Science 9 - Unit E - Review Sheet

Learning Outcomes

Can you?

- ☐ identify different perspectives on the nature of Earth and space
- ☐ investigate and illustrate the contributions of technological advances to a scientific understanding of space
- ☐ describe the distribution of matter in space
- ☐ identify evidence for, and describe characteristics of, bodies that make up the solar system and compare their characteristics with Earth's
- ☐ describe and apply techniques for determining the position and motion of objects in space
- ☐ investigate predictions about the motion, alignment, and collision of bodies in space
- ☐ analyze space environments, and identify challenges that must be met in developing life-supporting systems
- ☐ describe technologies for life-support systems, and interpret the scientific principles on which they are based
- ☐ describe technologies for space transport, and interpret the scientific principles involved
- ☐ identify materials and processes developed to meet needs in space, and identify related applications
- ☐ describe the development of artificial satellites, and explain the major purposes for which they are used
- ☐ explain, in general terms, the operation of optical telescopes, including telescopes that are positioned in space environments
- ☐ explain the role of radio and optical telescopes in determining characteristics of stars and star systems
- ☐ describe and interpret, in general terms, the technologies used in global positioning systems and in remote sensing
- ☐ recognize the risks and dangers associated with space exploration
- ☐ describe Canadian contributions to space research and development and to the astronaut program
- ☐ identify and analyze factors that are important to decisions regarding space exploration and development

Unit at a Glance

- Ancient astronomers learned a lot about the heavens without much, if any, technology.
- Earth was the first frame of reference people used.
- Careful measurements of planetary motions led to two conflicting theories of the universe - geocentric and heliocentric.
- The invention of the telescope enabled astronomers to make more precise measurements of celestial objects, and the heliocentric theory won out.
- The invention of the spectroscope enabled astronomers to infer the composition of stars.
- Spectroscopy also enables astronomers to find out the direction of motion of celestial bodies because of the Doppler effect.
- The distances to the nearest stars are found with parallax.
- Radio signals come from the sky. Radio astronomers made many more discoveries about celestial bodies.
- Telescopes of all types have been made bigger over the years. They have been connected through the use of computers. Some telescopes have been placed in space.
- Rockets were designed for war and have been turned to peaceful applications. All of the things we put in space need rockets to get them there.
- Computers are important for space technology. They are used to calculate orbits, store and manipulate images, and to receive and act upon instructions from Earth.
- The Hubble space telescope is one of a series of space-based observatories planned or launched.
- Scientists are studying Earth from space with satellites. These satellites may be in low Earth orbits, or in geosynchronous orbits. This is called remote sensing.
- The global positioning system is a fleet of satellites used by people to locate their position on Earth.
- The Sun, Moon, and every planet (except Pluto) have been visited by at least one Earth spacecraft. We have some close-up data on these as a result.
- The main focus of a human presence in space at this time is to occupy a space station. Canada is a partner in this endeavour, supplying many technological devices and astronauts as mission specialists.

Unit E: Space Exploration

Science 9 Review

Wherever necessary, answer questions on a separate sheet of paper.

1. Explain why knowing when the summer solstice occurred was important for ancient peoples.

2. Describe the difference between a geocentric model of the solar system and a heliocentric model.

3. a) Why is the astronomical unit used when describing distances in our solar system?

   b) Why isn't the astronomical unit used when describing distances to stars outside our solar system?

4. Describe what must happen in order for a nebula to begin the formation of a new star.

5. Describe what is happening to a star when it is in the red giant phase of its life.

6. Describe two differences between the inner and outer planets.

7. Why are comets sometimes referred to as "dirty snowballs"?

8. Explain why it makes sense to use unmanned space probes when first visiting a body in space.

9.Sketch a rocket and label the three main components.

10. Describe an advantage to using an ion drive to propel a spacecraft.

11. Explain two purposes of the International Space Station.

12. If an astronaut is in space for a great length of time, why is it essential that he or she exercise regularly and strenuously?

13. List two psychological effects of long periods of space travel.

14. List and describe three things a space suit must provide for an astronaut who is outside the spacecraft.

15. How do humans use satellites to assist with communication?

16. Describe the differences between refracting telescopes and reflecting telescopes.

17. Sketch and label the parts of a reflecting telescope.

18. What are two advantages that the Hubble Space Telescope has over ground-based telescopes?

19. Which form of electromagnetic radiation has the shortest wavelength?

20. Describe two advantages that a radio telescope has over an optical telescope.

21. Describe the technique called interferometry.

22. Describe an advantage of using a remote probe to study a planet rather than an Earth-based telescope.

23. Suppose an international crew aboard an exploration spacecraft discovered a large asteroid that was particularly rich in valuable materials. List three issues that would arise from the group's claiming the asteroid. (Hint: Consider the political, environmental, and ethical issues described in your hand-out.)

24. Ancient peoples considered specific times of the year and particular bodies in the sky to be very special. What evidence do we have that would support this idea?

25. How did the advancement of the telescope lead to the model of the solar system we know today?

26. Why is the distance that light travels in a year (a light-year) used as a unit for describing distances to stars and galaxies?

27. Why is looking at stars in space said to be looking into the past?

28. Referring to the Hertzsprung–Russell diagram in Figure 1.18 on page 385 of the student book, describe the characteristics of a giant star (located in the top right corner of the diagram).

29. Describe the three steps in solar system formation.

30. Besides distance from the Sun, give one difference between terrestrial planets and Jovian planets.

31. Explain the difference between a meteoroid, a meteor, and a meteorite.

32. What would happen to a rocket that does not reach Earth's escape velocity of 28 000 km/h?

33. Why does it make more sense to launch an interplanetary spacecraft from an orbiting space station rather than from Earth?

34. Describe two examples of services that satellites provide to people on Earth.

35. The very large radio telescope in Arecibo, Puerto Rico, can focus very small signals from space. What is one disadvantage to using a radio telescope of this size?

36. There are many issues associated with space exploration and travel. For each of the following headings, provide a concern or issue that would relate to space exploration.

Political	Ethical	Environmental

Use the following information to answer question 37.

Imagine that two new planets have been discovered. Planet X has been found between the orbits of Venus and Earth. Planet Y has been found between the orbits of Jupiter and Saturn. Use the following table to help you answer the questions below.

Planet	Diameter (km)	Surface Gravity (Earth = 1)	Surface Material	Atmosphere
Venus	12 100	0.91	rock	carbon dioxide, sulfuric acid
Planet X				
Earth	12 756	1	water, rock	nitrogen, oxygen, water vapour
Jupiter	143 200	2.5	liquid hydrogen	hydrogen, helium
Planet Y				
Saturn	120 000	0.93	liquid hydrogen	hydrogen, helium

37. a) Based on the data from the table above, what can you say about the size of planet X relative to Earth and Venus?

b) Describe what you would expect the surface of planet X to be composed of.

c) Would you expect the surface of planet Y to be solid? Explain your answer.

d) How would the gravity on planet X compare with the gravity on Earth and Venus?

e) How would the size of planet X compare with the size of planet Y?

f) Which planet, X or Y, would you expect to have more than one moon? Explain why.

g) What would you expect to be the composition of the atmosphere of planet Y?

h) Would you expect planet X to have a ring system? Explain your answer.