

Important Concepts . . .

Preview Review



Science ***Grade 9 TEACHER KEY***

W1 - Lesson 3A: Energy Consumption

***W1 - Lesson 3B: The Distribution of
Matter in Space***

Important Concepts of Grade 9 Science

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W1 - Lesson 2	Electrical Circuits
W1 - Lesson 3A	Energy Consumption
W1 - Lesson 3B	The Distribution of Matter in Space
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W3 - Lesson 3B	Organisms and Matter in their Environment
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W3 - Lesson 5	Transfer of Materials through the Air, Ground, and Water/Biological Impacts of Hazardous Chemicals
W3 - Quiz	

Materials Required

Textbook:
Science in Action 9

Science Grade 9

Version 5

Preview/Review W1 - Lesson 3 TEACHER KEY

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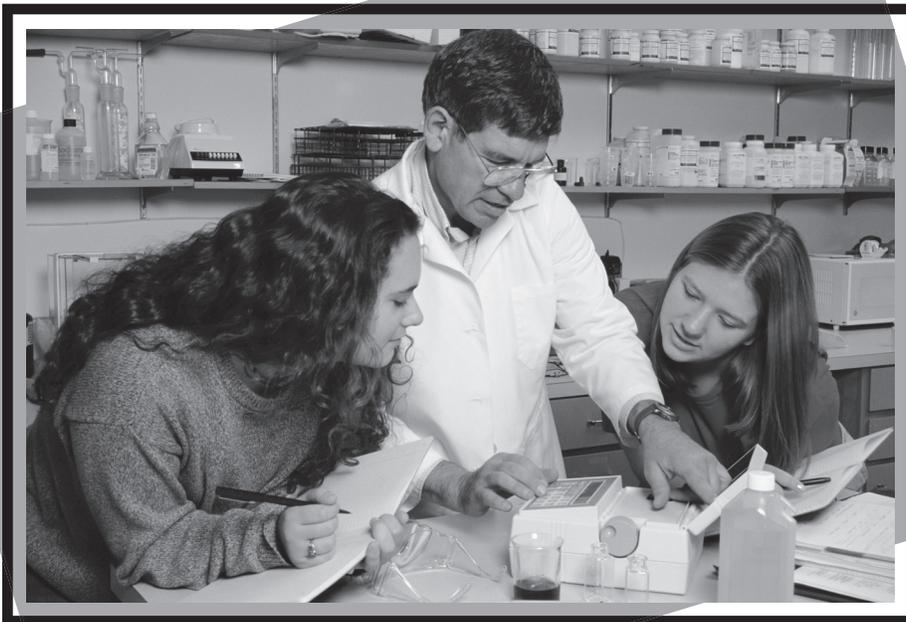
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Preview/Review Concepts for Grade Nine Science

TEACHER KEY



*W1 - Lesson 3A:
Energy Consumption*

OUTLINE

By the end of this lesson, you should

- know the definition of power and be able to calculate it using current and voltage
- know the definition of energy and be able to calculate it using power and time

GLOSSARY

kilowatt hour - commonly used unit of electrical energy equal to the power consumption of 1000 W for one hour

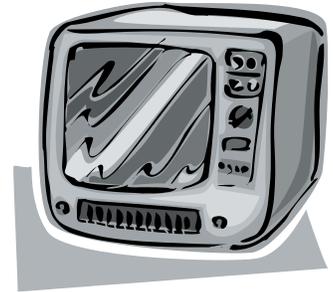
power - rate at which a device converts energy

W1 - Lesson 3A: Energy Consumption

Do you get in trouble when you leave the lights or television on in a room that is not in use? It probably has something to do with the **cost** of electricity. This lesson is about how electricity is measured.

Energy Usage

To operate your favorite video game, you need power. **Power** is defined as the rate at which a device converts energy. A unit of power is a **watt**, which is the same as a **joule / second**. Every appliance in your house has a power rating (how fast an appliance uses **power**). Many new appliances are more **efficient** in the amount of power they use.



The amount of power a device uses is calculated mathematically using a formula:

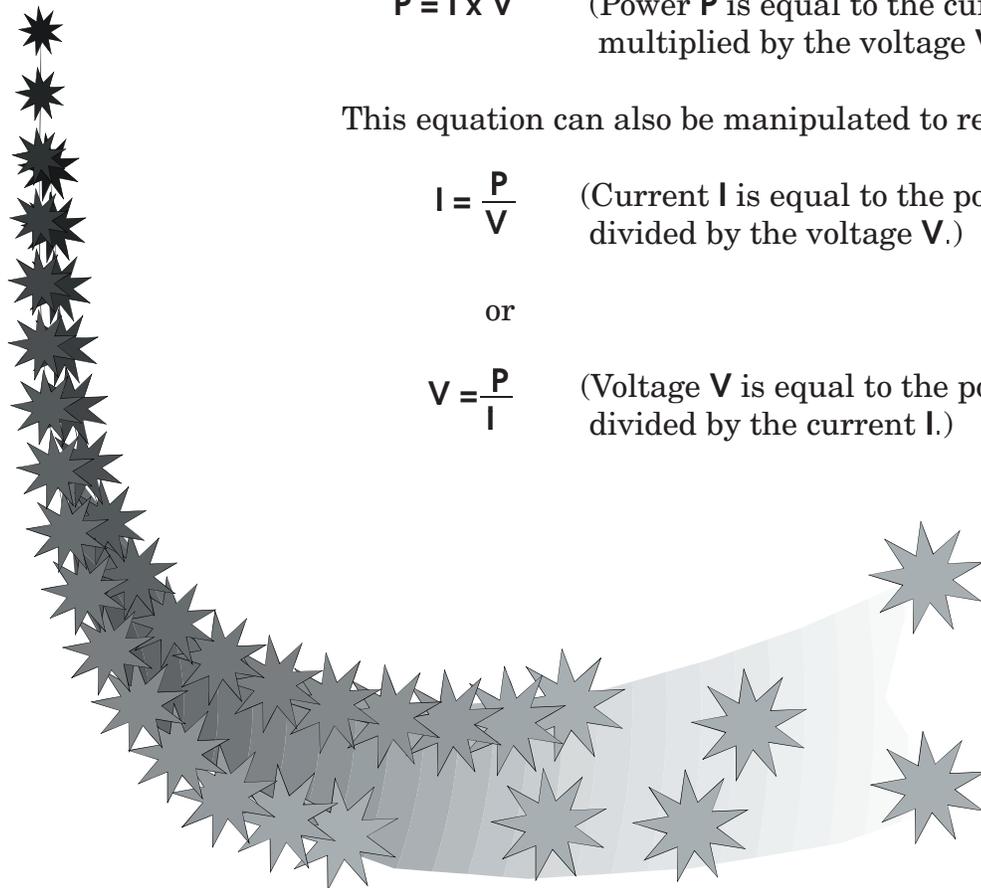
$$P = I \times V \quad (\text{Power } P \text{ is equal to the current } I \text{ multiplied by the voltage } V.)$$

This equation can also be manipulated to read

$$I = \frac{P}{V} \quad (\text{Current } I \text{ is equal to the power } P \text{ divided by the voltage } V.)$$

or

$$V = \frac{P}{I} \quad (\text{Voltage } V \text{ is equal to the power } P \text{ divided by the current } I.)$$





Here is a sample problem:

A refrigerator has 6.5 amps of current flowing to it and requires 115 volts to operate. How much power does the fridge require?

Problem Solving Steps:

Step 1

Identify the variables.

$$I = 6.5 \text{ amps}$$

$$V = 115 \text{ volts}$$

$$P = ?$$

Step 2

Identify the equation and substitute in your numbers (including units).

$$P = I \times V$$

$$P = 6.5 \text{ amps} \times 115 \text{ volts}$$

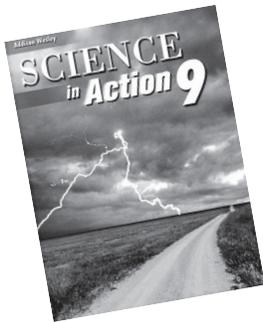
Step 3

Solve the problem.

$$P = 747.5 \text{ watts}$$

Read page 332 of *Science in Action 9*.

1. Your bedside lamp has a 60 watt light bulb. If it is plugged into a 120 volt socket, what is the current flowing through the light bulb?



$$P = 60 \text{ watts}$$

$$V = 120 \text{ volts}$$

$$I = ?$$

$$I = \frac{P}{V}$$

$$I = \frac{60 \text{ watts}}{120 \text{ volts}}$$

$$I = 0.5 \text{ amps}$$

2. A dryer requires a 120 volt wall socket to supply its power. If the current flowing through it is 8 amps, what is its power rating?

$$P = ?$$

$$V = 120 \text{ volts}$$

$$I = 8 \text{ amps}$$

$$P = IV$$

$$P = (120 \text{ volts})(8 \text{ amps})$$

$$P = 960 \text{ watts}$$

The second calculation you need to complete is how to determine energy. **Energy** is the ability to do work. A unit of energy is a **joule**. To determine how much **energy** an appliance (such as a stereo) uses, the power rating of the appliance we are looking at must be calculated.

Here is the mathematical calculation for energy.

$$E = P \times t \quad (\text{Energy is equal to the amount of power used } P \text{ multiplied by time used } t \text{ in seconds.})$$

Here is a sample problem:

A television has a power rating of 100 watts. If the TV is on for 2 hours, how much energy (in joules) is being used?



Problem Solving Steps:

Step 1

Identify the variables.

$$P = 100 \text{ wats}$$

$$t = 2 \text{ hours} \quad (\text{must convert to seconds})$$

$$E = ?$$

$$t = 2 \text{ hours} \times \frac{3600 \text{ sec}}{1 \text{ hour}} = 7200 \text{ seconds}$$

Step 2

Identify the equation and substitute your numbers (including units).

$$E = P \times t$$

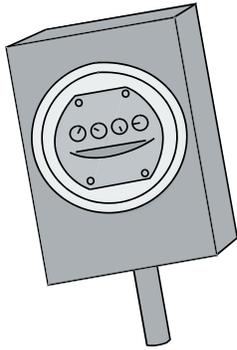
$$E = 100 \text{ wats} \times 7200 \text{ seconds}$$

Step 3

Solve the problem.

$$E = 720\,000 \text{ joules or } 720 \text{ kilojoules}$$

Read page 333 of *Science in Action 9*.



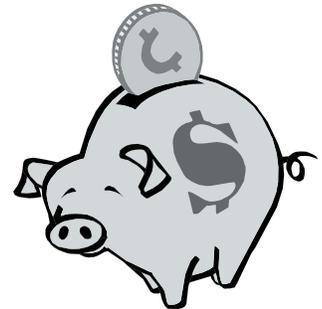
3. How much energy is being used if a dishwasher with a power rating of 2 300 watts runs for 30 minutes?

$$\begin{array}{ll}
 E = ? & E = P \times t \\
 P = 2300 \text{ watts} & E = (2300 \text{ watts})(1800 \text{ s}) \\
 T = 30 \text{ min or } 1800 \text{ sec} & E = 4140000 \text{ Joules or } 4140 \text{ KJ}
 \end{array}$$

4. How much energy is being used if a microwave oven (with a power rating of 1000 watts) runs for 15 minutes?

$$\begin{array}{ll}
 E = ? & E = P \times t \\
 P = 1000 \text{ watts} & E = (1000 \text{ watts})(900 \text{ s}) \\
 T = 15 \text{ min or } 900 \text{ sec} & E = 900000 \text{ Joules or } 900 \text{ KJ}
 \end{array}$$

Calculating the cost of power is also significant. The present cost of power is approximately 6.5 cents per kilowatt hour. The amount of electricity your household uses is measured and billed in **kilowatt hours**. A kilowatt is basically a watt divided by 1000. To calculate the cost of power, multiply the amount of power used (**kWh**) by the cost (\$).



Read page 333 of *Science in Action 9*.

5. An average household uses 650 kWh per month. If the cost of electricity is 6.5 cents per kWh, how much does this power cost?

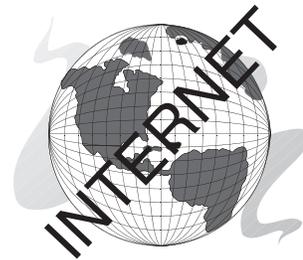
$$\underline{650 \text{ kWh} \times \$0.065 = \$42.25}$$

Internet Websites

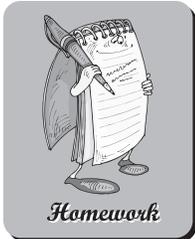
The addresses for the websites below were valid at the time of printing.

www.energysolutionsalta.com/default.asp?V_DOC_ID=871

www.miltonhydro.com/downloads/Energy_Saving_Tips.pdf



After completing this lesson, you should be able to calculate the amount of power your family uses and also the actual dollar cost of that power. Complete the following homework assignment.



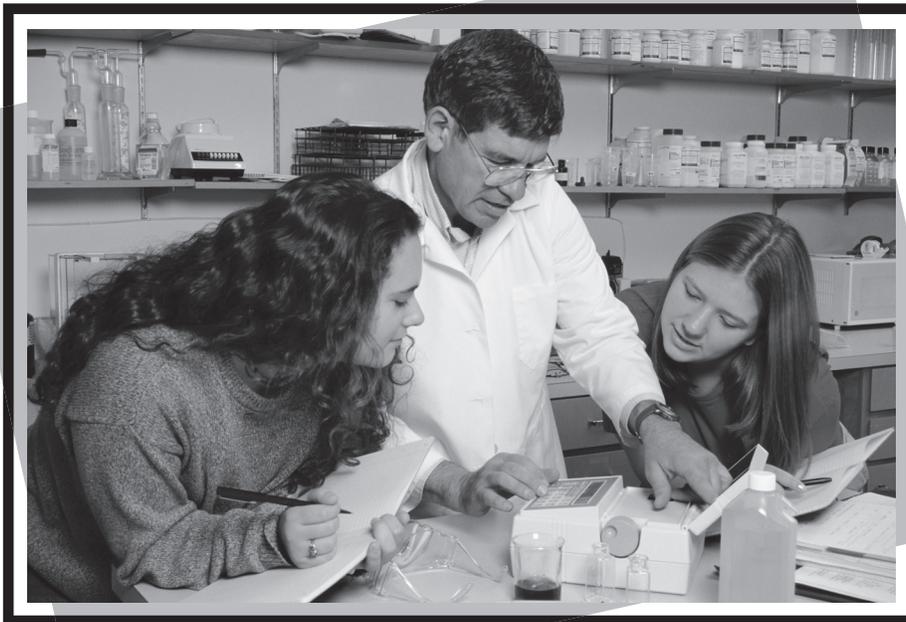
Homework

6. Go home and ask to look at a power bill for your residence. Find out how many kilowatts of energy (**kWh**) your family used in a month and identify the actual cost of that power.



Preview/Review Concepts for Grade Nine Science

TEACHER KEY



*W1 - Lesson 3B:
The Distribution of Matter in Space*

OUTLINE

By the end of this lesson, you should

- identify the distribution of matter in space
- identify characteristics of the planets in our solar system and compare them to Earth

GLOSSARY

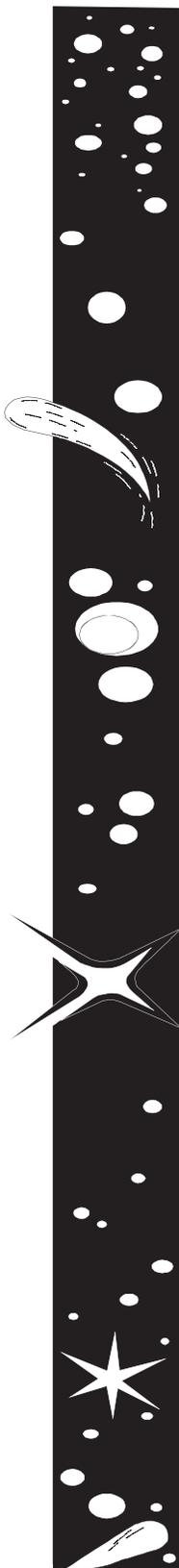
black hole - a super-dense remnant of a supernova; an object around which gravity is so intense that even light cannot escape.

constellations - groupings of stars that form patterns in the night sky (e.g., Ursa Major)

fusion - the process by which hydrogen is converted into helium, releasing large quantities of energy

solar winds - streams of electrically charged particles discharged by the Sun in every direction; solar winds pass Earth at nearly 400 km/s

W1 - Lesson 3B: The Distribution of Matter in Space



Do you enjoy watching the stars at night? What are you actually looking up at in the sky?

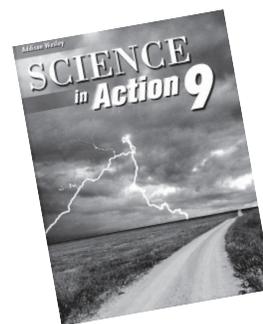
The Life of a Star

Have you ever looked into the night sky and viewed the Big Dipper and the Little Dipper? When you see this you are viewing **stars** across the night sky. The Big Dipper is known as an **asterism**, an unofficially recognized star grouping. A **star** is a hot, glowing ball of hydrogen gas that gives off massive amounts of light energy.

A star starts its life in a **nebula**. This is a cloud of large amounts of dust and gases in space . A **protostar** is the first part of the life of a star. It starts as a rotating cloud of gas and dust with a core that starts to glow. As the protostar gets hotter (to 10 000 000 degrees Celsius), hydrogen is converted to helium in a process called **fusion**. Large quantities of energy are released and a new star is created.

Two categories of stars are formed. They can be either **massive stars** or **sun-like stars**. A star spends most of its life converting hydrogen to helium. A star can last for millions or billions of years. Eventually, the fuel in the star is used and it begins to swell into a red giant. A **red giant** forms when a sun-like star increases in size because the nuclear reactions expand past the core of the star. When the fusion reaction stops in a sun-like star, it shrinks and becomes a **white dwarf** that is no larger than the size of Earth. Eventually the star forms into a **black dwarf** which is cold and dark.

Read pages 384 - 387 of *Science in Action 9*.



1. List two characteristics by which stars differ from each other.

Stars vary in their mass and colour.



2. How does the life cycle of a massive star compare to the life cycle of a sun-like star?

A massive star converts into a red supergiant, a supernova, and then a black hole. In comparison, a sun-like star converts into a red giant, a white dwarf, and a black dwarf

3. Give a definition of a supernova.

A supernova is an enormous explosion that marks the death of a massive star.

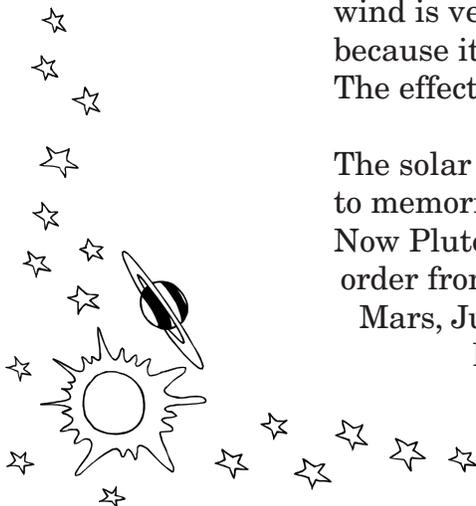
Our Solar System

Have you ever heard of the “Milky Way”? This is the name of the galaxy that we live in. A galaxy is a grouping of millions of stars, gas, and dust held together by gravity. Our galaxy includes the sun, the planets, asteroids, comets, and meteoroids.



The sun is a star that provides energy to our world. Hydrogen and helium in the core of the sun undergo fusion to produce energy. The sun also produces a solar wind that is made of charged particles that are released towards all planets in the solar system. This solar wind is very harmful to living things, but the Earth is protected because it has a magnetic field that deflects the charge particles. The effects of these particles are evident in the Aurora Borealis.

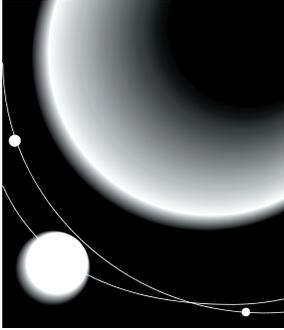
The solar system contains nine planets. Astronomy students used to memorize the following acronym: My Very Eyes May Just See U Now Pluto. This helped us remember the order of the planets. In order from closest to the sun the planets are Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, Neptune, and Pluto. Technology has allowed scientists to learn more of the characteristics of each of the planets in our solar system. The planets have several similarities and differences.



Read pages 394 - 396 of *Science in Action 9*.

4. Complete the following chart comparing characteristics of the nine planets in our solar system.

	Name of Planet & Number of Moons	Composition	Color	Average Surface Temperature	Special Characteristics
a.	Mercury 0	- <i>no atmosphere</i> - <i>has both rough and smooth surfaces</i>	<i>brown</i>	<i>180 degrees Celsius</i>	- <i>closest to the sun</i> - <i>temperatures vary greatly (-180 to 400 degrees Celsius)</i>
b.	Venus 0	- <i>clouds of CO₂ gas</i> - <i>rains sulfuric acid</i>	<i>brown</i>	<i>480 degrees Celsius</i>	- <i>rotates from east to west</i>
c.	Earth 1	- <i>has an atmosphere</i> - <i>water is 70 % of the surface</i> - <i>is also rocky</i>	<i>blue</i>	<i>15 degrees Celsius</i>	- <i>water exists in three states</i> - <i>supports life</i>
d.	Mars 2	- <i>iron oxides on the surface</i> - <i>rocky</i>	<i>red</i>	<i>53 degrees Celsius</i>	- <i>atmosphere is made of CO₂</i>
e.	Jupiter 28	- <i>composed of hydrogen and helium gas</i>	<i>white / green</i>	<i>108 degrees Celsius</i>	- <i>largest planet</i> - <i>has a big red spot</i> - <i>has 3 thin rings</i>
f.	Saturn 19	- <i>composed of hydrogen and helium gas</i>	<i>yellow with rings</i>	<i>180 degrees Celsius</i>	- <i>has distinctive rings</i> - <i>has a quick rotation</i>
g.	Uranus 17	- <i>composed of hydrogen and helium gas</i>	<i>blue, orange, yellow</i>	<i>214 degrees Celsius</i>	- <i>planet appears to roll during its orbit</i>
h.	Neptune 8	- <i>composed of hydrogen, helium, and methane gas</i>	<i>bluish</i>	<i>220 degrees Celsius</i>	- <i>gives off 3 times more energy than it receives</i> - <i>has fastest wind speeds</i>
i.	Pluto 1	- <i>frozen ball of methane</i>	<i>yellow?</i>	<i>230 degrees Celsius</i>	- <i>rotates from east to west</i>



5. Which planet has the fastest rotation? Which has the slowest rotation?

Jupiter has the fastest rotation at 9.85 hours. Venus has the slowest rotation at 243 days.

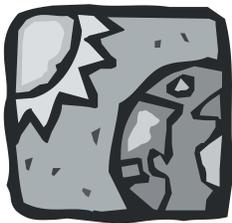
6. What factors determine the average surface temperature of a planet? Explain.

The distance to the sun determines the average surface temperature of a planet. The closer a planet is to the sun, the warmer its temperature.

7. Describe how the Earth is different from all of the other planets in our solar system.



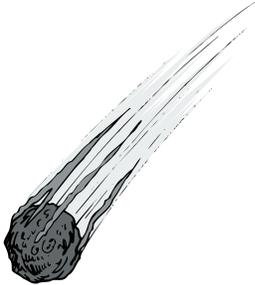
It can support life. Its atmosphere contains gases and it has a magnetic field that deflects harmful UV rays and the solar winds that come from the sun. The Earth also contains water in all 3 states.



The other bodies found in our solar system include asteroids, comets, meteoroids, meteors, and meteorites. The **asteroid belt** is made of thousands of small metallic and rocky bodies travelling between Mars and Jupiter. A **comet** is dust and ice. Its tail begins to glow when it comes near the sun. The heat from the sun boils the frozen gases of the comet, and the gases trail behind it in a tail. The tail of a comet can be millions of kilometres long. **Meteoroids** are small pieces of rock that have no particular path. We usually notice them only when they enter Earth’s atmosphere and burn up as **meteors** or fall to the ground as **meteorites**.

Read pages 397-398 of *Science in Action 9*.

- 8. Explain the difference between a meteor and a meteorite.



A meteor travels through Earth's atmosphere and gives off light energy. If it hits the ground, it becomes a meteorite.

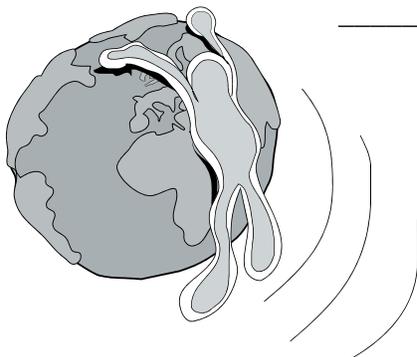
- 9. What is a nickname for a comet? Where are comets usually found in our solar system? What famous comet orbits the sun?



It is called a dirty snowball. Comets usually slowly orbit the outermost part of our galaxy around the sun. Halley's comet is a famous comet.

- 10. How large can asteroids be?

The largest asteroid "Ceres" is over 1000 km wide.



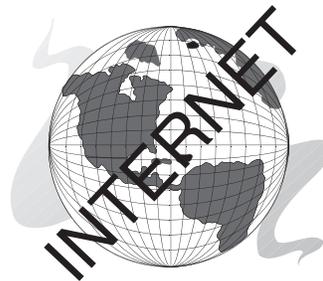
Internet Websites

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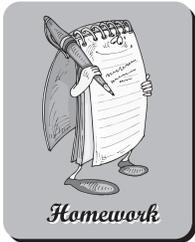
<http://www.enchantedlearning.com/subjects/astronomy/planets>

<http://ladyk.com/interactive/learning>

<http://www.the-solar-system.net>



After completing this lesson, you should be able to identify the life cycle of a star and identify the major bodies found in our solar system. Complete the following homework assignment.



Homework

11. If you could visit any planet in our solar system, which one would you choose? Explain.

Answers will vary.

I would go to Venus to see how different this planet is from Earth. This planet is the closest in size and composition to the Earth.

12. Before you go to sleep at night, look closely at the features of the moon. Describe what you see.

Answers will vary.

I see craters on the surface.



