



Science In Action 9 – Unit 5 Space Exploration Summary of Key Concepts and Review Questions Booklet

Section 1.0 Understanding of Earth and Space has Changed over Time

Key Concepts ❖ **Ancient cultures – myths and legends**

What **myths and legends** explained about space by **ancient cultures**? Fill in the table.

	The width of a mitt was used at arm's length to gauge the height of the Sun above the horizon. When it was 1 mitt-width, seal pups would be born in two lunar cycles.
First Nations of the Pacific Northwest	
	The megaliths erected at Stonehenge were arranged in concentric circles to mark the summer and winter solstices.
Mayans	
	The pyramids were built to align with the seasonal positions of certain stars
Greeks	
	Key rocks in medicine circles aligned with the bright star that rose in the dawn, such as Aldebaran, Rigel, and Sirius.

Illustrate the two Models of Planetary Motion

Geocentric	Heliocentric
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Astronomer who developed this model ...	Astronomer who developed this model ...

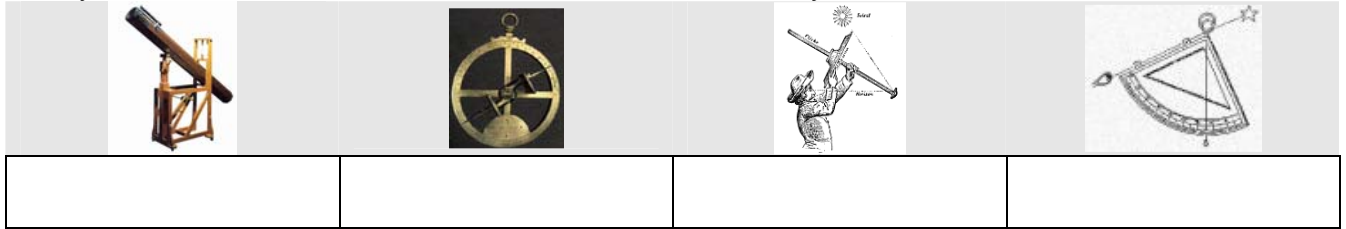
Kepler discovered what was missing from the heliocentric model. It was _____



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Key Concepts ❖ Technology to study space has evolved through history

Identify the **astronomers tools** used to make observations of the sky.

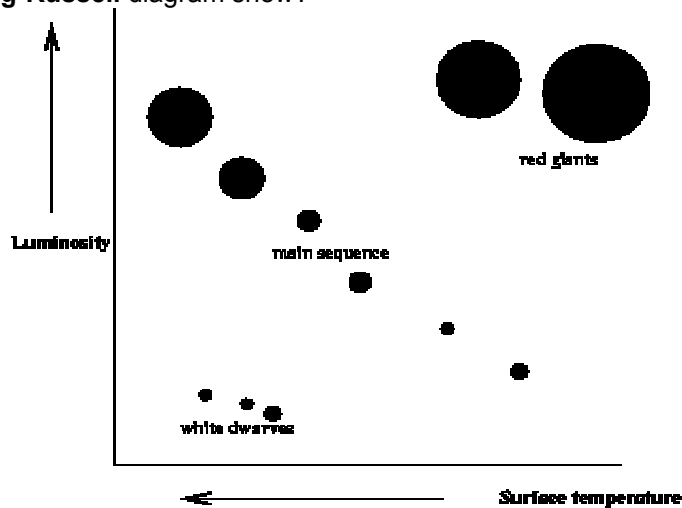


How did each improvement help to **advance our understanding** of what was observed?

Explain the difference between **Astronomical Units** and **Light-years**.

Key Concepts ❖ Earth orbits a star (billions of stars in the **Milky Way Galaxy**)

What does the **Hertzsprung-Russell** diagram show?





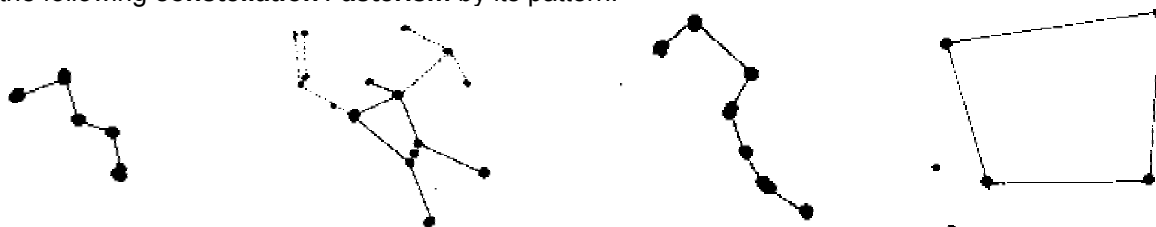
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Illustrate the life cycles of **massive stars** and **Sun-like stars**.

What is a **Black Hole** and how is it formed?

Myths and legends are used to explain **constellations**, based on their unique patterns. Those that are included in myths and legends, but are not officially recognized as constellations are called **asterisms**.

Identify the following **constellation / asterism** by its pattern.



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What are the three types of galaxies?

Key Concepts ❖ Accurate data & telescope technology improve understanding

What are the three stages in the formation of a solar system? (The '**protoplanet hypothesis**')

1. _____
2. _____
3. _____

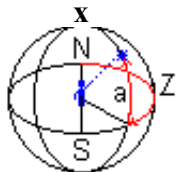
Review your planet spreadsheet information cards prepared in class.



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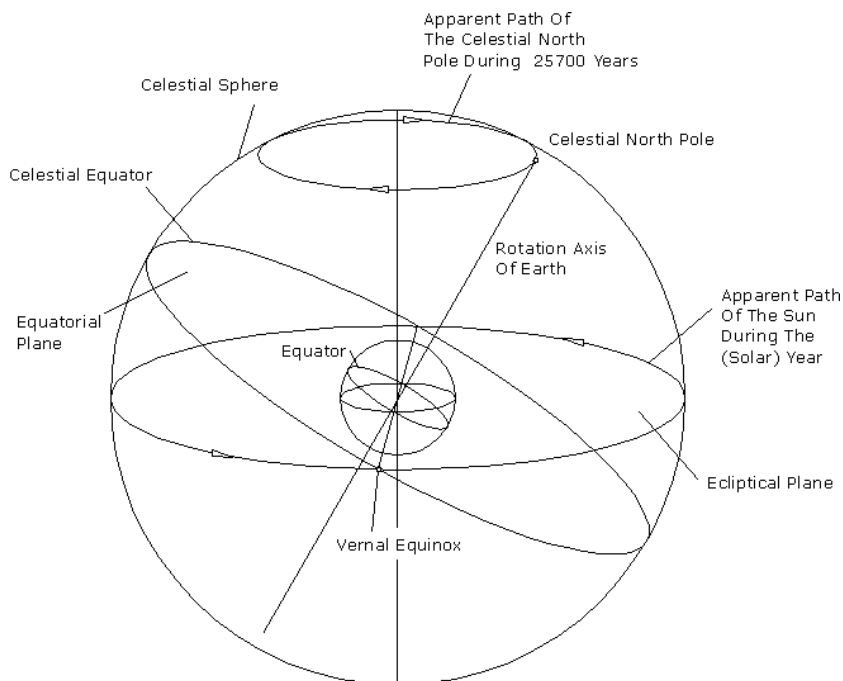
What is **SETI** ?

Key Concepts ❖ Star position – uses compass direction (**azimuth**) and altitude.



x	
a	
Z	

Explain what the **Celestial Sphere** is used for.





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Section 2.0 Technological Developments to Explore Space

Key Concepts ❖ **Rocketry** has advanced over time

Identify the 3 main parts of a **rocket**.

Part	Function

Explain the difference between **ion drives** and **solar sails**.

Ion Drive	Solar Sails

Identify the three main types of **spacecraft** and what they are used for.

Type of spacecraft	What it is used for ...

Key Concepts ❖ **Humans basic needs must be met in order to live in space**

Give examples for each type of **Hazard of Living In Space**

HAZARD	Examples
Environmental Hazards	
Psychological Challenges to Confined Living	
Microgravity and the Human Body	

Briefly describe the purpose of a **space suit** and how has it been improved over the years.



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What are the functions of the **Life Support Systems** on the **International Space Station**?

- _____
- _____
- _____
- _____
- _____

Key Concepts ❖ Satellites provide information on weather, communications and global positioning as well as identify natural resources on the Earth

What is the difference between 'natural satellites' and 'artificial satellites'?

Explain how each type of satellite is used for a specific purpose.

Type of satellite	What it is used for ...
Communication	
Observation and Research	
Remote Sensing	
Personal Tracking	

Give a practical application, for use on the Earth, of a material that was originally developed for use in the space program, by each field identified in the table below.

Field	Space Use	Earth Use
Computer		
Consumer		
Medical		
Industry		
Transportation		
Public Safety		
Entertainment		



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Section 3.0 Telescopes and other Space Technologies

Key Concepts ❖ **Reflecting** (mirrors) and **Refracting** (lenses) telescopes focus light

Illustrate two different optical telescopes used to study space

Reflecting (mirrors) telescopes	Refracting (lenses) telescopes

What is Interferometry?

Describe the advantages of the Hubble Space Telescope over Earth-based telescopes

Key Concepts ❖ **Electromagnetic Spectrum:** visible light, infrared, X-ray, ultraviolet, gamma radiation

How do scientists and astronomers use the many different forms of 'invisible' electromagnetic energy?

Energy Form	Space Use	Earth Use
Radio		
microwave		
infrared		
ultraviolet		
X-ray		
Gamma		



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Describe how an **array** is useful to astronomers ...

What is the purpose behind sending space probes out into space?

Key Concepts ❖ **Triangulation** and **Parallax** used to measure distance in space

Using **triangulation**, determine the distance across a gorge. Show all your work.

Information you will need:

Baseline is 25 m
Angle a) is
Angle b) is
Scale 1 cm = 5m

What is **parallax**?



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Key Concepts ❖ **Star spectrum shift** determines if it is moving away or towards us

How is a star's **composition** determined?

How is a star's **position** (coming toward or moving away) determined?

What is the **Doppler Effect** and what practical applications use it?

Section 4.0 Space Exploration & Technology Affect Society & the Environment

Key Concepts ❖ **Dangers of space exploration: debris, radiation**

Identify the tragedy and danger involved in space travel.

Danger	Year	Tragedy
Training exercise prior to launch		
	1986	
		Columbia Space Shuttle

Explain how space junk can be dangerous?



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Key Concepts ❖ Canadian contributions – history of research and exploration

Complete the following table of Canadian Space Moments

Year	Canadian	Moment
1839		
1962		
1972		
1984		
	Roberta Bondar	
		1st Canadian to walk in space

Key Concepts ❖ Space Ownership issues: political, environmental and ethical

Identify the questions as political, environmental or ethical and pose a question in each of these categories:

Issue	Political	Environmental	Ethical
Who has the authority in space?			
Should we explore an alien home?			
What should be done with waste in space?			
	X		
		X	
			X