

UNIQUE STUDY POINT

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Class: VI	Subject: Science	Session: 2025-26
Chapter: 12 - Beyond Earth	Time: 1½ Hours	Max. Marks: 40

General Instructions:

1. All questions are compulsory.
2. This question paper contains 20 questions divided into five sections A, B, C, D and E.
3. Section A contains 10 MCQs of 1 mark each.
4. Section B contains 4 questions of 2 marks each.
5. Section C contains 3 questions of 3 marks each.
6. Section D contains 1 question of 5 marks.
7. Section E contains 2 Case Study Based questions of 4 marks each.

SECTION A - Multiple Choice Questions (1 mark each)

- Q1.** Which planet has two moons named Phobos and Deimos?
(a) Earth
(b) Mars
(c) Jupiter
(d) Saturn
- Q2.** In which constellation is the star Aldebaran (Rohiṇī) located?
(a) Orion
(b) Ursa Major
(c) Taurus
(d) Canis Major
- Q3.** What is the approximate distance of the Moon from Earth?
(a) 150,000 km
(b) 384,000 km
(c) 500,000 km
(d) 1,000,000 km
- Q4.** The group of stars called Pleiades (Kṛittikā) is part of which constellation?
(a) Orion
(b) Taurus
(c) Ursa Major
(d) Canis Minor
- Q5.** When was Chandrayaan-3's successful landing on the Moon?
(a) 15 August 2023
(b) 23 August 2023

- (c) 26 January 2023
- (d) 14 November 2023

Q6. Which of the following is a telescope app mentioned for mobile phones?

- (a) Star Map
- (b) Sky Map
- (c) Planet Finder
- (d) Night Sky Pro

Q7. Earth takes approximately how many hours to complete one rotation?

- (a) 12 hours
- (b) 24 hours
- (c) 27 hours
- (d) 365 hours

Q8. The name of the lander in Chandrayaan-3 mission was:

- (a) Pragyan
- (b) Vikram
- (c) Bheem
- (d) Dhruva

Q9. Which outer planet is farthest from the Sun?

- (a) Jupiter
- (b) Saturn
- (c) Uranus
- (d) Neptune

Q10. The Himalayan Chandra Telescope is located in:

- (a) Nainital
- (b) Hanle, Ladakh
- (c) Darjeeling
- (d) Shimla

SECTION B - Short Answer Questions (2 marks each)

Q11. What is meant by the term "revolution"? How long does Earth take to complete one revolution?

Q12. Distinguish between the Big Dipper and the Little Dipper.

Q13. Why should you wait for about 30 minutes after reaching a dark observation site before starting night sky observation?

Q14. Name three inner planets and state one common characteristic they share.

SECTION C - Short Answer Questions (3 marks each)

Q15. What are the benefits of using a telescope for night sky observation? Name two types of telescopes mentioned in the chapter.

Q16. Describe the tail of a comet. What causes it to form, and in which direction does it point?

Q17. Explain why dark sky reserves like the Hanle Dark Sky Reserve are important for astronomy and society.

SECTION D - Long Answer Question (5 marks)

Q18. Write a comprehensive note on India's space missions to the Moon (Chandrayaan program), covering:

- (i) Overview of all Chandrayaan missions (1, 2, 3, and planned 4)
- (ii) The historic achievement of Chandrayaan-3
- (iii) The names of the lander and rover in Chandrayaan-3
- (iv) The significance of National Space Day
- (v) The goals of future Chandrayaan missions

SECTION E - Case Study Based Questions (4 marks each)

Q19. Case Study 1: Light Pollution and Dark Skies

Priya lives in Mumbai, a large metropolitan city. When she looks at the night sky from her balcony, she can see only a few bright stars and the Moon. During her summer vacation, she visited her grandmother in a small village. There, she was amazed to see thousands of stars clearly visible in the night sky, including a faint band of light stretching across the sky - the Milky Way. Her grandmother explained that cities have too many artificial lights that prevent people from seeing the stars clearly, while villages have darker skies with minimal light pollution.

Based on the above passage, answer the following questions:

- (a) What is light pollution? (1 mark)
- (b) Why could Priya see more stars in the village than in Mumbai? (1 mark)
- (c) What are two negative effects of light pollution? (1 mark)
- (d) Suggest one way to reduce light pollution. (1 mark)

Q20. Case Study 2: Observing Planets

Rajesh is an amateur astronomer who enjoys observing the night sky. One evening, he noticed a very bright object near the western horizon just after sunset. It was much brighter than the surrounding stars and did not twinkle like them. Using his Sky Map app, he confirmed that it was Venus, often called the Evening Star. A few months later, he observed the same bright object near the eastern horizon just before sunrise. He also learned that besides Venus, four other planets - Mercury, Mars, Jupiter, and Saturn - can be seen with the naked eye, though they are not as bright as Venus.

Based on the above passage, answer the following questions:

- (a) How could Rajesh distinguish Venus from stars? (1 mark)
- (b) Why is Venus called both the "Evening Star" and "Morning Star"? (1 mark)
- (c) Name three planets besides Venus that can be seen with naked eye. (1 mark)
- (d) Why is Venus the brightest planet in our sky? (1 mark)

SECTION A - Answers to MCQs

Ans 1. (b) Mars

Mars has two small moons named Phobos and Deimos, named after the sons of the Greek god of war, Ares (Mars in Roman mythology).

Ans 2. (c) Taurus

Aldebaran, known as Rohiṇī in Indian astronomy, is a bright star in the constellation Taurus.

Ans 3. (b) 384,000 km

The Moon is approximately 384,000 km (about 3,84,000 km) away from Earth.

Ans 4. (b) Taurus

The group of stars called Pleiades, known as Kṛittikā in Indian astronomy, is part of the constellation Taurus.

Ans 5. (b) 23 August 2023

Chandrayaan-3 successfully soft-landed on the Moon on 23 August 2023, and this date is now celebrated as National Space Day in India.

Ans 6. (b) Sky Map

Sky Map is mentioned as a handy app for identifying stars, constellations, and planets from mobile phones. Stellarium is another such app mentioned.

Ans 7. (b) 24 hours

Earth takes approximately 24 hours to complete one full rotation about its axis, which we call a day.

Ans 8. (b) Vikram

The lander in the Chandrayaan-3 mission was named Vikram, while the rover was named Pragyan.

Ans 9. (d) Neptune

Neptune is the farthest planet from the Sun among the eight planets in our Solar System.

Ans 10. (b) Hanle, Ladakh

The Himalayan Chandra Telescope is located at the Indian Astronomical Observatory in Hanle, Ladakh, atop Mount Saraswati.

SECTION B - Answers to Short Answer Questions

Ans 11. What is meant by the term "revolution"? How long does Earth take to complete one revolution?

Revolution: Revolution is the movement of an object around another larger object in space. It is the orbital motion of a celestial body around another body.

Earth's Revolution Period: Earth takes approximately **one year (365 days)** to complete one revolution around the Sun.

Note: While revolving around the Sun, Earth also rotates about its own axis, which takes 24 hours (one day).

Ans 12. Distinguish between the Big Dipper and the Little Dipper.

Big Dipper	Little Dipper
Lies in the constellation Ursa Major	Lies in the constellation Ursa Minor
Known as Saptarīṣhi in India	Contains the Pole Star (Dhruva tārā)
Used to locate the Pole Star	The Pole Star is at the end of its handle

Ans 13. Why should you wait for about 30 minutes after reaching a dark observation site before starting night sky observation?

You should wait for about 30 minutes after reaching a dark observation site to allow your **eyes to adapt to darkness**. This process is called dark adaptation.

Benefits of waiting:

- (i) The pupils of your eyes gradually expand in darkness to let in more light
- (ii) Your eyes become more sensitive to dim light
- (iii) This significantly improves your ability to see faint stars and celestial objects
- (iv) You will be able to see many more stars that were not visible initially

Without this adaptation period, you would miss seeing many dim but beautiful celestial objects.

Ans 14. Name three inner planets and state one common characteristic they share.

Three Inner Planets:

- 1. Mercury
- 2. Venus
- 3. Mars

(Note: Earth is also an inner planet)

Common Characteristic: All inner planets have **solid surfaces with rocks** on them. They are also called terrestrial or rocky planets because of this characteristic.

(Other acceptable answers: smaller in size, higher density, few or no moons, no ring systems)

SECTION C - Answers to Short Answer Questions

Ans 15. What are the benefits of using a telescope for night sky observation? Name two types of telescopes mentioned in the chapter.

Benefits of using a telescope:

- 1. **Magnification:** Telescopes make distant objects appear larger and clearer, allowing us to see details not visible to the naked eye.
- 2. **Brightness:** Telescopes collect more light than our eyes, making dim objects appear brighter and more visible.
- 3. **Distant Objects:** Telescopes help us view many dim celestial objects that are not visible with naked eyes, such as distant galaxies, nebulae, and faint stars.

4. **Surface Details:** We can observe surface features of planets and the Moon in much greater detail, such as craters, clouds, and planetary rings.

Two types of telescopes mentioned:

1. **Binoculars** - A simple handheld optical instrument for viewing celestial objects
2. **Astronomical Telescope** - More powerful instruments used for serious sky observation (examples mentioned include the Himalayan Chandra Telescope and telescopes at observatories)

Ans 16. Describe the tail of a comet. What causes it to form, and in which direction does it point?

Description of a Comet's Tail:

A comet's tail is a long, glowing stream of gas and dust that extends behind the comet's nucleus. It can be millions of kilometers long and is one of the most spectacular sights in the night sky.

What causes it to form:

- Comets are made up of dust, gases, rocks, and ice
- When a comet approaches close to the Sun, the Sun's heat causes the frozen material (ice) in the comet to start evaporating
- This evaporating material (gases and dust) forms the characteristic long tail of the comet
- The solar wind (stream of charged particles from the Sun) pushes this material away from the comet's nucleus, creating the tail

Direction of the tail:

The tail of a comet **always points away from the Sun**, regardless of the direction in which the comet is moving. This is because the solar wind and radiation pressure from the Sun push the tail material away from the Sun.

Interesting fact: As comets move away from the Sun, they appear dimmer and their tails become less prominent until they are no longer visible to the naked eye.

Ans 17. Explain why dark sky reserves like the Hanle Dark Sky Reserve are important for astronomy and society.

Importance of Dark Sky Reserves:

For Astronomy and Scientific Research:

1. **Preserve Dark Skies:** Light pollution is growing rapidly worldwide, making truly dark skies increasingly rare. Dark sky reserves protect these valuable locations.
2. **Better Observations:** Minimal light pollution allows astronomers to observe faint celestial objects more clearly, leading to better scientific data and discoveries.
3. **Research Facilities:** They provide ideal conditions for astronomical research and house sophisticated telescopes and equipment.
4. **Long-term Studies:** Protecting dark skies ensures that future generations of astronomers can continue important long-term astronomical studies.

For Society:

1. **Education:** Dark sky reserves educate people about light pollution and its effects, raising

awareness about this environmental issue.

2. Cultural Connection: They help maintain humanity's connection with the night sky, which has been important to cultures throughout history.

3. Astro-tourism: Reserves like Hanle promote astro-tourism, creating economic opportunities for local communities while preserving natural darkness.

4. Community Involvement: Local people are trained as Astronomy Ambassadors, providing employment and fostering community engagement with science.

5. Environmental Protection: Controlling light pollution also benefits wildlife, as many species are affected by artificial light at night.

The Hanle Dark Sky Reserve is particularly significant as it is one of the world's highest-altitude observatories and serves both scientific and social purposes.

SECTION D - Answer to Long Answer Question

Ans 18. Write a comprehensive note on India's space missions to the Moon (Chandrayaan program).

INDIA'S CHANDRAYAAN PROGRAM

(i) Overview of All Chandrayaan Missions:

Chandrayaan-1 (2008):

- India's first mission to the Moon, launched in 2008
- An orbiter mission that studied the Moon from orbit
- Made significant discoveries including evidence of water molecules on the Moon's surface
- Operated successfully for about 10 months
- Marked India's entry into lunar exploration

Chandrayaan-2 (2019):

- Launched in July 2019
- Consisted of an orbiter, lander, and rover
- The orbiter successfully entered lunar orbit and continues to send valuable data
- The lander attempted to soft-land near the south pole but lost communication during descent
- Despite the landing challenge, the orbiter continues to contribute to lunar science

Chandrayaan-3 (2023):

- Launched in July 2023
- Consisted of a lander (Vikram) and rover (Pragyan)
- Successfully achieved soft-landing on 23 August 2023
- Created history by landing near the Moon's south pole
- Conducted various experiments on the lunar surface
- Mission accomplished all its objectives

Chandrayaan-4 (Planned):

- Being planned as India's next lunar mission
- Aims to bring back soil and rock samples from the Moon
- Will be a sample return mission, a highly complex undertaking

- Will further advance India's capabilities in space technology

(ii) The Historic Achievement of Chandrayaan-3:

- **First in the World:** India became the first country in the world to achieve a soft-landing near the Moon's little-explored south pole
- **Scientific Importance:** The south polar region is of great scientific interest as it contains permanently shadowed craters that may hold water ice and other valuable resources
- **Fourth Country to Land:** India became only the fourth country to successfully soft-land on the Moon (after USA, Soviet Union, and China)
- **Technological Milestone:** Demonstrated India's growing space technology capabilities and precision
- **Inspiration:** Inspired millions of young Indians to pursue careers in science and technology

(iii) Names of Lander and Rover in Chandrayaan-3:

- **Lander: Vikram** - Named after Dr. Vikram Sarabhai, the father of the Indian space program
- **Rover: Pragyan** - The word "Pragyan" means "wisdom" in Sanskrit

Both the lander and rover worked together to conduct scientific experiments on the lunar surface.

(iv) Significance of National Space Day:

- The Government of India declared **23 August** as **National Space Day** to commemorate the successful landing of Chandrayaan-3
- **Purpose:** To celebrate India's achievements in space exploration and inspire future generations
- The date marks a historic moment in Indian science and technology
- It serves as a reminder of what can be achieved through dedication, innovation, and scientific pursuit
- Encourages young students to develop interest in space science and astronomy

(v) Goals of Future Chandrayaan Missions:

Chandrayaan-4 Objectives:

- Collect and return samples of lunar soil and rocks to Earth for detailed analysis
- Study the composition and age of lunar materials in laboratories on Earth
- Understand the Moon's formation and evolution better
- Develop and demonstrate sample return technology

Long-term Goals:

- Build on knowledge gained from each mission to plan more advanced missions
- Contribute to international understanding of the Moon
- Prepare for potential future human missions to the Moon

- Explore possibilities of utilizing lunar resources
- Establish India as a leader in space exploration

Conclusion:

The Chandrayaan program represents India's growing capabilities in space technology and demonstrates the country's commitment to scientific exploration. Each mission builds upon previous achievements, contributing valuable knowledge about the Moon while inspiring millions of people about the possibilities of space exploration.

SECTION E - Answers to Case Study Based Questions

Ans 19. Case Study 1: Light Pollution and Dark Skies

(a) What is light pollution?

Light pollution is the presence of excessive artificial light at night time. It is caused by outdoor lights from streets, buildings, advertisements, and other sources that brighten the night sky unnecessarily, making it difficult to see stars and other celestial objects.

(b) Why could Priya see more stars in the village than in Mumbai?

Priya could see more stars in the village because:

- Villages have much less artificial lighting compared to big cities like Mumbai
- There is minimal light pollution in rural areas, resulting in darker skies
- The darker sky provides better contrast, making even faint stars visible
- Cities have excessive lighting from streets, buildings, and advertisements that creates a bright sky glow, obscuring most stars

(c) What are two negative effects of light pollution?

- 1. Reduced Star Visibility:** Light pollution makes it difficult or impossible to see stars and other celestial objects clearly, reducing our ability to enjoy and study the night sky.
- 2. Impact on Wildlife:** Many animals and birds rely on natural darkness for navigation, hunting, and reproduction. Artificial light at night disrupts their natural behaviors and biological cycles.

(Other acceptable answers: Waste of energy, health impacts on humans, disruption of ecosystems)

(d) Suggest one way to reduce light pollution.

One effective way to reduce light pollution is to:

Use shielded lighting fixtures that direct light downward where it is needed, rather than allowing it to scatter upward into the sky. Additionally, using lights only when necessary and turning them off when not in use can significantly reduce light pollution.

(Other acceptable answers: Use lower-intensity lights, install motion sensors, use amber-colored lights instead of bright white lights, educate people about light pollution)

Ans 20. Case Study 2: Observing Planets

(a) How could Rajesh distinguish Venus from stars?

Rajesh could distinguish Venus from stars by observing that:

- Venus was much brighter than the surrounding stars

- (ii) Venus did not twinkle, while stars appeared to twinkle
- (iii) Venus appeared as a steady, bright point of light

Planets shine with steady light because they are closer to Earth and appear as small discs rather than points, while stars are so far away that they appear as points and their light twinkles due to atmospheric effects.

(b) Why is Venus called both the "Evening Star" and "Morning Star"?

Venus is called both names because:

- It is called the "**Evening Star**" when it is visible in the western sky just after sunset (in the evening)
- It is called the "**Morning Star**" when it is visible in the eastern sky just before sunrise (in the morning)
- Venus's orbit around the Sun means that sometimes it appears in the evening sky and at other times in the morning sky
- Despite these names, Venus is actually a planet, not a star

(c) Name three planets besides Venus that can be seen with naked eye.

Three planets that can be seen with the naked eye (besides Venus) are:

1. Mercury
2. Mars
3. Jupiter

(Note: Saturn can also be seen with the naked eye, making a total of five visible planets)

(d) Why is Venus the brightest planet in our sky?

Venus is the brightest planet in our sky because:

1. **Proximity:** After the Sun and Moon, Venus is one of the closest celestial objects to Earth
2. **Thick Atmosphere:** Venus has a very thick atmosphere with dense clouds that are highly reflective
3. **High Reflectivity (Albedo):** Venus's clouds reflect about 70% of the sunlight that falls on it, making it appear very bright
4. **Size:** Venus is nearly the same size as Earth, giving it a substantial surface area to reflect sunlight

The combination of these factors makes Venus shine much brighter than any other planet or star in our night sky.