earth without a hiccup;
- ☆ If you could fly to the Sun in a 747 at a typical cruising speed of 900-1000 km/hour, it would take 17 years to get there and another 17 years to get back.

*"The night sky with its beautiful stars and its message of our place in the universe is a precious treasure of all humanity, on which we rely for our knowledge and understanding of our origins and destiny."*

**International Astronomical University on Space Research, 1992**



# Comets

Comets are thought to have formed very early in the history of the Solar System and so contain materials that have been undisturbed since that time. Studying comets can tell us a lot about what the Solar System was like 4.5 to 5 billion years ago. They also help us learn how the Sun and planets formed.

At any time, there are several comets in the sky but they are all relatively faint compared to comet Hale-Bopp, and require a good sized telescope to see. Bright comets like Hyakutake and Hale-Bopp occur every couple of decades, on average, but become harder and harder to see because of the growing problem of light pollution.

The advent of a new comet is totally unpredictable, and that goes a long way to explaining why comet hunting is such an important activity among amateur astronomers (they are the only ones with the time to scan large areas of sky looking for comets). They find them first and then notify the rest of the world. Then the science gets done, everyone gets to enjoy the new comet, and the discoverer has the comet named after him or her. Great fun!

You can think of a comet as a snowball in space. They have three parts:

- ☆ **Nucleus:** the small, solid, frozen part of the comet. It is made up of frozen gases (methane, ammonia), water and dust (carbon, silica). The nucleus may be several kilometres across.
- ☆ **Coma:** the cloud of gas and dust that expands outward from the nucleus when the comet nears the Sun and the Sun's radiation begins to vaporise the comet. The coma may reach 100,000 kilometres in diameter.
- ☆ **Tail:** the extension of the coma cloud from the comet. There are actually two tails: one composed of gas that streams outward from the Sun in a straight line, and a dust tail that curves very slightly along the comet's orbital path. The comet's tail is caused by the Solar Wind and always points away from the Sun.

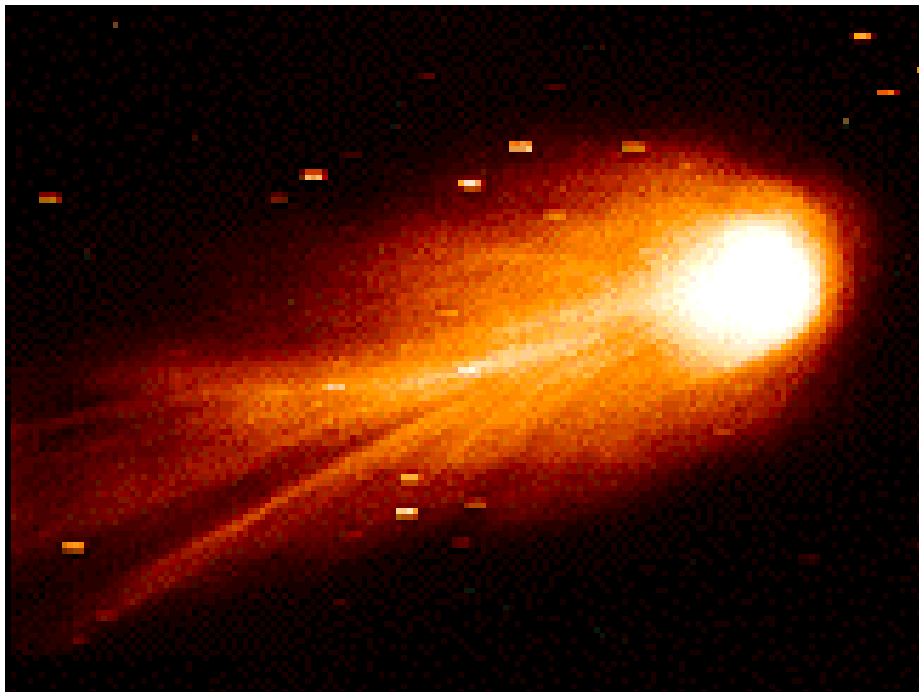




## Did You Know...

- ☆ Comets used to be called “hairy stars” or “broom stars”;
- ☆ Comets used to be considered as powerful omens, both good and bad;
- ☆ Comets orbit the sun in elliptical orbits;
- ☆ They are thought to be ancient leftovers from the formation of the solar system;
- ☆ They come from one of two very distant regions of the solar system; *the oort cloud* or the *kuiper belt*;
- ☆ They sometimes crash into the Sun if they get too close.

Hale - Bopp





# Make a Model Comet

Remember that the main part of the comet, the nucleus, is still embedded inside the coma. The nucleus is not shown in our model because it is only 10 km or so across. This would make it smaller than the tiniest pinpoint!

1. Glue a cotton ball that is about 5 cm onto the middle of a sheet of paper. This represents the coma of the comet.
2. Cut 10-15 strips of crepe paper 4-5 metres long.
3. Tape the paper sheet with the coma on it at one end of a wall. Gather one end of all the crepe paper strips. Tape or glue them next to the coma so that they can easily be stretched along a wall.
4. Stretch the crepe paper along the wall and tape it so that the tail fans out slightly.
5. Add labels to identify the comet and its different parts.

In this activity, you will make a model Comet Hale-Bopp to understand its immensity.

**1 cm = 100,000 km**



# Constellations

For centuries, people in all parts of the world have gazed up at the stars to help them navigate the oceans, to know when to plant their crops and harvest them afterwards. To make reading this “celestial map” easier, they would group familiar patterns of stars into recognisable shapes that reminded them of familiar objects, or characters from stories. We call these “recognisable patterns of stars” *constellations*.

When you think about constellations, which ones come to mind? In the box below, jot down as many names of constellations as you can. You can even include a small sketch of the constellation.

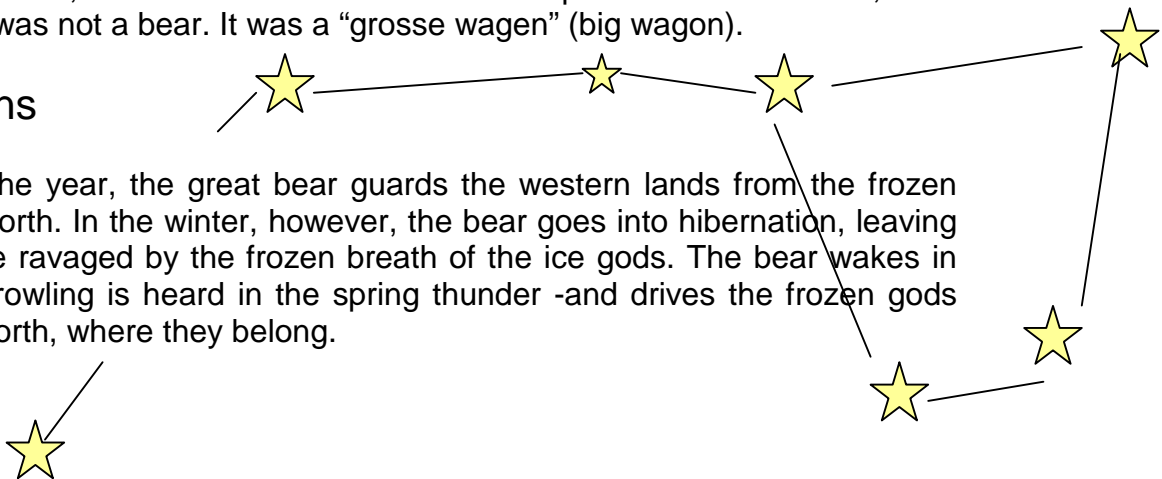
You have probably noticed that a great majority of star patterns bear little, if any resemblance to the figures they are supposed to represent; that is, the names of the constellations are meant to be symbolic. Our modern constellation system comes to us from the ancient Greeks. However you should be aware that many other cultures in the world have also associated certain star groupings with their own mythological characters and objects familiar to them. For example, read the following myths that are associated with the constellation “Ursa Major” (the great bear), more commonly known as “the big dipper”.

## German

To the Germans, who had much first-hand experience with bears, this constellation was not a bear. It was a “grosse wagen” (big wagon).

## Zuni Indians

For most of the year, the great bear guards the western lands from the frozen gods of the North. In the winter, however, the bear goes into hibernation, leaving the land to be ravaged by the frozen breath of the ice gods. The bear wakes in spring –his growling is heard in the spring thunder -and drives the frozen gods back to the North, where they belong.





# My Constellation

Now it's your turn to find a recognisable pattern of stars, and to create a myth around them. Look closely at the stars on this page. Can you form a picture of something or someone? Write the story behind your constellation in the area provided at the bottom of this page.



My constellation is called \_\_\_\_\_  
because \_\_\_\_\_

---

---

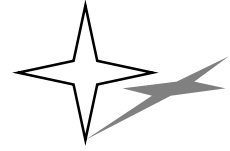
---

---

---



# Astronomy Investigation



Let's see what kind of an astronomy detective you are. Using books from your school library, try and answer the following questions.

1. Can you name the planets of our Solar System in order? \_\_\_\_\_

\_\_\_\_\_

2. Which planets are larger than Earth? \_\_\_\_\_

\_\_\_\_\_

3. What planet is closest to the Sun? Farthest? \_\_\_\_\_

\_\_\_\_\_

4. Can you name at least five constellations? \_\_\_\_\_

\_\_\_\_\_

5. What are the different parts of a comet? \_\_\_\_\_

\_\_\_\_\_

6. Can you name a famous comet? \_\_\_\_\_

7. What is the tallest mountain in our Solar System? \_\_\_\_\_

8. Which planet has the greatest number of moons? \_\_\_\_\_

\_\_\_\_\_

9. Which planet(s) of our Solar System has no moon? \_\_\_\_\_

\_\_\_\_\_