Topic 3.5

How do we benefit from space exploration?

Key Concepts

- We develop technologies that shape our lives.
- We are challenged to think and act locally, globally, and universally.
- We gain a deeper appreciation for ourselves and our home planet.

Key Skills

Inquiry

To protect the eyes of astronauts in space and on the Moon, NASA scientists and engineers looked to the eyes of birds of prey on Earth. They discovered that eagles, hawks, and many other raptors produce an orange-coloured fluid in their eyes. This fluid protects the eyes from harmful radiation in sunlight such as ultraviolet rays. The fluid also reduces glare and enhances contrast. All these properties of the eye fluid were highly desirable for the visor material used on space helmets. So the scientists and engineers figured out how to produce it, and it was used to manufacture them. The resulting visor material is able to block 100 percent of harmful radiation. The same technology used in space helmets is yours any time you wear sunglasses that have lenses with the brand name SunTiger® or Eagle Eyes®.

Starting Point Activity

1. In what ways do you think you benefit from space exploration? Include examples of specific products or services you use that you think came from space missions.
2. Each year, many billions of dollars throughout the world are spent on space exploration. Meanwhile, many problems here on Earth—poverty, starvation, environmental damage, to name a few—require money and expertise to help solve them. Do you think money should be spent on space exploration? Justify your opinions.

We develop technologies that shape our lives.

During a typical week, you interact with, use, and even eat dozens of things that are linked to space exploration. These products are spinoffs of space exploration. (A spinoff is a product or a technology that is originally developed for one use but is modified for other uses.) The pictures on this page barely scratch the surface of the number of space spinoffs that have helped to shape society.

1. You're off to the mall to meet some friends. You glance at your watch and hope its quartz timing crystals aren't accurate. If they are, you've just missed your bus. Unfortunately your watch is correct. After all, similar watches were used for the first human mission to the Moon.

2. Should you walk instead? Luckily you've got runners on. Maybe you'd get there faster if you knew you were supported by space exploration. Running shoes are made with shock-absorbing Moon-boot material.

3. You pause to text-message your friends that you're going to be late. Your phone is designed with miniature components created originally for the shuttle program, to save space and weight on space missions.

4. Need to supplement breakfast. You stop in at a store to buy an energy bar. The cashier scans the UPC code on the back. These codes were designed to track each of the millions of tiny pieces used to build a space capsule.

LEARNING CHECK

1. Define the term "spinoff."
2. List five space spinoffs that you use in your daily life.
3. Use two examples to explain how space spinoffs have helped to shape society.

5 The Sun is strong, so you dig for your sunglasses. Oops—they catch on your bag and fall on the bench. Not a scratch, thanks to the scratch-resistant coating designed originally for the windows on the space shuttle.

6 As you cross the street, a car screeches to a halt in front of a dashing dog. It stops just in time, thanks to high-temperature space material that has improved brakes in motor vehicles.

7 You've arrived, but now it's your friends who are late. In a newspaper someone has left behind, you skim an article about how robots designed for space now fill dangerous jobs on Earth, handling hazardous chemicals, working with explosives, and risking life and limb (okay, just limb) for humans. Who knew?

Views like this are made possible with satellite technology developed originally for space exploration and military surveillance missions. (But who watches the watchers?)

We are challenged to think and act locally, globally, and universally.

You have probably heard the statement, "Think globally, act locally." Among other things, this statement reminds us that there are consequences to the ideas we have and the actions we take in response to those ideas. Where exploring space is concerned, do we always think enough about the consequences of our ideas and actions? Do the pros of a mission always outweigh the cons? Read about the two examples here, and share what you think.

Nuclear-Powered Planetary Probes

The Cassini-Huygens (cah-SEE-NEE HIGH-genz) space probe reached Saturn and its moon system in 2004. However, its launch, shown in **Figure 3.19**, was more controversial. The probe was carrying 33 kg of radioactive plutonium as a power source. Some people asked what might happen if there were an accident, such as an explosion, during or shortly after lift-off.

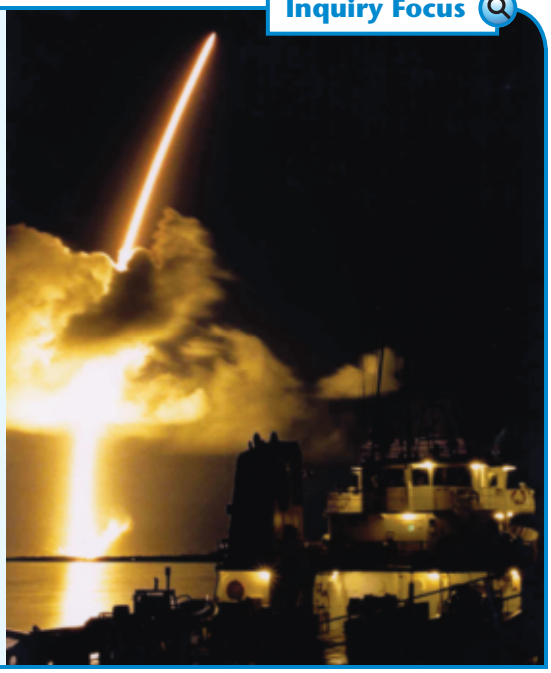
NASA authorities assured everyone that the risk of radioactive material leaving the spacecraft during such an accident was very small. However, if the rocket carrying the probe had blown up in the atmosphere, over 5 billion people, and countless numbers of other organisms, would have been exposed to the radiation.

Inquiry Focus

Activity 3.15

TRAVELLING BOMBS—WORTH THE RISK?

The Cassini-Huygens probe successfully reached Saturn and has greatly expanded our knowledge of the great ringed planet and several of its moons. One of those moons, Titan, is the only moon known to have an atmosphere, and contains chemicals that could support life. So understanding Titan can help us understand life back here, on Earth. Should we have allowed the probe to take off? Do the benefits outweigh the risks? What other solutions might there be?



▶ **Figure 3.19** The rocket carrying the Cassini-Huygens space probe was launched in 1997.

Terraforming—New Horizons for Humanity

Some scientists believe that it is technologically possible to transform alien, lifeless worlds or landscapes into life-sustaining ecosystems for future human colonies. Some scientists believe the technology for doing so already exists. Transforming an alien environment into one that can support Earth life is called terraforming. ("Terra" means land or earth.) At one time, terraforming was a topic only for science-fiction writers. Now, however, as the rate of our population growth increases and as our concerns for our global climate systems mount, terraforming represents one possible solution to the future of our human species. **Figure 3.20** shows what a terraformed landscape might look like.

Inquiry Focus

Activity 3.16

OFF-WORLD EARTHS—WORTH THE RISK?

Some people, perhaps many people, would say that we have not done a very good job of respecting and managing the ecosystems that sustain us and other living things on Earth. Have we learned our lessons enough to believe that we can do a better job on the Moon, on Mars, on Titan, or on other planets and moons in the universe? Do the benefits outweigh the risks? What other solutions might there be?

▼ **Figure 3.20** This picture shows an artist's vision of Mars being terraformed. Actually doing this would require, among other things, creating a water cycle, plant life to generate and sustain an atmosphere, and nutrient cycles to sustain the plants.

We gain a deeper appreciation for ourselves and our home planet.

▲ **Figure 3.21** The pose of the human figure on this ancient ivory is similar to the pose of the figure that later civilizations saw in the stars of Orion.

Space exploration has influenced our sense of self—our understanding of where, when, and who we are, within and beyond the boundaries of our planet. When we look up at the night sky, we are explorers just as much as any astronaut is or has been. Travel through the words and images below and share the journey we have taken over time, from some of our earliest observations of the sky to those we are making today.

We Are Stargazers

Figure 3.21 shows a tiny piece of ivory from 32 000 years ago that records a glimpse of an ancient sky. The mammoth tusk, found in Germany, is thought to show a pattern of stars in the night sky—possibly the constellation we call Orion. It is the oldest human drawing yet known.

We Are Timekeepers

The Cro-Magnon people, ancient cousins of ours, lived in Europe over 15 000 years ago. They used their observations of the changing night sky to draw the first lunar calendar on cave walls near Lascaux, France. Refer to **Figure 3.22**. The 29 dots represent the 29 days of the Moon's phases. (It takes 29.5 days for the Moon to complete a full cycle from one new Moon to the next.)

▼ **Figure 3.22** This painting is one of about 2000 that were made deep in caves in southern France 15 000 to 17 000 years ago.

We Are Navigators

Sailors and wanderers, both ancient and modern, rely on the predictable patterns of constellations and other celestial objects to find the way from home to there and back again.

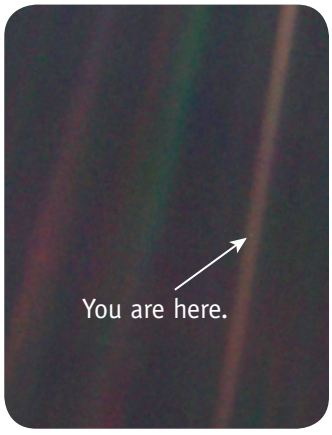
We Are Explorers

In the mid-1900s, we decided to find out what was "out there" ourselves. In 1961, cosmonaut Yuri Gagarin became the first person in space. In 1969, American astronauts Neil Armstrong and Buzz Aldrin were the first humans to set foot on the Moon. In 2005, cosmonaut Sergei Krikalev broke the record for the longest time spent in space, spending over two years on the International Space Station. Refer to **Figure 3.23**.

◀ **Figure 3.23** Yuri Gagarin (A), Neil Armstrong (B), and Sergei Krikalev (C)—record-breakers in the history of space exploration.

We Are Voyagers

In 1977, two small probes—*Voyager 1* and *Voyager 2*—left Earth on a mission to observe and study the four outer planets before hurtling onward to the outer reaches of our solar system, and beyond. The *Voyager* probes have travelled, and continue to travel, farther from Earth than any other human-made craft in history (**Figure 3.24**). They carry with them a piece of humanity, of us—pictures, songs, and stories about the people of a small, pale-blue, life-supporting planet called Earth.



▲ **Figure 3.24** In 1990, as *Voyager 1* began its long journey to the edge of the solar system, it "looked back" at our home system of planets. In its view, Earth is a speck of light barely 0.1 pixels in size.

LEARNING CHECK

1. Refer to **Figure 3.22**. Predict why ancient civilizations created drawings of constellations.
2. Why do people continue to explore space and send space probes to the far reaches of our galaxy?
3. In your own words, compare the similarities and differences between ancient explorers and modern-day space explorers.

Making a DIFFERENCE

Stargazing is becoming more difficult because of light pollution. Light pollution is light that shines where it is not needed. A lit sign meant to be seen by people passing by produces light pollution if it also shines light into the sky where it isn't needed.

Shelby Mielhausen noticed that light pollution was increasing in Tobermory, Ontario, her home town. She studied the issue for a project in Grade 8. She wanted to know how light pollution affects the number of stars she could see. She counted visible stars in four communities and confirmed her prediction. Owen Sound, the largest community, had the most light pollution and the smallest star count. Shelby also studied outdoor lighting design and constructed a light shield that can help reduce light pollution.

What could you do to decrease light pollution in your neighbourhood?

When Nishant Balakrishnan was in Grade 9, he observed that every winter the hydro lines in the city freeze and communities lost power until the lines could be repaired. He thought about the way earthworms and leeches move vertically, and he wondered if he could design a robot that could climb hydro towers in a similar way.

Nishant named his design Leech Bot. The robot is controlled by a microprocessor. It uses springs, magnets and motors to creep across surfaces and flip over obstacles. "I've always tried to model solutions to problems based on what I see around me, because it's the basic things in nature that offer the most elegant and effective solutions," says Nishant. He believes that Leech Bot could be modified to do repair work on Earth as well as in space and on remote worlds such as Mars or the Moon.

What kind of robot can you imagine designing for use in space or on Earth?

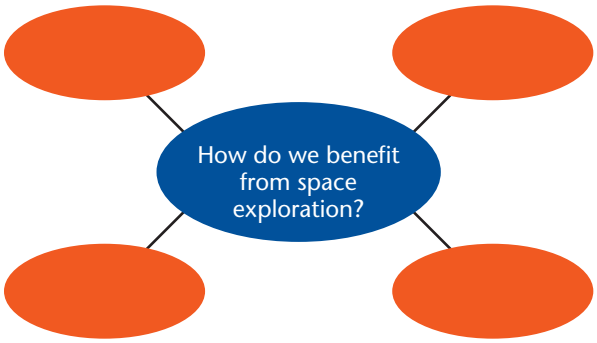
Topic 3.5 Review

Key Concepts Summary

- We develop technologies that shape our lives.
- We are challenged to think and act locally, globally, and universally.
- We gain a deeper appreciation for ourselves and our home planet.

Review the Key Concepts

1. K/U Answer the question that is the title of this topic. Copy and complete the graphic organizer below in your notebook. Fill in four examples from the topic using key terms as well as your own words.



2. C Refer to **Figure 3.5**. In your notebook, draw a one-frame cartoon identifying one spin-off of space exploration that has a direct impact on your life.

3. A Below is a list of technologies that are direct spin-offs of space exploration. Identify a possible occupation that would benefit from each of these technologies and explain how it might benefit an individual in that job.

a) Water purification technology used on the Apollo spacecraft

b) Cordless power tools and appliances

c) Freeze-dried food developed for the long *Apollo* missions

d) A sensitive, hand-held infrared camera that observes the flames produced during the launch of the space shuttle

e) Airocide, an air-purifier that kills 93.3 percent of airborne disease-causing organisms that pass through it, including the anthrax bacterium

4. C On January 11, 2007 China launched an anti-satellite missile and destroyed one of its aging weather satellites. The Anti-satellite (ASAT) Test produced as many as 35 000 pieces of debris about 1 cm in size. Nearly 1500 pieces were 10 cm and larger. Space scientists say there have already been three known cases in the last 15 years when satellites were disabled by collisions with space debris. In your opinion, should China have conducted this type of test? Justify your answer.

5. C NASA is preparing to send a small satellite into orbit that can be propelled by solar sails. When light from the Sun strikes the surface of the sail, solar energy is transferred to it. This energy provides a force that propels the satellite through space. Solar sails provide very low but inexhaustible thrust to move the satellite. In your opinion, should scientists use nuclear-powered or solar-powered sails as a propulsion system for interplanetary probes? Justify your answer.

6. A One day, humans could make a planet such as Mars suitable for life by transforming its environment through terraforming. If you were a scientist in charge of this massive project, how would you change the environment of Mars to make it suitable for life forms from Earth? Justify your answer.

Unit 3 Summary

Topic 3.1: What do we see when we look at the night sky?

Key Concepts

- We see stars that we organize into patterns.
- We see celestial objects of the universe.
- We see objects separated by immense distances.

Key Terms

constellation (page 171)
universe (page 172)
gravitational pull (page 172)
orbit (page 172)
solar system (page 172)
star (page 172)
galaxy (page 173)
astronomical unit (AU) (page 174)
light-year (page 175)

Big Ideas

- Celestial objects in the solar system and universe have specific properties that can be investigated and understood.

Topic 3.2: What are the Sun and the Moon and how are they linked to Earth?

Key Concepts

- The Sun is our nearest star.
- Interactions of Earth and the Sun make life possible.
- The Moon is our nearest neighbour in space.
- The Sun, Moon, and Earth interact to create eclipses.

Key Terms

magnetosphere (page 186)
aurora (page 186)
solar eclipse (page 190)
lunar eclipse (page 191)

Big Ideas

- Celestial objects in the solar system and universe have specific properties that can be investigated and understood.

Topic 3.3: What has space exploration taught us about our solar system?

Key Concepts

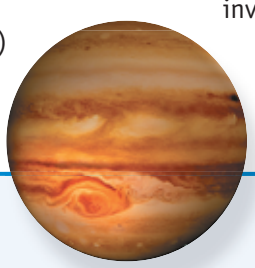
- The four inner Earth-like planets are small and rocky.
- The four outer gas-giant planets are large and ringed.
- Rocky chunks of various sizes make up the rest of the solar system.

Key Terms

inner planets (page 198)
outer planets (page 200)
asteroid (page 202)
meteoroid (page 203)
comet (page 203)

Big Ideas

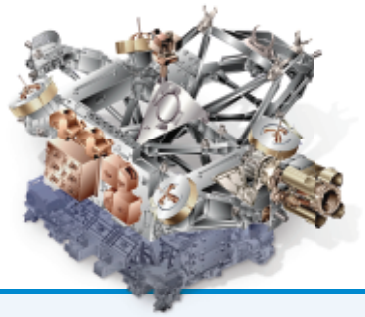
- Celestial objects in the solar system and universe have specific properties that can be investigated and understood.



Topic 3.4: What role does Canada play in space exploration?

Key Concepts

- Canada contributes people and technology to explore space.
- Canada helps build the future of space exploration.



Big Ideas

- Celestial objects in the solar system and universe have specific properties that can be investigated and understood.
- Technologies developed for space exploration have practical applications on Earth.

Topic 3.5: How do we benefit from space exploration?

Key Concepts

- We develop technologies that shape our lives.
- We are challenged to think and act locally, globally, and universally.
- We gain a deeper appreciation for ourselves and our home planet.

Big Ideas

- Celestial objects in the solar system and universe have specific properties that can be investigated and understood.
- Technologies developed for space exploration have practical applications on Earth.

Inquiry Investigation: Space Thirst

Astronauts need water to drink, but water is heavy and costly to carry. Instead of bringing a supply for the whole mission, astronauts need to capture all sources of water (including waste water) and recycle it, the way cities do.

Initiate and Plan

1. For this investigation, use simulated urine made of glucose and food colouring. Your goal is to produce clean, clear, colourless water from the simulated urine.
2. Consider different methods that can be used to purify your water sample (for example, filtering or boiling). Design an investigation to test one of these methods.
3. Write a plan for your investigation. Include:
   - equipment and materials from the science lab
   - step-by-step method
   - safety precautions
   - a procedure for recording results
   - criteria for measuring and judging results
4. Have your teacher approve your plan.

Perform and Record

5. Conduct your investigation and record the results.

Analyze and Interpret

1. Describe the results of your investigation.
2. Were you satisfied with the quality of your final water sample? Explain why or why not.
3. Do you think your water sample is safe to drink? Why or why not?
4. How did knowing what was in your water sample influence your investigation?
5. Could your method be used to test a different type of waste water, for example, sweat or wash water?
6. Could your procedure be used on a space mission? Explain why or why not.

Communicate Your Findings

7. Present your results in a brief written or oral report. Include either a detailed outline of your procedure or a series of graphics.

Assessment Checklist

Review your project when you complete it.
Did you…

- ☑ determine which method of purifying water would work with your sample? K/U
- ☑ create a plan using appropriate equipment and following all safety precautions? T/I
- ☑ demonstrate that the goal of clean, clear, colourless water would be achieved as the result of your procedure? T/I
- ☑ organize and record your results using an appropriate format? C
- ☑ explain how your purification process would (or would not) work on a space mission? A

An Issue to Analyze: The Costs and Benefits of Space Travel

The transport of material into space via the space shuttle or existing rockets costs more than $22 000 for each kg sent! Researchers are investigating the possibility of using a space elevator, electromagnetic launch vehicles, or other technologies to do the job instead. What are the costs and benefits of new space travel technologies?

Issue

What are the costs and benefits of two different space travel technologies that could be used to carry equipment into space?

Initiate and Plan

1. As a class, find out what new technologies are being developed for space transport. Choose two you would like to investigate.
2. Make a list of the information you need to determine the costs and benefits of each space travel technology.
3. Record your information in chart form in your notebook.
4. Review your research plans with your teacher.

Perform and Record

5. Use the Internet or material provided by your teacher to find the information.
6. Record where you obtained your information and specific details about costs and benefits for the different technologies.

Analyze and Interpret

1. Evaluate the costs and potential benefits of each space travel technology.
2. Prepare a t-chart to show the costs and potential benefits of each technology.
3. Use your analysis to make a recommendation regarding the space travel technology that appears to have the greatest potential for development.

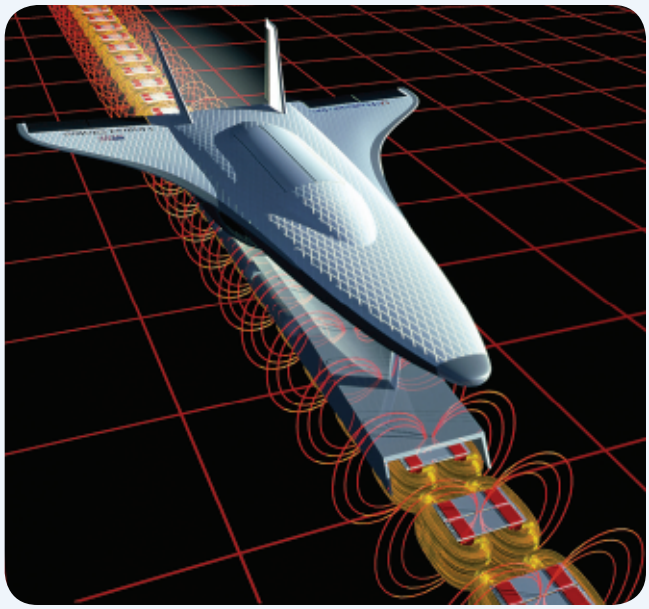
Communicate Your Findings

4. Prepare a brief written or oral report to describe the costs and benefits of two space travel technologies and recommend what you consider to be the best option.

Assessment Checklist

Review your project when you complete it.
Did you...

- ☑ identify which two space travel technologies you would like to investigate? K/U
- ☑ use a variety of sources to gather the information you need to determine the costs and benefits of each space travel technology? T/I
- ☑ summarize your information in a t-chart to show the costs and potential benefits of each option for space travel? C
- ☑ make a recommendation regarding the space travel technology that appears to have the greatest potential for development? A



Unit 3 Review

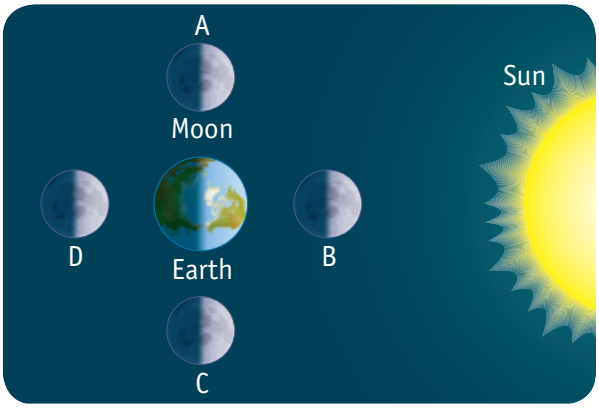
Connect to the Big Ideas

You can answer these first two questions now or after you have completed the other Unit 3 Review questions.

1. Celestial objects in the solar system and universe have specific properties that can be investigated and understood. Canada's participation in space exploration can be traced back to 1839 with the establishment of the first observatory to study the Northern Lights. Prepare a timeline or a brief report on the role that Canada has played in the exploration of space. Include some details about Canada's role as a leader in space robotics and satellite communications.
2. Technologies developed for space exploration have practical applications on Earth. Use a cartoon, drawing, or story to describe how your life might have been different had humans not explored space.

Knowledge and Understanding K/U

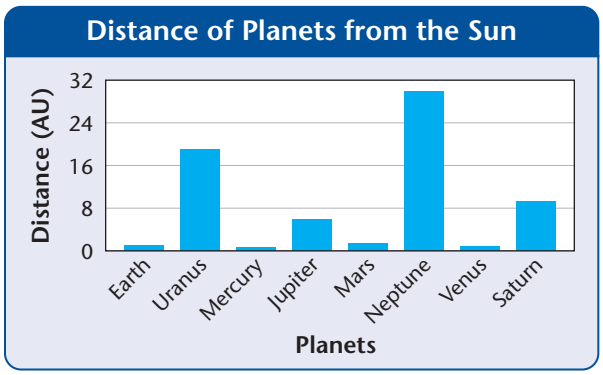
3. In your notebook, draw and label a sketch that shows the relationship between stars and constellations.
4. Use a series of drawings to predict how the Little Dipper constellation would appear to move around Polaris during one evening.
5. Explain how the terms "Sun," "gravitational pull," "planets," and "solar system" are related.
6. Look back at **Figure 3.6**. Identify the major components of a galaxy such as this.
7. Identify the unit that scientists would use to measure the distance between Earth and each of the following celestial objects.
   - **a)** Sun
   - **b)** Uranus
   - **c)** Betelgeuse (a star)
   - **d)** Andromeda Galaxy
8. Use words, a picture, or a graphic organizer to explain the relationship among Earth's magnetosphere, the aurora borealis, and solar wind.
9. Use the diagram below to answer the questions that follow.



   - **a)** In which position is the Moon at third quarter?
   - **b)** In which position is the Moon at first quarter?
   - **c)** For a lunar eclipse to occur, in which position in its orbit must the Moon be?
   - **d)** For a solar eclipse to occur, in which position in its orbit must the Moon be?
10. Identify four features that the inner planets have in common with Earth.
11. Identify five features that the outer planets have in common with each other.
12. Name all the planets that have one or more moons.
13. On November 20, 2008, a large fireball raced across the skies of Alberta and Saskatchewan. More than 1000 pieces of the fireball were found in the Buzzard Coulee region of Alberta. Use this information to describe a meteoroid, a meteor, and a meteorite.
14. Identify the Canadian satellite that is "keeping an eye" on asteroids, and explain the significance of this satellite.
15. List two contributions that Canadian-developed technologies have made to the International Space Station (ISS).
16. In terms of space exploration, define the term "spinoff" and provide two examples of spinoffs that have affected your life.

Thinking and Investigation T/I

17. Based on the data in this graph, determine which planet is closer to Earth: Saturn or Jupiter. Show your work.



1 AU = 150 000 000 km

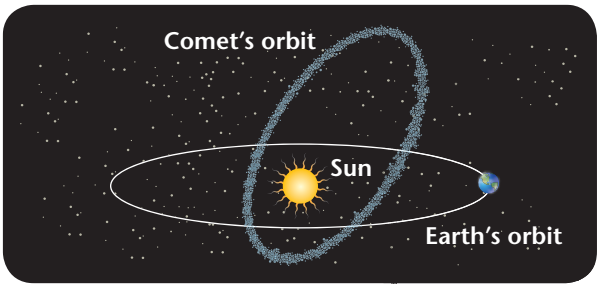
18. Stars can be classified by their surface temperatures. Based on the data in the table below, determine the colour of the following stars:

a) Betelgeuse (3100 K);
b) Arcturus (4500 K);
c) Antares (3000 K);
d) Rigel (11 000 K); and
e) the Sun (6000 K).

Classification of Stars by Colour and Temperature

Star Classification	Colour	Temperature (K)
O	blue	30 000–60 000
B	blue-white	11 000–30 000
A	white	7500–11 000
F	yellow-white	6000–7500
G	yellow	5000–6000
K	yellow-orange	3500–5000
M	red	less than 3500

19. Based on the diagram and the caption below, describe the relationship between the meteoroids associated with the Perseid meteor shower and the comet Swift-Tuttle.



Comet Swift-Tuttle takes approximately 130 years to circle the Sun and was last observed in 1992. Earth passes through the debris left in space by the comet. Every summer, we see a dazzling display of meteoroids striking Earth's surface. This display is called the Perseid meteor shower.

Communication C

20. Refer to the heading on page 226: "We are Timekeepers." Suppose the information below about the Maya pyramid were added to that page. Write a heading for this information, and then explain its significance.

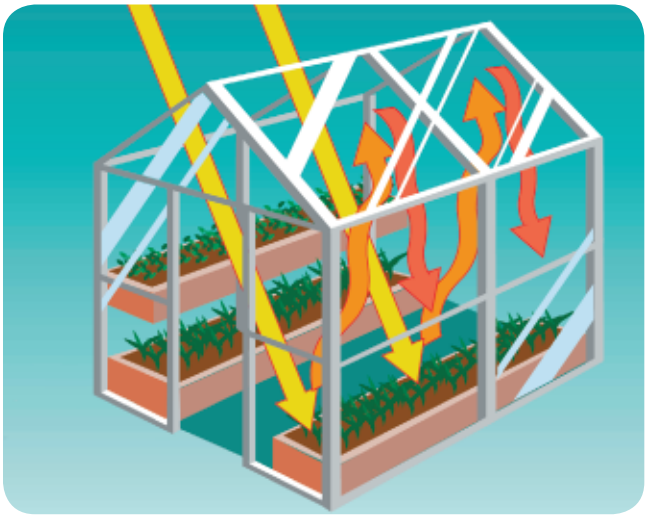
The Pyramid of Kukulkan (the feathered serpent) is a popular site for visitors today to Chichén Itzá, in the Yucatan region of Mexico. The pyramid has four stairways, each with 91 stairs. If you add the total number of stairs, plus the platform at the top, you get 365.

22. The Canadian Space Agency is working on a mission to bring soil samples back from Mars. Research the pros and cons of this mission. Then have a class discussion about sending humans to Mars.

Unit 3 Review

Application A

22. Based on the picture and caption below, create a diagram or a graphic organizer to summarize how the glass in a greenhouse is similar to Earth's atmosphere.



Many people use a greenhouse for growing plants. Solar energy (yellow arrow) reaches the greenhouse, passes through the glass, and is absorbed by the ground and plants inside. Some of this solar energy is given off by the ground and plants as heat (orange arrows). Most of this heat cannot escape through the glass (red arrows).

23. The space probe named *NEAR Shoemaker* was launched in February 1996. (NEAR stands for Near Earth Asteroid Rendezvous.) In February 2001, it landed on the rocky surface of the asteroid Eros, which is nearly 322 million kilometres from Earth. Identify some technological challenges that scientists must have faced attempting to land a space probe on the surface of this asteroid.

24. Astrobiology is the study of the origin, distribution, and future of life in the universe. Astrobiology includes the search for environments in our solar system and beyond our solar system that could support life. Based on the factors and resources needed to sustain life on Earth, predict three factors that astrobiologists would look for in their search for life on other planets. Explain your reasoning.

25. People from different cultures have different ways to explain and understand celestial objects. For instance, some have said that the northern lights (the *aurora borealis*) form a narrow, dangerous pathway that souls travel after the death of the physical body. Others have said that the shimmering lights could be reflected firelight from the edge of the world, sunlight reflected from ice caps, or reflected light from ice crystals in the sky. Use words, diagrams, or a graphic organizer to summarize how scientists today explain the northern lights.

26. Imagine that you are going to create a scale model of our solar system that compares the sizes of the planets in relation to each other and to the Sun.

a) Identify the pages in Unit 3 that you would look on to find the information you need. (Hint: There are three pages that would be most helpful.)

b) Name an object that you could use to represent the sizes of the following solar-system objects in your scale model. Explain why these objects are good choices.

- an object to represent the size of Mercury
- an object to represent the size of Earth
- an object to represent the size of Jupiter
- an object to represent the size of Uranus

27. Unit 3 began with a song written by Canadian artist, Buffy Sainte-Marie and a photograph from the movie, *E.T. The Extra-Terrestrial*, which is now used as the logo for the company, Amblin Entertainment.

a) Suggest a different photograph that you think would be a good choice to start this unit.

b) Suggest a different song that you think would be a good choice to start this unit.

c) Explain how your choices of photograph and song work together well for this unit.

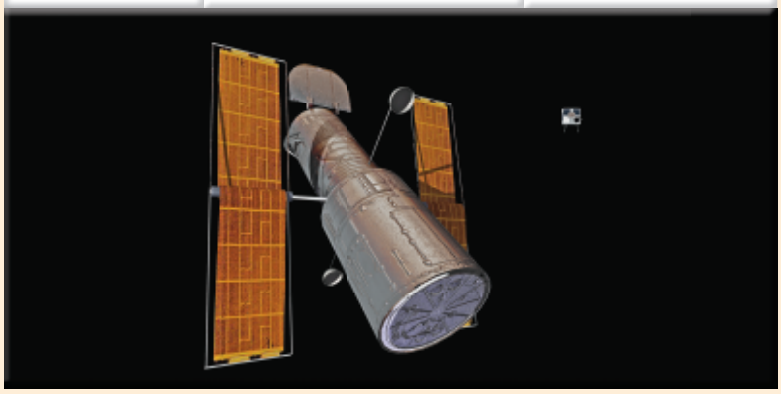
Literacy Test Prep

Read the selection below, and answer the questions that follow it.

The *Hubble Space Telescope* (*HST*) is a large space telescope that has revolutionized astronomy by providing extremely deep and clear views of the universe. It was launched in 1990 by the United States and has been in operation ever since. *MOST* (Microvariability and Oscillation of STars) is Canada's first space telescope. It was launched in 2003. The purpose of *MOST* is to study stars that are similar to the Sun. The table compares the *HST* and *MOST*.

A Comparison of the *HST* and *MOST*

	Hubble Space Telescope	*MOST*
Cost and year of launch	$10 billion; 1990	$10 million; 2003
Dimensions and mass	13.2 m × 4.2 m (about the size of a large school bus); 11 110 kg	65 × 65 × 30 cm (about the size of a suitcase); 60 kg
Instruments	7 science instruments; diameter of the primary optical mirror: 2.4 m	telescope mirror diameter: 15 cm
Altitude above Earth	600 km	820 km
Power	solar energy	solar energy



Multiple Choice

In your notebook, record the best or most correct answer.

28. The short form for Canada's space telescope is

a) *CST* **c)** *MOST*
b) *HST* **d)** *MST*

29. Refer to the table on this page. One feature that both telescopes have in common is

a) their power source
b) their year of launch
c) their size
d) the number of instruments

30. The size of the HST is similar to that of

a) a suitcase **c)** a mirror
b) a large school bus **d)** a large van

31. The cost of building and launching *MOST* was

a) $10 billion **c)** $10 milllion
b) $13.2 million **d)** $60 million

32. *MOST*'s altitude above Earth is

a) 600 km **c)** 220 km
b) 820 m **d)** 820 km

Written Answer

33. In 2008, the tiny *MOST* space telescope received the Alouette Award for its outstanding contributions to space technology and research. Imagine that you interviewed one of the scientists that invented *MOST*. Write a one-paragraph newspaper article based on your interview. Include these elements in your article:

- a strong lead sentence
- a made-up name for the scientist
- a quote from the scientist describing how she or he felt after learning of the award. (Be creative!)