

**KEEPING TIME WITH THE SKIES**

**Class 08 - Science (Curiosity)**

**Time Allowed: 1 hour and 30 minutes**

**Maximum Marks: 160**

1. What is the term used for the period when the bright part of the Moon increases? [1]
  - a) Gibbous period
  - b) Waning period
  - c) Crescent period
  - d) Waxing period
2. Calculate the number of days in a lunar year. [1]
  - a) 360 days
  - b) 366 days
  - c) 354 days
  - d) 365 days
3. What is the shape of the Moon when it is called "Purnima"? [1]
  - a) A full bright circle
  - b) A half circle
  - c) No visible shape
  - d) A crescent
4. What organization is responsible for launching satellites in India? [1]
  - a) Space X
  - b) ESA
  - c) NASA
  - d) ISRO
5. Approximately how long does it take for satellites orbiting 800 km above Earth to complete one orbit? [1]
  - a) 100 minutes
  - b) 200 minutes
  - c) 1 day
  - d) 30 minutes
6. What causes the phases of the Moon? [1]
  - a) The Moon's orbit around the Earth
  - b) The Moon's rotation
  - c) The Sun's orbit around the Earth
  - d) The Earth's rotation
7. What is the primary difference between a sidereal and a tropical year? [1]
  - a) Cultural importance
  - b) Religious significance
  - c) Length of the year
  - d) Weather patterns
8. How do artificial satellites assist in scientific research? [1]
  - a) By creating images of other planets
  - b) By providing powerful telescopic views on the ground
  - c) By making observations of stars and celestial objects
  - d) By absorbing solar radiation
9. In a Gregorian calendar, how many days do most months have? [1]
  - a) 31
  - b) 30 or 31

- c) 28 or 29 d) 30

10. How long is the mean solar day? [1]  
 a) 24 hours b) 23 hours  
 c) 12 hours d) 48 hours

11. Eid-ul-Fitr is celebrated after the sighting of which phase of the Moon? [1]  
 a) Half Moon b) New Moon  
 c) Crescent Moon d) Full Moon

12. In which direction should you look to spot the Moon at sunrise after a full Moon day? [1]  
 a) West b) East  
 c) North d) South

13. Which festival is celebrated on the new Moon of the month of Kartika? [1]  
 a) Diwali b) Buddha Purnima  
 c) Holi d) Dussehra

14. What happens to satellites after their useful life ends? [1]  
 a) They continue to orbit indefinitely b) They are returned to Earth for reuse  
 c) They become space junk or debris d) They transform into scientific instruments

15. Which Indian festival moves ahead by one day every 71 years? [1]  
 a) Bihu b) Vaisakhi  
 c) Makar Sankranti d) Pongal

16. **Assertion (A):** ISRO's missions include Mangalyaan to Mars and Aditya L1 to study the Sun. [1]  
**Reason (R):** These missions exemplify India's commitment to advancing space sciences and applications.  
 a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.  
 c) A is true but R is false. d) A is false but R is true.

17. **Assertion (A):** Gregorian calendars adjust their months to add up to 365 days. [1]  
**Reason (R):** The extra hours from Earth's nearly quarter-day over 365-day revolution accumulate to form an additional day every four years.  
 a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.  
 c) A is true but R is false. d) A is false but R is true.

18. **Assertion (A):** The Moon's position appears to shift each day when observed at the same time. [1]  
**Reason (R):** This happens because the Earth rotates faster than the Moon orbits around Earth.  
 a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.

- c) A is true but R is false. d) A is false but R is true.
19. **Assertion (A):** Calendars must be periodically corrected to maintain alignment with Earth's revolutions around the Sun. [1]  
**Reason (R):** The Earth's yearly revolution slightly exceeds 365 days, requiring correction by adding leap years.
- a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.  
c) A is true but R is false. d) A is false but R is true.
20. **Assertion (A):** The Moon appears to change shape throughout the month. [1]  
**Reason (R):** The Earth casts different shadows on the Moon each night.
- a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.  
c) A is true but R is false. d) A is false but R is true.
21. Scientific studies show that the Moon is getting farther away from the Earth and slower in its revolution. Will luni-solar calendars need an intercalary month more often or less often? [1]
22. What actually causes the phases of the Moon? [1]
23. When can a lunar eclipse occur? [1]
24. On a full Moon day, where is the Moon when the Sun rises in the east? [1]
25. When is a waxing Moon best seen? [1]
26. Ravi said, "I saw a crescent Moon, and it was rising in the East, when the Sun was setting." Kaushalya said, "Once I saw the gibbous Moon during the afternoon in the East." Who out of the two is telling the truth? [1]
27. A total of 37 full Moons happen during 3 years in a solar calendar. Show that at least two of the 37 full moons must happen during the same month of the solar calendar. [1]
28. What is the full Moon day called in Hindu tradition? [1]
29. At any moment, what fraction of the Moon is illuminated by sunlight? [1]
30. Explain the reason for the Moon's change in appearance from day to day. [1]
31. How does the Moon's position in the sky change each day? [2]
32. Why does the Moon sometimes appear in the daylight? [2]
33. Describe the phases of the Moon as it transitions from full Moon to new Moon. [2]
34. What are some common uses of artificial satellites? [2]
35. What are the fundamental causes behind the apparent motion of the Sun as observed from Earth? [2]
36. On which periodic phenomenon are the following measures of time based: (i) day (ii) month (iii) year? [2]
37. What happens to artificial satellites after their operational life is over? [2]
38. Can lunar and solar eclipses occur every month? Justify your answer. [2]
39. Compare and contrast a Full Moon and a New Moon. [2]
40. What would happen if Earth had two moons instead of one? How would that change the night sky? [2]
41. Explain how the Moon's phases affect its visibility and position in the sky. [3]

42. Explain the waxing and waning periods of the Moon and how they form a monthly cycle. [3]
43. What is the cause of the Moon's changing appearance from Earth? [3]
44. How are Indian festivals linked to astronomical events and calendar systems? [3]
45. Define Shukla Paksha and Krishna Paksha. Approximately how long is each and how do the visible shapes change? [3]
46. Describe the difference between crescent and gibbous phases of the Moon, and how they appear. Ans: [3]
47. A student claims, "The Moon always rises when the Sun sets." Is this correct? Explain with an example. [3]
48. What is the difference between the waxing and waning periods of the Moon? [3]
49. Explain how the motion of the Sun in the sky helps in measuring a day. [3]
50. Why do eclipses not happen every new Moon or full Moon? [3]
51. **Read the following text carefully and answer the questions that follow:** [4]

Calendars were created by observing natural cycles of the Sun, Moon, and seasons. A day was defined by Earth's rotation, a month by the Moon's phases (29.5 days), and a year by Earth's revolution around the Sun (365¼ days). Lunar calendars, based on the Moon, have 354 days and do not align with seasons. Solar calendars, like the Gregorian, adjust days and leap years to match seasons. Luni-solar calendars combine both systems to remain accurate.

**Questions:**

- a. Which calendar is widely used today as a solar calendar? (1)
- b. Why do lunar calendars not align with seasons? (1)
- c. Explain how leap years help in solar calendars. (2)

**OR**

Compare lunar and solar calendars. (2)

52. **Read the following text carefully and answer the questions that follow:** [4]

The Moon is Earth's natural satellite, while many artificial satellites launched by countries also orbit Earth, about 800 km above its surface. These satellites take roughly 100 minutes to complete an orbit and support communication, navigation, weather forecasting, disaster management, and scientific research. ISRO has launched satellites like Cartosat for mapping, AstroSat for studying celestial bodies, and missions such as Chandrayaan, Mangalyaan, and Aditya L1, advancing India's space exploration significantly.

**Questions:**

- a. How long does an artificial satellite take to complete one orbit around Earth? (1)
- b. Why are artificial satellites launched into space? (1)
- c. Explain the contribution of ISRO in launching artificial satellites. (2)

**OR**

Differentiate between natural and artificial satellites with examples. (2)

53. **Read the following text carefully and answer the questions that follow:** [4]

Many Indian festivals are connected with astronomical phenomena and are determined by lunar, luni-solar, or solar calendars. Festivals like Diwali, Holi, Eid, and Buddha Purnima are based on Moon phases, so their Gregorian dates change yearly. In contrast, solar sidereal festivals like

Makar Sankranti and Bihu occur on nearly the same Gregorian dates. Over time, due to Earth's axial wobble, some solar festivals slowly shift away from solstices or equinoxes.

**Questions:**

- a. Which festival is based on the solar sidereal calendar? **(1)**
- b. Why do festivals like Diwali and Eid fall on different dates in the Gregorian calendar each year? **(1)**
- c. Explain why festivals based on solar sidereal calendars, like Makar Sankranti, gradually shift dates in the Gregorian calendar. **(2)**

**OR**

Compare the shifting of dates in lunar-based and solar sidereal-based festivals. **(2)**

54. **Read the following text carefully and answer the questions that follow:** **[4]**

The Moon appears to change shape because only its sunlit portion is visible from Earth. As the Moon revolves around Earth, the visible illuminated part varies, producing phases such as new Moon, crescent, half, gibbous, and full Moon. The shrinking bright part is called the waning phase, while the growing bright part is the waxing phase. These changes repeat in a cycle of about one month, though the Moon itself remains spherical.

**Questions:**

- a. Which phase of the Moon occurs when the illuminated portion is not visible from Earth? **(1)**
- b. Why do we see different phases of the Moon from Earth? **(1)**
- c. Distinguish between waxing and waning phases of the Moon. **(2)**

**OR**

Explain why the phases of the Moon should not be confused with a lunar eclipse. **(2)**

55. **Read the following text carefully and answer the questions that follow:** **[4]**

The Indian National Calendar, adopted in 1956, is a solar calendar used alongside the Gregorian calendar. It begins on 22 March, a day after the spring equinox, and has 365 days in a year. Months are named from traditional Indian systems, with 30 or 31 days. In leap years, an extra day is added to Chaitra. This calendar was recommended by the Calendar Reform Committee led by Meghnad Saha to unify timekeeping across India.

**Questions:**

- a. When does the Indian National Calendar year begin? **(1)**
- b. Why was the Indian National Calendar introduced? **(1)**
- c. Describe how leap years are adjusted in the Indian National Calendar. **(2)**

**OR**

Evaluate the importance of the Calendar Reform Committee in 1952. **(2)**

56. **State whether the given statement is True or False:** **[5]**

- (a) The dates of Indian festivals based on the sidereal calendar do not change over time. **[1]**
- (b) We can sometimes see the Moon during the daytime. **[1]**
- (c) The Moon has no influence on the artistic and cultural practices in India. **[1]**
- (d) A lunar eclipse occurs when the Moon comes between the Earth and the Sun. **[1]**
- (e) Artificial satellites are only launched once a year by countries around the world. **[1]**

57. **Fill in the blanks:** **[5]**

- (a) The Indian National (Saka) Calendar begins on \_\_\_\_\_ March in a normal year. **[1]**

- (b) Years divisible by 4 are leap years, with exceptions for century years not divisible by \_\_\_\_\_. [1]
- (c) The Moon appears to grow during the \_\_\_\_\_ phase. [1]
- (d) The Moon does not have its own light; it \_\_\_\_\_ the sunlight. [1]
- (e) Buddha Purnima occurs on the full Moon of \_\_\_\_\_. [1]
58. Explain the role of artificial satellites in enhancing daily life activities. How do they contribute to communication and navigation? [5]
59. Why do traditional Indian festivals based on the solar Sidereal calendar shift dates concerning the Gregorian calendar over time? [5]
60. Explain the significance of Earth's rotation and revolution in the development of calendars. [5]
61. Explain how festivals like Holi and Eid-ul-Fitr reflect cultural ties to lunar and luni-solar calendars in Indian society. [5]
62. Discuss how artificial satellites have transformed weather monitoring and disaster management. [5]
63. Describe the process through which ancient people devised lunar calendars and the issues they faced. [5]
64. How do the concepts of solstices and equinoxes relate to Indian festival dates, and how has this relationship evolved? [5]
65. Describe the importance of understanding space debris and its impact on current and future space projects. [5]
66. Analyze the impact of lunar and solar calendars on cultural and agricultural practices in ancient societies. [5]
67. What are the differences between lunar, solar, and luni-solar calendars, and how do their structures help synchronize with natural cycles? [5]

**Solution**  
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1. **(d)** Waxing period  
**Explanation:**  
The period when the bright part of the Moon increases is known as the waxing period.
2. **(c)** 354 days  
**Explanation:**  
A lunar year consists of 12 lunar months, each roughly 29.5 days, totaling 354 days.
3. **(a)** A full bright circle  
**Explanation:**  
The full Moon day or Purnima is when the Moon appears as a full bright circle.
4. **(d)** ISRO  
**Explanation:**  
ISRO is the Indian organization responsible for launching satellites.
5. **(a)** 100 minutes  
**Explanation:**  
Satellites at this altitude take about 100 minutes to complete an orbit.
6. **(a)** The Moon's orbit around the Earth  
**Explanation:**  
The phases of the Moon are caused by the Moon's orbit around the Earth. As it moves, the position of the Moon changes relative to the Earth and Sun, so we see different portions of its sunlit half. This changing view creates phases like new moon, crescent, quarter, gibbous, and full moon.
7. **(c)** Length of the year  
**Explanation:**  
The sidereal and tropical years differ slightly in length due to the slow wobble of the Earth's axis.
8. **(c)** By making observations of stars and celestial objects  
**Explanation:**  
Satellites like AstroSat observe stars and celestial bodies, advancing scientific research.
9. **(b)** 30 or 31  
**Explanation:**  
In the Gregorian calendar, most months have either 30 or 31 days; only February varies in a leap year.
10. **(a)** 24 hours  
**Explanation:**  
The mean solar day is the average time it takes for the Sun to return to its highest position at noon, lasting 24 hours.
11. **(c)** Crescent Moon

**Explanation:**

Eid-ul-Fitr is celebrated after sighting the crescent Moon.

12. (a) West

**Explanation:**

The Moon is visible in the western direction at sunrise after a full Moon day.

13. (a) Diwali

**Explanation:**

Diwali is celebrated on the new Moon of the month of Kartika.

14.

(c) They become space junk or debris

**Explanation:**

After their useful life, satellites often become space junk or debris.

15.

(c) Makar Sankranti

**Explanation:**

Makar Sankranti moves ahead by one day every 71 years.

16. (a) Both A and R are true and R is the correct explanation of A.

**Explanation:**

ISRO's diverse missions enhance India's space capabilities, reflecting commitment to space sciences.

17. (a) Both A and R are true and R is the correct explanation of A.

**Explanation:**

Gregorian calendars consider fractional days by adding a leap day, resulting in months' lengths being inconsistent.

18. (a) Both A and R are true and R is the correct explanation of A.

**Explanation:**

The daily apparent shift is due to the combination of the Earth's rotation and the Moon's orbit.

19. (a) Both A and R are true and R is the correct explanation of A.

**Explanation:**

The addition of leap days compensates for the celestial mechanics and prevents drift in calendar synchronization with the Earth's solar journey.

20.

(c) A is true but R is false.

**Explanation:**

- Assertion (A) is true because the Moon appears to change shape due to its phases as it revolves around the Earth.
- Reason (R) is false because the Earth does not cast shadows on the Moon to create phases. Moon phases happen due to the changing visible portion of the sunlit side of the Moon, not Earth's shadow (except during a lunar eclipse).

21. Less often. If the Moon slows, lunar months get longer, so the gap with solar years shrinks, needing fewer extra months to sync.

22. They are caused by the changing positions of the Moon, Earth, and Sun.

23. It can occur only on a full Moon day.

24. It is almost setting in the west.

25. A waxing Moon is best seen at sunset.

26. Both could be true! Ravi saw a waxing crescent (evening), and Kaushalya saw a waning gibbous (afternoon, visible during day).

27. 3 years have 36 months (12 per year). With 37 full Moons, by pigeonhole principle, at least one month must have two ( $37 > 36$ ).
28. In Hindu tradition, the full Moon day is called Purnima.
29. Half of the Moon is illuminated by sunlight at any moment.
30. The change is due to different portions of the Moon being illuminated by the Sun as it revolves around the Earth.
31. The Moon's position shifts slightly eastward each day, so it is not in the same place at the same time. This is why its rise and set times also change daily.
32. The Moon can rise before sunset, sometimes in the afternoon. In such cases, it is visible in the sky while the Sun is still up.
33. The phases from full Moon to new Moon are called waning phases. During this time, the Moon's visible illuminated part decreases, changing from full Moon to gibbous, then to a half circle, followed by crescent until it's not visible at all during the new Moon.
34. Artificial satellites are utilized for communication, navigation, weather monitoring, disaster management, and scientific research. They help in collecting data, improving maps, planning cities, observing stars, and monitoring celestial objects. Their functions benefit both daily life and scientific endeavors.
35. The apparent motion of the Sun, rising in the east and setting in the west, is due to Earth's rotation on its axis. This daily motion helps define a day, with the Sun reaching its highest point in the sky, the mean solar day averaging 24 hours, based on shadow measurements.
36. i. Day: Earth's rotation on its axis.  
ii. Month: Moon's phases (orbit around Earth).  
iii. Year: Earth's revolution around the Sun.
37. After their operational life, some artificial satellites become space debris. This space junk may include old satellites and rocket parts that no longer serve any purpose. These debris often clutter space and pose a risk of colliding with functional satellites, affecting the safety and functionality of space operations.
38. Lunar and solar eclipses do not occur every month because the Moon's orbit is slightly tilted compared to Earth's orbit around the Sun. This misalignment means the Moon often misses Earth's shadow or the Sun, allowing these phenomena to occur only occasionally.
39.
  - Full Moon: The Moon is fully visible from Earth. Earth is between the Sun and the Moon. It occurs midway in the lunar month.
  - New Moon: The Moon is not visible from Earth. The Moon is between the Earth and the Sun. It marks the beginning of the lunar month.
  - In both cases, the Moon is aligned with the Earth and Sun, but from opposite directions.
40.
  - Two moons could mean brighter nights and stronger tides, maybe more eclipses or weird shadows.
  - The night sky would look cooler with two glowing orbs, possibly in different phases, lighting up the darkness more.
  - But it might mess with animal behaviors or ocean levels.
41.
  - The Moon's position in the sky and the timing of its rise and set depend on its phase.
  - New Moon rises and sets with the Sun; not visible.
  - The First Quarter is visible in the afternoon and early evening.
  - Full Moon rises at sunset and sets at sunrise.
  - Last Quarter is visible late at night and in the morning.
  - As the Moon moves through its orbit, its angle with the Earth and Sun changes, which affects how much of it we see and when.
42.
  - The waxing period is when the bright portion of the Moon increases, starting from the new Moon and becoming full in about two weeks. The waning period is when the bright portion decreases, starting from the full Moon and becoming new Moon in about two weeks.
  - Together, waxing and waning make a repeating cycle every month. This cycle takes about 29.5 days from one full Moon to the next.

43. The Moon's phases, or its changing appearance, are caused by the positions of the Sun, Earth, and Moon. As the Moon orbits the Earth, different parts of it are lit by the Sun, and this is what we see from Earth. Sometimes we see a full Moon, other times only a part of it. These changes happen in a regular cycle every month and are called lunar phases.
44.
  - Many Indian festivals are set according to the phases of the Moon, such as Diwali on the new Moon and Holi on the full Moon. Others are based on solar positions, such as Makar Sankranti, which marks the Sun's northward movement.
  - Luni-solar calendars adjust dates to match both Moon phases and seasonal cycles. This is why festival dates change in the Gregorian calendar each year. These links show how culture and astronomy are closely connected.
45.
  - Shukla Paksha (waxing): from new Moon to full Moon (~14-15 days); visible bright fraction grows crescent → first quarter (half) → gibbous → full.
  - Krishna Paksha (waning): from full to new (~14-15 days); bright fraction shrinks gibbous → last quarter (half) → crescent → new.
46.
  - A crescent Moon appears when less than half of the Moon's visible surface is illuminated. It can occur during both waxing and waning periods.
  - A gibbous Moon appears when more than half, but not all, of the surface is lit. This also happens during both waxing and waning. These appearances change gradually as the Moon moves in its orbit around Earth.
47. Not always. Moonrise time shifts by ~50 minutes daily. For many phases, the Moon can rise in the afternoon (e.g., waxing gibbous) or after midnight (waning phases). Only near full Moon does moonrise occur close to sunset; otherwise it varies.
48. The waxing period of the Moon happens when the visible, bright part of the Moon increases. This starts from the new Moon and continues until it becomes a full Moon. This process takes about two weeks. After that, the waning period begins, where the illuminated part slowly decreases. The Moon goes from full Moon back to new Moon. Both waxing and waning are part of the Moon's regular cycle.
49.
  - The Sun appears to rise in the east, move across the sky, and set in the west because Earth rotates on its axis. The highest position of the Sun in the sky, when shadows are shortest, marks noon.
  - The time from one noon to the next is called a mean solar day. This length is about 24 hours, which is the basic unit for measuring time in days. This daily cycle has been used since ancient times to keep track of time.
50.
  - Although full Moons and new Moons happen every month, eclipses are rare. This is because the Moon's orbit is slightly tilted compared to Earth's orbit around the Sun.
  - Most of the time, the Sun, Earth, and Moon are not perfectly aligned. A lunar eclipse can only happen when Earth's shadow falls on the Moon, and a solar eclipse happens only when the Moon's shadow falls on Earth. These alignments occur only a few times a year.
51.
  - a. The Gregorian calendar is widely used today as a solar calendar.
  - b. Lunar calendars have 12 months of about 29.5 days, making a year of 354 days. This is shorter than the solar year of 365 days, so lunar months gradually shift and lose synchronization with seasons.
  - c. The Earth takes about  $365\frac{1}{4}$  days to revolve around the Sun. To balance the extra  $\frac{1}{4}$  day each year, solar calendars add one extra day every four years, creating a leap year. This adjustment ensures that calendars remain synchronized with the solar cycle and changing seasons.

**OR**

Lunar calendars are based on Moon's phases, with months of 29.5 days, making a 354-day year. They do not match seasonal cycles. Solar calendars, like the Gregorian, align with Earth's revolution (365 days) and include leap years to correct seasonal shifts. Hence, solar calendars remain accurate for agriculture and civil use.

52.
  - a. An artificial satellite takes about 100 minutes to complete one orbit around Earth.
  - b. Artificial satellites are launched to help in communication, navigation, weather monitoring, disaster management, and scientific research. They play a vital role in modern life by supporting technology, safety, and scientific advancement.
  - c. ISRO has launched many satellites, such as Cartosat for high-quality imaging to improve mapping and disaster management, and AstroSat for studying celestial objects. Major missions like

Chandrayaan, Mangalyaan, and Aditya L1 highlight India's advancements in space exploration and research.

**OR**

Natural satellites occur naturally, like the Moon orbiting Earth. Artificial satellites are man-made objects launched into orbit for specific purposes, such as communication, navigation, or research. Examples include ISRO's Cartosat, AstroSat, and Chandrayaan missions, which serve scientific and technological needs.

53. a. Makar Sankranti is based on the solar sidereal calendar.  
b. These festivals are based on lunar calendars, where months follow Moon's phases (29.5 days). Since lunar and solar years differ, the dates shift each year in the Gregorian calendar.  
c. Solar sidereal festivals were once aligned with solstices or equinoxes. However, due to Earth's axial wobble (precession), there is a small difference between sidereal and tropical years. Over centuries, this causes festivals like Makar Sankranti to move forward in the Gregorian calendar, shifting about one day every 71 years.

**OR**

Lunar-based festivals shift noticeably each year in the Gregorian calendar because lunar years (354 days) are shorter than solar years. Solar sidereal-based festivals, however, remain nearly fixed yearly but shift gradually over centuries due to precession of Earth's axis. Thus, lunar shifts are immediate and visible, while sidereal shifts are slow and long-term.

54. a. The New Moon phase occurs when the illuminated portion is not visible from Earth.  
b. We see different phases of the Moon because the Moon revolves around the Earth, and only the sunlit portion is visible to us. The visible illuminated part changes daily, creating phases like crescent, half, gibbous, and full Moon.  
c. In the waxing phase, the visible illuminated portion of the Moon increases each day, beginning after the new Moon and continuing until the full Moon. In the waning phase, the illuminated portion decreases daily, starting after the full Moon and ending at the new Moon. These phases repeat in a monthly cycle.

**OR**

Phases of the Moon occur due to the Moon's revolution around the Earth, changing the visible illuminated portion. A lunar eclipse, however, happens only on a full Moon day, when Earth's shadow falls on the Moon. Hence, phases are a regular monthly cycle, while eclipses are rare and occur only under specific alignment conditions.

55. a. The Indian National Calendar year begins on 22 March.  
b. The Indian National Calendar was introduced to unify multiple regional calendars in India. It ensured a standard, accurate, and consistent system for civil and official purposes, while also reflecting traditional Indian astronomical principles.  
c. In the Indian National Calendar, leap years follow the same rule as the Gregorian calendar. When a year is divisible by four, an extra day is added to Chaitra, the first month. As a result, the new year begins on 21 March instead of 22 March. This keeps the calendar synchronized with seasons.

**OR**

The Calendar Reform Committee, chaired by Meghnad Saha, studied existing Indian calendars and recommended a unified solar calendar for official use. This was crucial for standardization, reducing confusion from multiple local calendars, and aligning India's civil calendar with astronomical accuracy while retaining traditional cultural links.

56. State whether the given statement is True or False:

- (a) **(b)** False

**Explanation:**

The dates of such festivals slowly shift away from solstices/equinoxes.

- (b) **(a)** True

**Explanation:**

The statement is true because the Moon reflects sunlight and is often above the horizon during daytime, especially in phases like the first quarter and last quarter. If the sky is clear

and the Moon is positioned well, it can be seen even in daylight.

- (c) **(b)** False

**Explanation:**

Moon imagery is prevalent in music, dance, and art.

- (d) **(b)** False

**Explanation:**

The statement is false because a lunar eclipse occurs when the Earth comes between the Sun and the Moon, not the other way around. In this position, the Earth blocks sunlight from reaching the Moon, and the Earth's shadow falls on the Moon.

- (e) **(b)** False

**Explanation:**

Many countries launch artificial satellites frequently as needed for different purposes.

57. Fill in the blanks:

- (a) 22
- (b) 400
- (c) Waxing
- (d) Reflects
- (e) Vaisakha

58. Artificial satellites play a pivotal role in revolutionizing communication and navigation. They facilitate seamless global communication through direct broadcasts, telecommunication services, internet connectivity, and data relay via satellite networks. For navigation, satellites like those in the Global Positioning System (GPS) provide real-time location data, allowing users to determine accurate positions anywhere on Earth's surface. This has adversaries in mobile applications, providing directions, location-based services, and emergency assistance. Overall, artificial satellites have dramatically transformed how we connect, interact, and navigate our world by ensuring we stay informed, reach destinations efficiently, and remain connected globally.
59. Festivals based on the solar Sidereal calendar, such as Makar Sankranti, experience date shifts over time due to the difference between sidereal and tropical years. This discrepancy is caused by Earth's axial precession, which leads to a gradual shifting of the festival dates from the solstices or equinoxes. As a result, despite being tied to solar movements, these festivals move by a day approximately every 71 years if observed in the Gregorian calendar.
60. The development of calendars is fundamentally linked to the Earth's rotation and revolution. Earth's rotation around its axis gives the illusion that the Sun moves across the sky daily, leading to the concept of a day. This periodic apparent motion, known as a solar day, is approximately 24 hours long. Meanwhile, Earth's revolution around the Sun dictates the cycle of seasons, which form the basis of a solar year, approximately 365 days. Both these natural cycles have been crucial in devising solar calendars. Therefore, understanding Earth's rotation and revolution allowed ancient observers to measure time effectively and align their calendars with daily solar movements and annual seasonal changes.
61. Holi, a Hindu festival, is celebrated on the full moon day in the month of Phalguna according to the luni-solar calendar, emphasizing its roots in both lunar phases and solar transitions. Eid-ul-Fitr, observed by Muslims, depends solely on the lunar calendar, marking the end of Ramazan when the crescent moon is sighted. These festivals highlight deep cultural connections as they dictate traditional practices, reflect cultural beliefs, and emphasize community participation based on these celestial occurrences, anchoring societal life to cosmic rhythms.
62. Artificial satellites have revolutionized weather monitoring and disaster management by providing advanced, real-time observational capabilities. Meteorological satellites continuously track atmospheric conditions, analyzing weather patterns and extreme events, enabling accurate forecasting systems. Satellites help meteorologists detect cloud formations, thermal patterns, and storm systems, strengthening preparedness and proactive response to weather changes. In disaster scenarios, satellites offer immediate and detailed assessments, allowing authorities to allocate resources effectively and coordinate with rescue and relief operations. With remote sensing technology, they support

environmental monitoring, ensuring critical information is accessible for decision-making, significantly reducing potential loss and enhancing disaster resilience.

63. Ancient people observed the phases of the Moon and used them to track time, leading to the creation of lunar calendars. A lunar month lasts about 29.5 days, with 12 lunar months fitting into one cycle of seasons, resulting in a lunar year lasting 354 days. This made it simpler to organize months, but a significant issue arose: the lunar calendar did not synchronize with seasons, which repeat every 365 days. This discrepancy led to the seasons shifting across months annually, complicating agricultural planning. Despite these challenges, lunar calendars provided an intuitive means of measuring time due to the Moon's visible phases.
64. Traditionally, some Indian festivals align with solstices or equinoxes, indicating changes in seasons or harvest periods. For instance, Pongal and Makar Sankranti historically coincide with the winter solstice. However, Earth's axial precession causes these festivals to shift slowly away from the exact solstice dates over centuries. Although the sidereal solar calendar maintains consistent Gregorian dates annually, minor discrepancies inevitably arise due to this gradual axis wobbling, demonstrating an evolving synchrony between celestial cycles and agricultural or cultural practices.
65. Space debris poses a significant challenge to both current and future space operations. After satellites complete their intended missions, leftover debris, including defunct satellites, and expendable rocket parts, clutter Earth's orbit. These fragments can damage active satellites, posing risks of collision which may lead to costly disruptions and compromise missions. Furthermore, this congestion increases hazards for crewed space missions and the International Space Station. Monitor and mitigation efforts are essential to safeguard future launches and ongoing activities, addressing the need to devise strategies for debris prevention, removal, and protection to ensure sustainable exploration and utilization of space.
66. Lunar and solar calendars profoundly impacted the cultural and agricultural practices of ancient societies. Lunar calendars, which follow the Moon's phases, allowed societies to predict and schedule religious festivals, ceremonies, and social events. However, because they didn't align with the solar year's seasonal cycle, they were less effective for agriculture. In contrast, solar calendars, based on Earth's orbit around the Sun, allowed for precise seasonal predictions, crucial for agricultural planning and determining planting and harvesting times. Thus, while lunar calendars often guided cultural and religious practices, solar calendars were vital for agricultural efficiency and survival, leading societies to adapt their calendrical systems to mesh these different purposes.
67. Lunar, solar, and luni-solar calendars all synchronize time with natural cycles. Lunar calendars track the 29.5-day cycle of the Moon's phases, effectively dividing the year into 12 months of 354 days. However, they don't align with the 365-day solar year. In contrast, solar calendars account for Earth's 365.25-day orbit around the Sun, integrating leap years to correct discrepancies. Luni-solar calendars merge these systems by using the Moon's cycle for months while adding additional month(s) every few years to maintain seasonal alignment. Thus, each calendar accommodates different aspects of natural cycles based on societal needs.