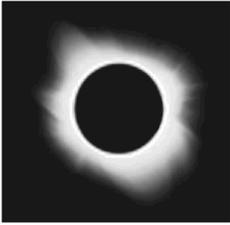
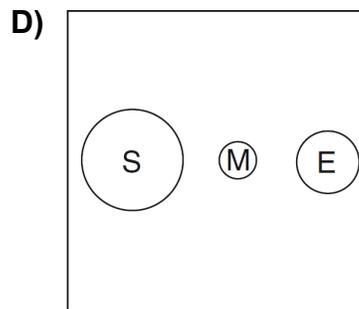
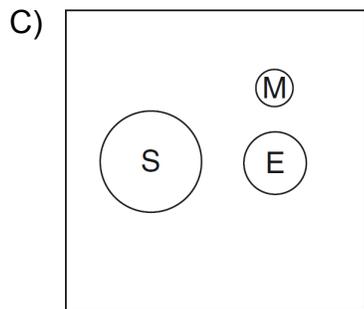
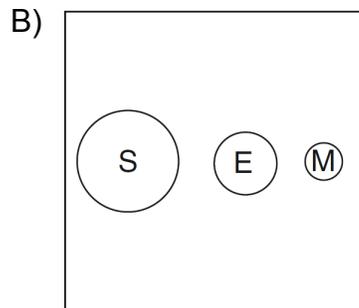
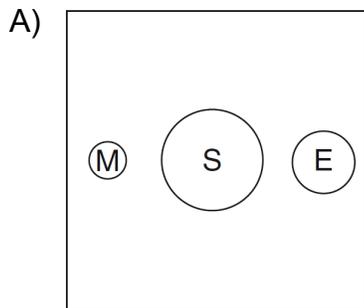


The Moon

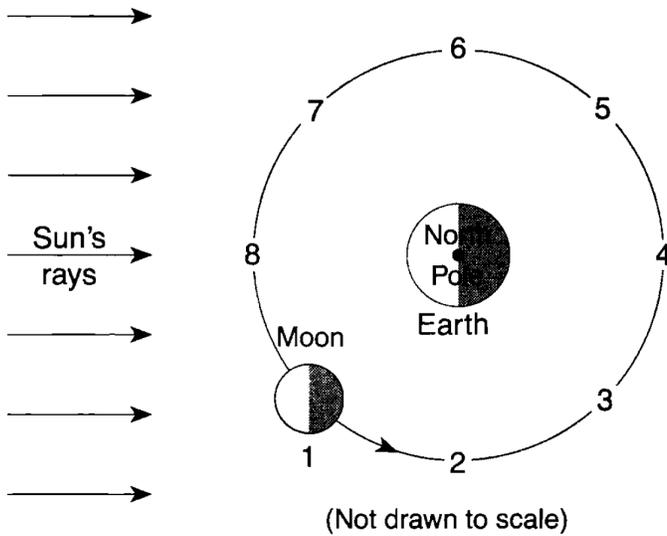
1. The diagram below represents a total solar eclipse as seen from Earth.



Which diagram correctly represents the relative positions of the Sun (*S*), Earth (*E*), and the Moon (*M*) in space during a total solar eclipse? [The diagrams are not drawn to scale.]



Base your answers to questions 2 through 5 on the diagram below, which shows the Moon at position 1 in its orbit around Earth. Numbers 2 through 8 represent other positions in the Moon's orbit.

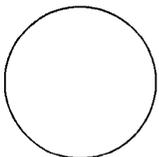


2. Identify *one* numbered orbital position where the gravitational attraction of the Moon and the Sun cause Earth to experience the highest high tides.

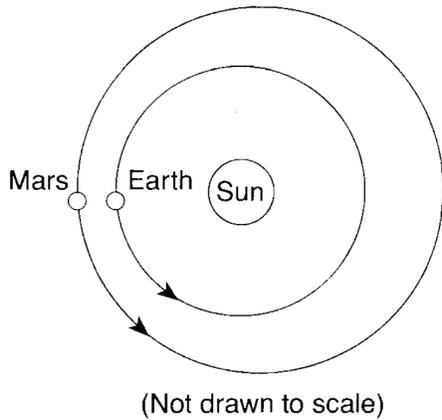
3. How many days does it take the Moon to go from one full-Moon phase to the next full-Moon phase when viewed from Earth?

4. A solar eclipse could occur when the Moon is located at which numbered position?

5. On the diagram below, shade the portion of the Moon that is in darkness as viewed from New York State when the Moon is at position 1.

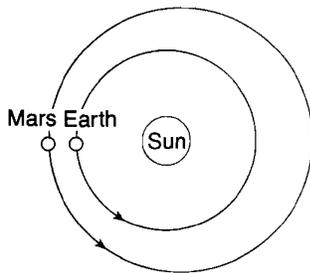


6. The diagram below shows the relative positions of Earth and Mars in their orbits on a particular date during the winter of 2007.

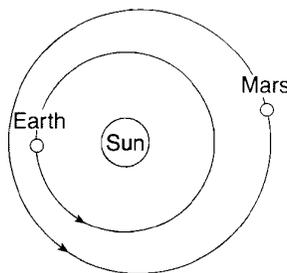


Which diagram correctly shows the locations of Earth and Mars on the same date during the winter of 2008?

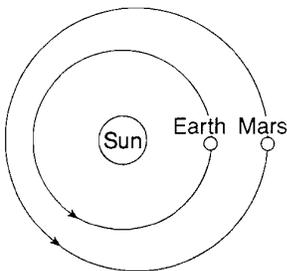
A)



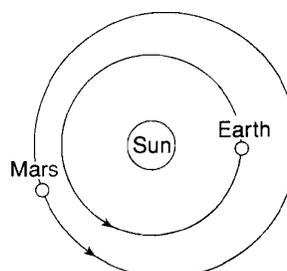
B)



C)



D)

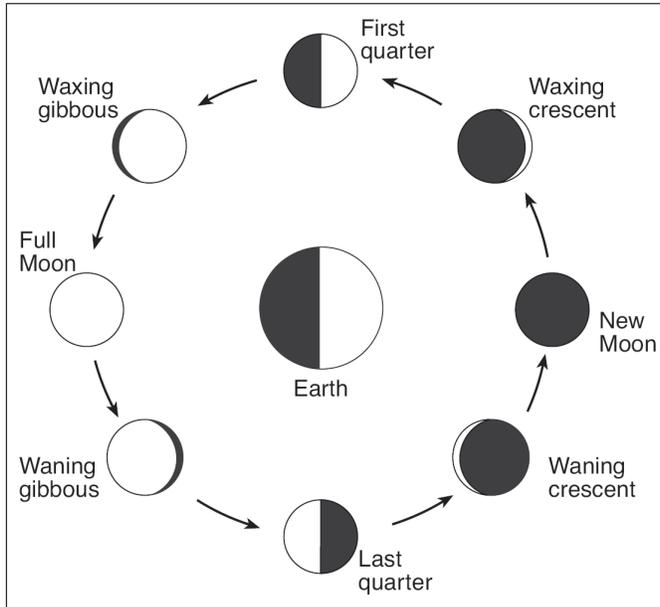


7. A high tide occurred at 6:00 a.m. at a beach on Long Island. The next high tide at this same beach would occur at approximately

- A) 12:15 p.m. on the same day **B) 6:30 p.m. on the same day**
 C) 12:45 p.m. on the following day D) 7:00 a.m. on the following day

Base your answers to questions 8 through 10 on

the diagram below, which shows positions of the Moon in its orbit and phases of the Moon as viewed from New York State.



(Not drawn to scale)

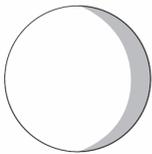
8. Which statement best explains why the same side of the Moon is viewed from Earth as the Moon goes through its phases?
- A) The Moon does not rotate as it revolves around Earth.
 - B) The Moon's period of rotation equals Earth's period of rotation.
 - C) The Moon's period of rotation equals Earth's period of revolution around the Sun.
 - D) The Moon's period of rotation equals the Moon's period of revolution around Earth.**
9. During which Moon phase might a solar eclipse be viewed on Earth?
- A) new Moon** B) first quarter C) full Moon D) last quarter
10. Approximately how many days occur between the Moon's first-quarter phase and the Moon's last-quarter phase?
- A) 7 d **B) 15 d** C) 29.5 d D) 365.26 d
-

Base your answers to questions **11** through **14** on the calendar below, which shows the month of July of a recent year. The dates of major Moon phases, as seen in New York State, are shown.

July						
Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
 1	2	3	4	5	6	7
 8	9	10	11	12	13	14
15	 16	17	18	19	20	21
22	 23	24	25	26	27	28
29	 30	31				

Key	
	New Moon
	First-quarter Moon
	Full Moon
	Last-quarter Moon

The diagram below represents the phase of the Moon observed from New York State one night during the month of July.

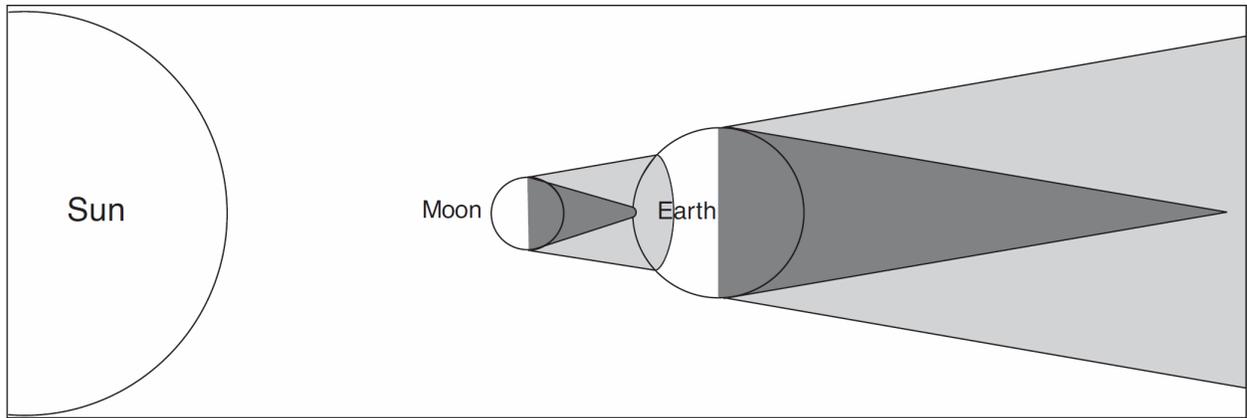


11. Why does the Moon's gravity have a greater effect on Earth's ocean tides than the Sun's gravity?
- A) The Sun is composed mostly of gases.
 - B) The Sun's gravity influences more planets.
 - C) The Moon has a greater mass.
 - D) The Moon is much closer to Earth.**
12. Eclipses do *not* occur every month because the Moon's
- A) rate of rotation is 15° each hour
 - B) orbit is inclined to Earth's orbit**
 - C) period of revolution is 27.3 days
 - D) period of rotation and period of revolution are the same

13. On which date will the next first-quarter Moon phase occur?
A) August 6 B) August 10 C) August 16 D) August 22

14. On which date was this phase of the Moon visible from New York State?
 A) July 4 B) July 11 **C) July 19** D) July 26

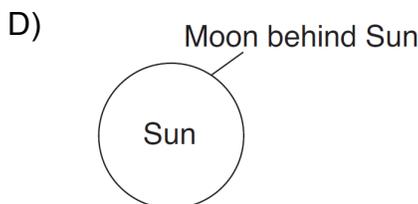
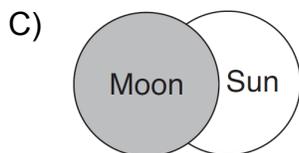
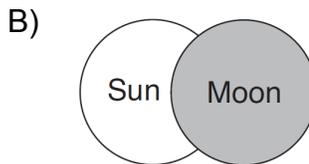
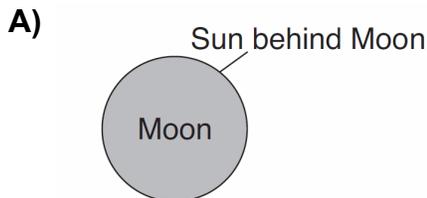
15. The diagram below shows the position of the Sun, the Moon, and Earth during a solar eclipse. The full shadow (umbra) and partial shadow (penumbra) of the Moon and Earth are shown.



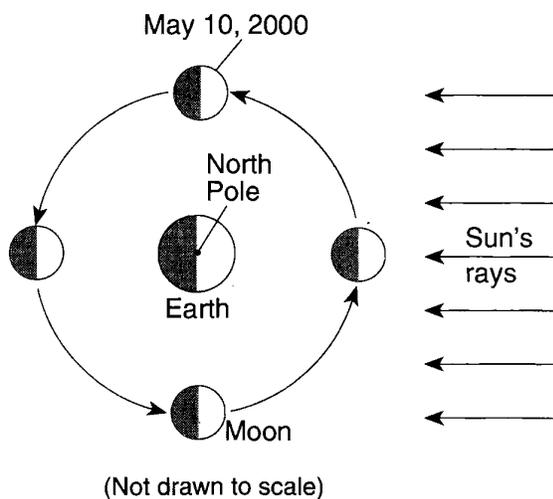
(Not drawn to scale)

Key	
	Umbra
	Penumbra

Which diagram best represents the appearance of the Sun and the Moon to an observer located within the umbra of the Moon's shadow on Earth's surface?

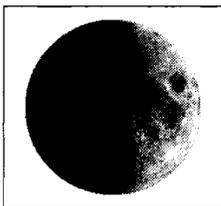


16. The diagram below shows the Moon at four positions in its orbit around Earth as viewed from above the North Pole. The date of one of the four positions has been labeled.

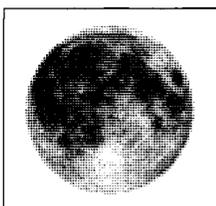


Which photograph shows the appearance of the Moon as viewed by an observer in New York State on May 17, 2000?

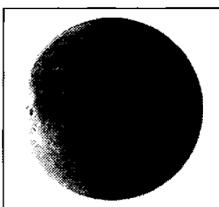
A)



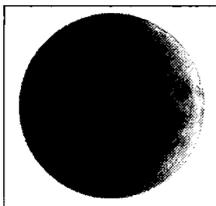
B)



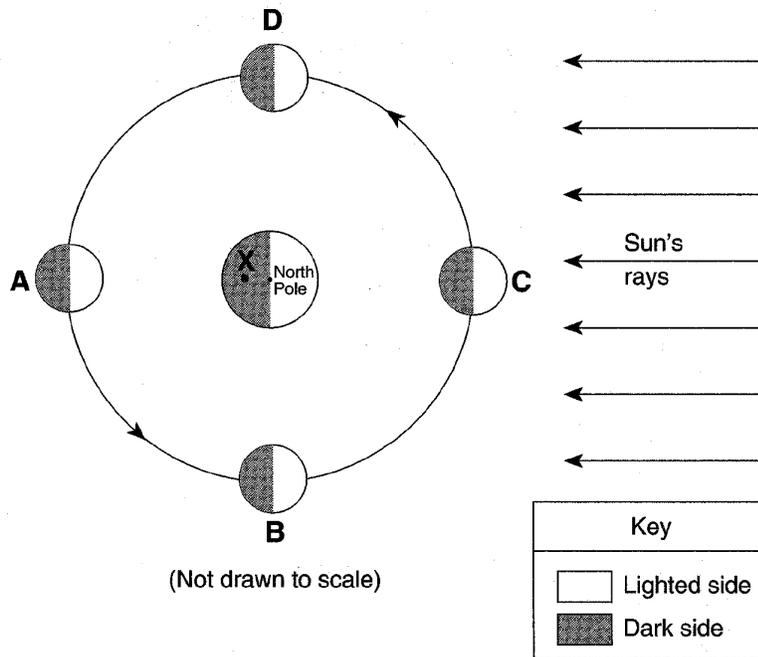
C)



D)



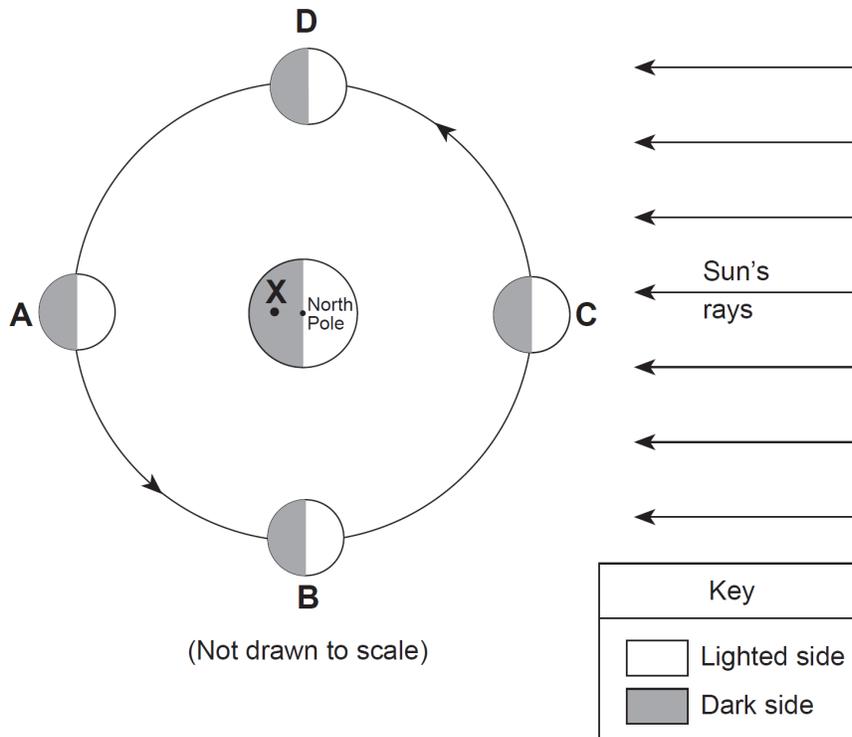
17. Base your answer to the following question on the diagram below, which shows Earth and the Moon in relation to the Sun. Positions *A*, *B*, *C*, and *D* show the Moon at specific locations in its orbit. Point *X* is a location on Earth's surface.



Which phase of the Moon would be observed on Earth when the Moon is at location *A* ?

- A)
- B)
- C)
- D)

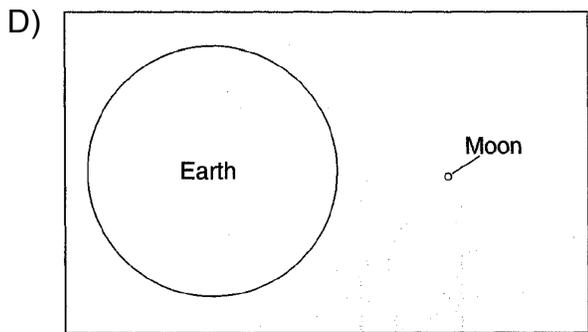
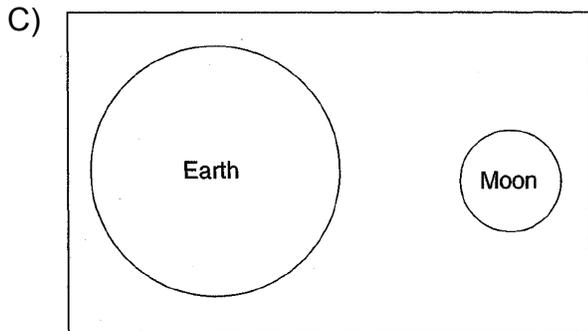
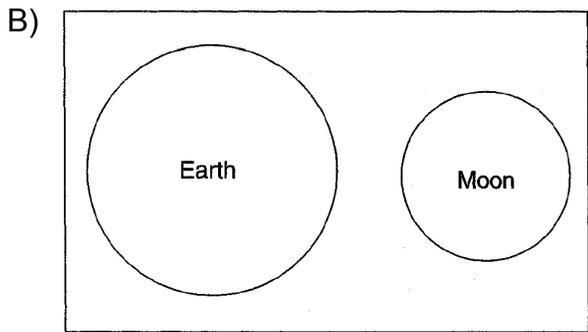
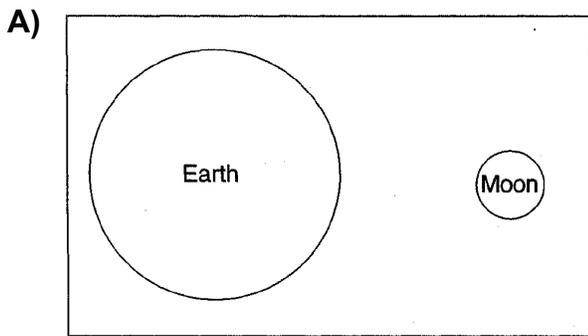
18. Base your answer to the following question on the diagram below, which shows Earth and the Moon in relation to the Sun. Positions *A*, *B*, *C*, and *D* show the Moon at specific locations in its orbit. Point *X* is a location on Earth's surface.



A solar eclipse might occur when the Moon is at location

- A) *A* B) *B* C) *C* D) *D*

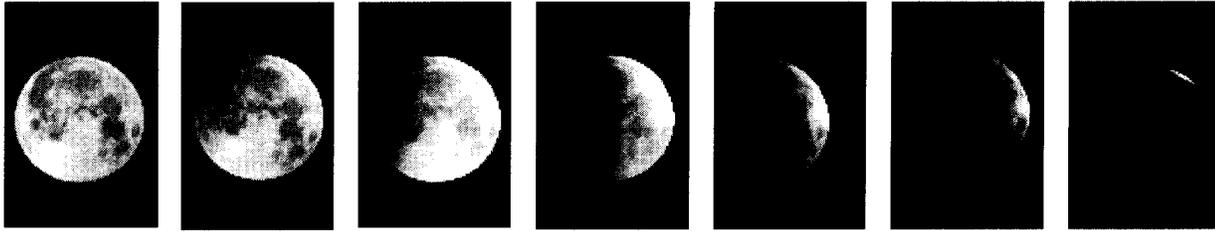
19. Which diagram best represents the size of the Moon, compared to Earth, when drawn to scale?



20. How many days are required for the Moon to go from one full-Moon phase to the next full-Moon phase when viewed from Earth?

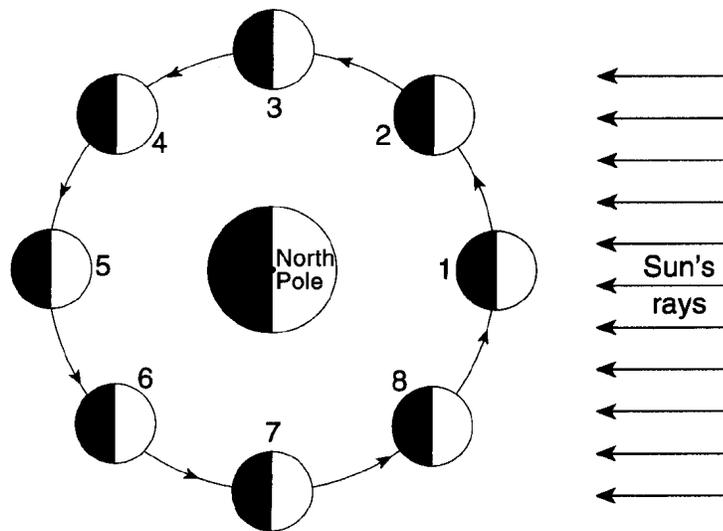
- A) 24 B) 27.3 C) **29.5** D) 365
-

21. The photographs below show the surface of the Moon as seen from Earth over an 80-minute period during a single night.



Which motion is responsible for this changing appearance of the Moon?

- A) The Moon moves into the shadow of Earth.
 B) The Moon moves into the shadow of the Sun.
 C) The Sun moves into the shadow of Earth.
 D) The Sun moves into the shadow of the Moon.
22. Base your answer to the following question on The diagram below shows the Moon as it revolves around Earth. The numbered locations represent different positions of the Moon in its orbit.

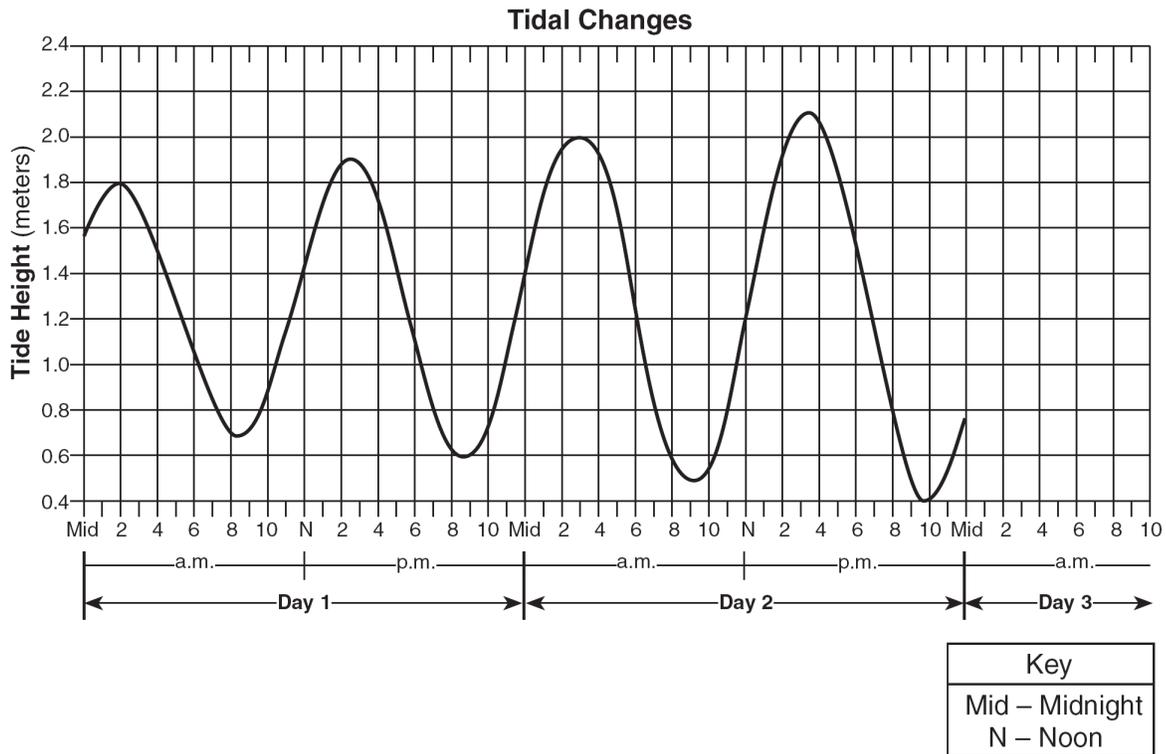


(Not drawn to scale)

Which Moon phase would be seen by an observer in New York State when the Moon is at position 2?

- A) B) C) D)

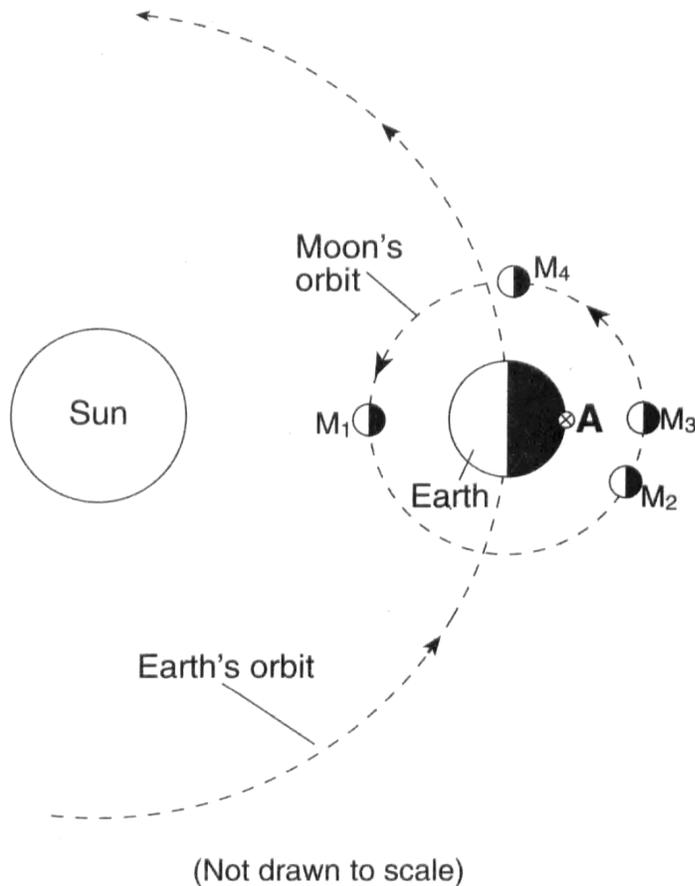
23. Base your answer to the following question on the graph below, which shows two days of tidal data from a coastal location in the northeastern United States.



The change in the tides as shown on the graph is primarily the result of

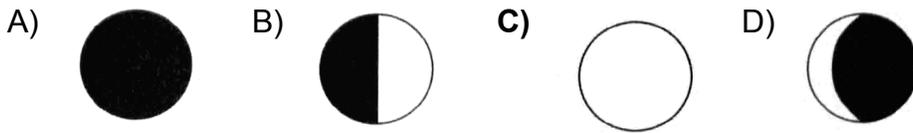
- A) Earth's rotation and the Moon's revolution
- B) Earth's rotation and revolution
- C) the Moon's rotation and Earth's revolution
- D) the Moon's rotation and revolution

Base your answers to questions **24** through **26** on the diagram below, which shows Earth in orbit around the Sun, and the Moon in orbit around Earth. M_1 , M_2 , M_3 , and M_4 indicate positions of the Moon in its orbit. Letter A indicates a location on Earth's surface.

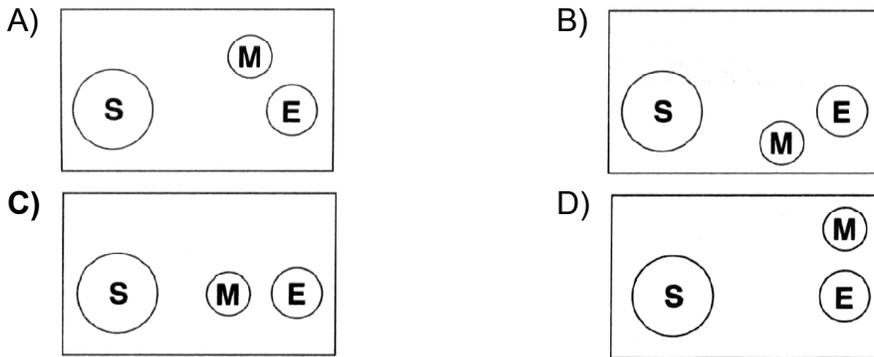


24. An observer at location A noticed that the apparent size of the Moon varied slightly from month to month when the Moon was at position M_4 in its orbit. Which statement best explains this variation in the apparent size of the Moon?
- A) The Moon expands in summer and contracts in winter.
 - B) The Moon shows complete cycles of phases throughout the year.
 - C) The Moon's period of rotation is equal to its period of revolution.
 - D) The Moon's distance from Earth varies in a cyclic manner.**
25. At which Moon position could a solar eclipse be seen from Earth?
- A) M_1** B) M_2 C) M_3 D) M_4

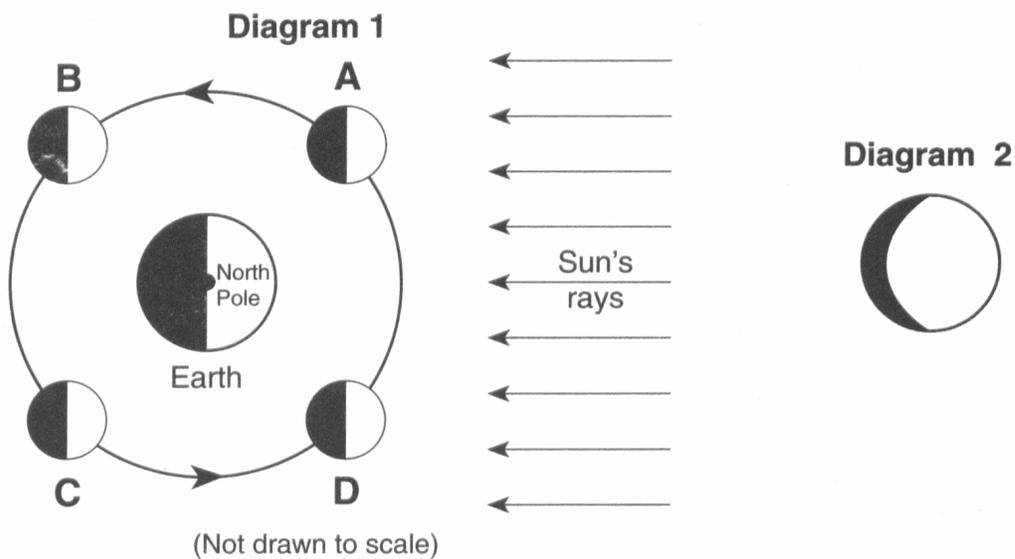
26. An observer at location *A* on Earth views the Moon when it is at position M_3 . Which phase of the Moon will the observer see?



27. Which arrangement of the Sun, the Moon, and Earth results in the highest high tides, and the lowest low tides on Earth? (Diagrams are not drawn to scale.)



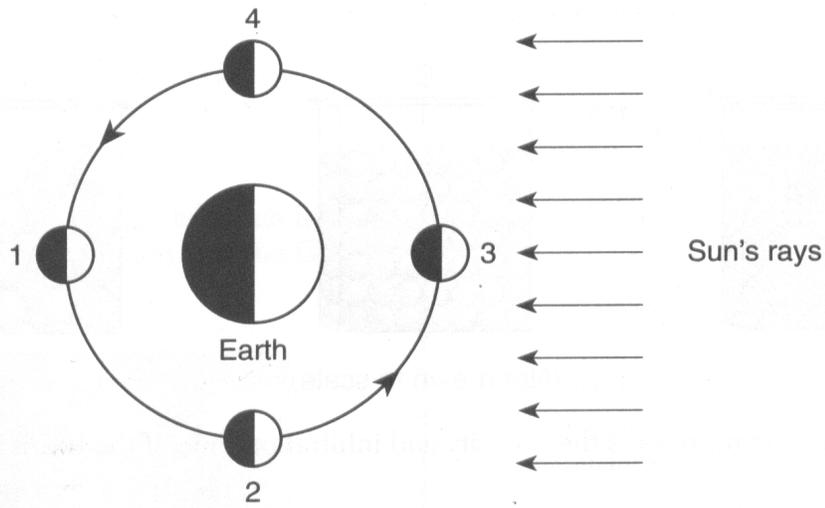
28. Diagram 1 shows the Moon in its orbit at four positions labeled A, B, C, and D. Diagram 2 shows a phase of the Moon as viewed from New York State.



At which labeled Moon position would the phase of the Moon shown in diagram 2 be observed from New York State?

- A) *A* B) *B* C) *C* D) *D*

29. Base your answer to the following question on The diagram below represents the Sun's rays striking Earth and the Moon. Numbers 1 through 4 represent positions of the Moon in its orbit around Earth.



(Not drawn to scale)

The highest tides on Earth occur when the Moon is in positions

- A) 1 and 3 B) 2 and 4 C) 3 and 2 D) 4 and 1
30. Which sequence of Moon phases could be observed from Earth during a 2-week period?

Key	
	Full Moon phase
	New Moon phase

- A) → → →
- B) → → →
- C) → → →
- D) → → →

31. Base your answer to the following question on the passage below.

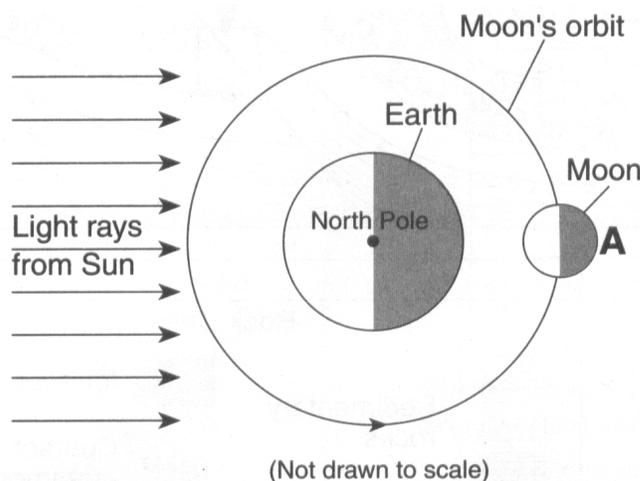
A Newly Discovered Planet

Scientists studying a Sun-like star named Ogle-Tr-3 discovered a planet that is, on the average, 3.5 million kilometers away from the star's surface. The planet was discovered as a result of observing a cyclic decrease in the brightness of Ogle-Tr-3 every 28.5 hours. The changing brightness is the result of the planet blocking some of the starlight when it is between Ogle-Tr-3 and Earth. This observation allowed scientists to find not only the planet, but also to determine the planet's mass and density. The mass has been calculated to be approximately 159 times the mass of Earth. The planet is only 20% as dense as Jupiter. Scientists think that this low density is the result of being very close to Ogle-Tr-3.

The planet was discovered when it passed between Earth and the star Ogle-Tr-3. Which event in our solar system results from a similar type of alignment of the Moon between Earth and the Sun?

- A) summer solstice
- B) winter solstice
- C) solar eclipse
- D) lunar eclipse

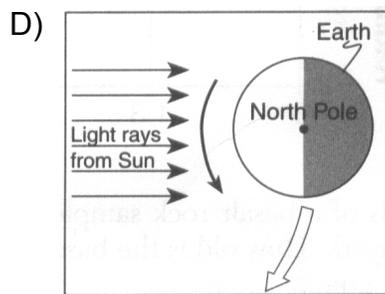
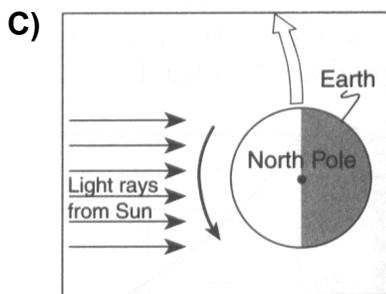
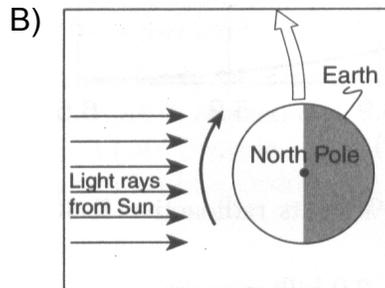
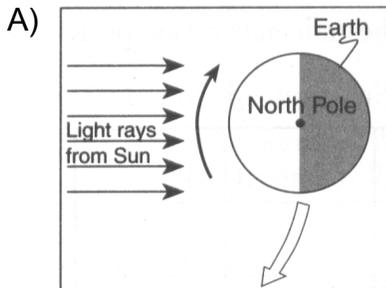
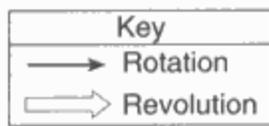
Base your answers to questions 32 and 33 on the diagram below, which shows the Moon, Earth, and the Sun's rays as viewed from space. Letter A indicates a certain position of the Moon in its orbit.



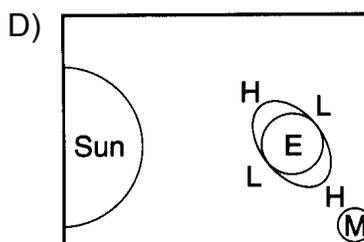
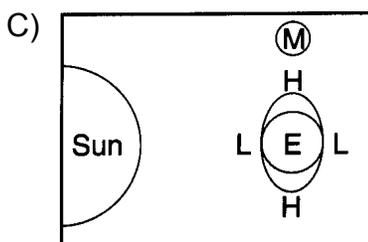
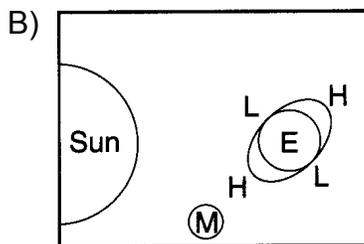
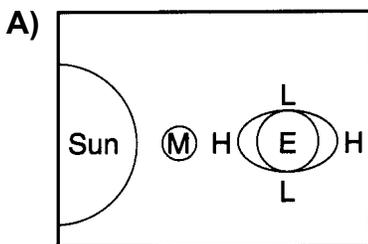
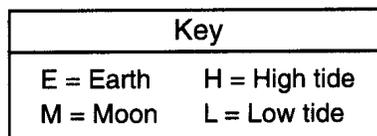
32. Which diagram represents the phase of the Moon, as seen by an observer on Earth, when the Moon is located at position A in its orbit?

- A)
- B)
- C)
- D)

33. Which diagram correctly shows the direction of Earth's rotation and revolution?



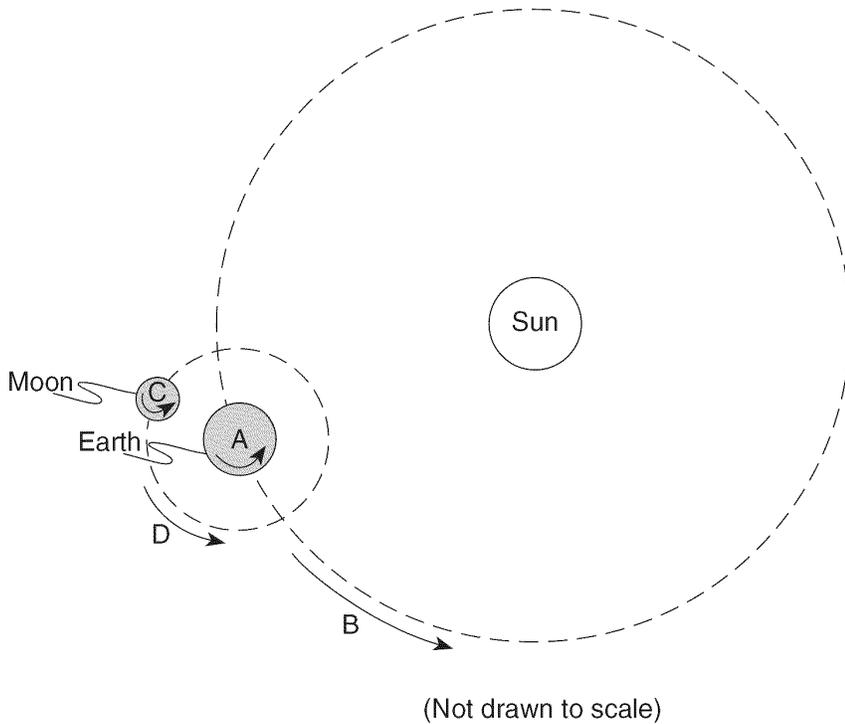
34. The diagrams below represent Earth's ocean tides at four different positions of the Moon. Which diagram shows the Moon position that will produce the highest high tides and the lowest low tides? (The diagrams are not drawn to scale.)



35. The same side of the Moon always faces Earth because the

- A) Moon's period of rotation is longer than its period of revolution around Earth
- B) Moon's period of rotation is shorter than its period of revolution around Earth
- C) Moon rotates once as it completes one revolution around Earth**
- D) Moon does not rotate as it completes one revolution around Earth

Base your answers to questions 36 and 37 on the diagram below, which has lettered arrows showing the motions of Earth and the Moon.



Key	
Arrow	Motion
A	Earth's rotation on its axis
B	Earth's revolution around the Sun
C	The Moon's rotation on its axis
D	The Moon's revolution around Earth

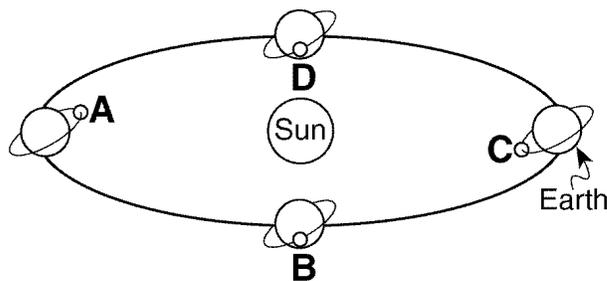
36. Which lettered arrow represents the motion that causes the Moon to show phases when view from Earth

- A) A
- B) B
- C) C
- D) D**

37. Which two motions are completed in about the same amount of time?

- A) A and B
- B) B and C
- C) C and D**
- D) A and D

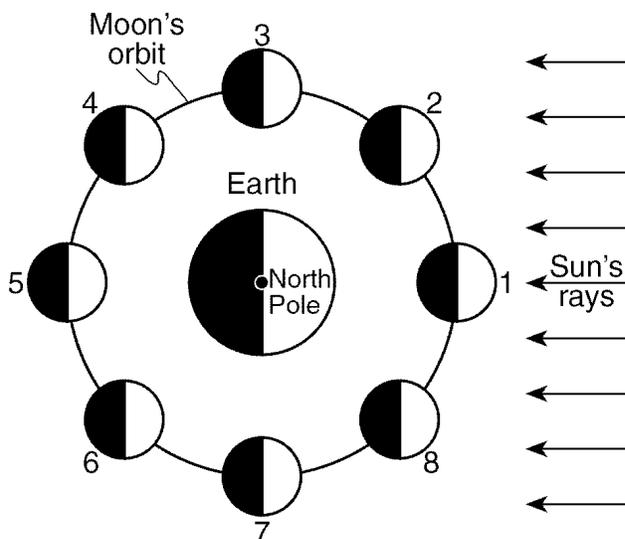
38. The diagram below shows Earth's orbit around the Sun and different positions of the Moon as it travels around Earth. Letters A through D represent four different positions of the Moon.



(Not drawn to scale)

An eclipse of the Moon is most likely to occur when the Moon is at position

- A) A B) B C) C D) D
39. Base your answer to the following question on The diagram below shows the Moon orbiting Earth, as viewed from space above Earth's North Pole. The Moon is shown at eight positions in its orbit.



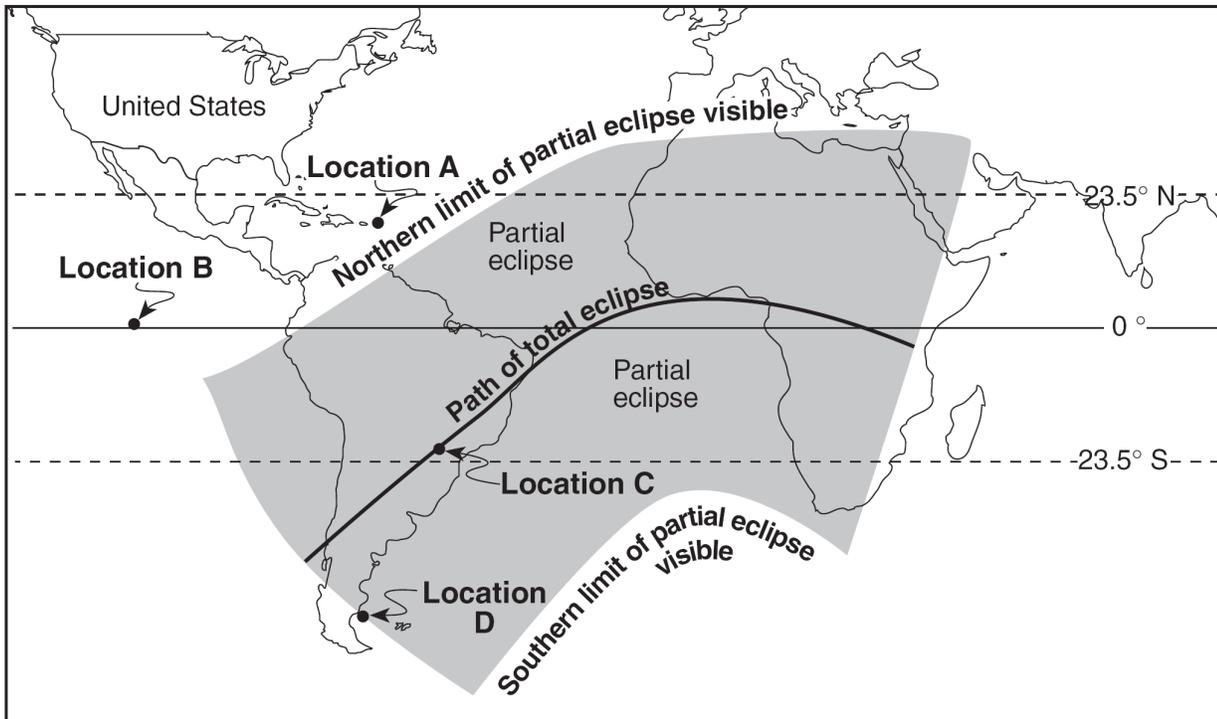
(Not drawn to scale)

Spring ocean tides occur when the difference in height between high tide and low tide is greatest. At which two positions of the Moon will spring tides occur on Earth?

- A) 1 and 5 B) 2 and 6 C) 3 and 7 D) 4 and 8
40. Which object is closest to Earth?
- A) the Sun B) Venus C) the Moon D) Mars

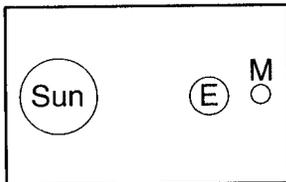
Base your answers to questions 41 through 43 on the world map below, which shows regions of Earth where a solar eclipse was visible on May 20, 1947. Location A, B, C, and D are on Earth's surface.

Solar Eclipse May 20, 1947

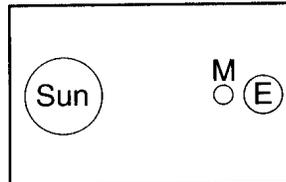


41. Which diagram best represents the positions of Earth (E), the Sun, and the Moon that created the solar eclipse? (Diagrams are not drawn to scale.)

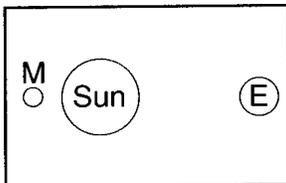
A)



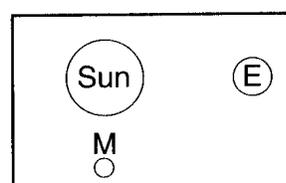
B)



C)



D)



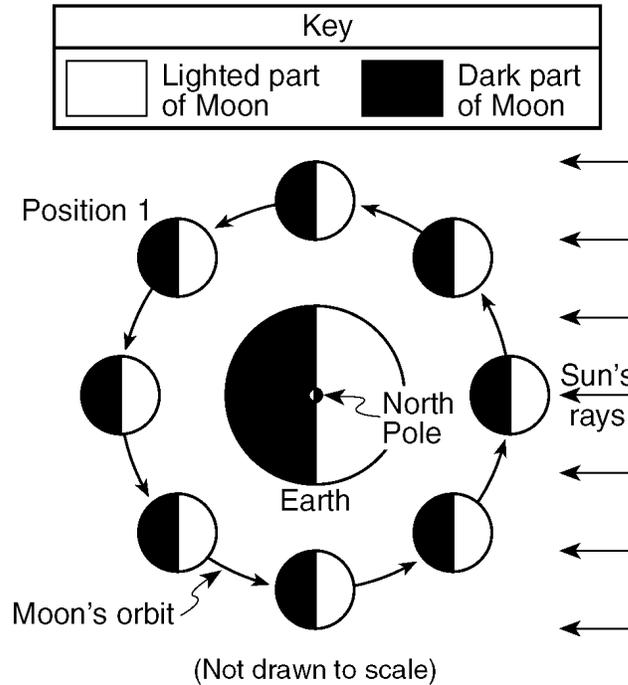
42. Which statement best describes the visibility of this eclipse from locations in New York State?

- A) A total eclipse was visible all day.
- B) A total eclipse was visible only from noon until sunset.
- C) A partial eclipse was visible only from noon until sunset.
- D) Neither a partial nor a total eclipse was visible.**

43. At which location could an observer have viewed this total solar eclipse if the skies were clear?

- A) A B) B C) C D) D
-

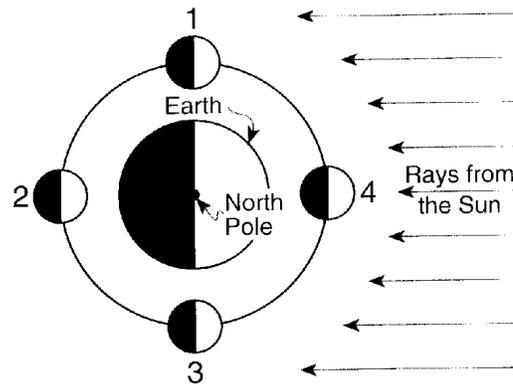
44. The diagram below represents the Moon in its orbit, as viewed from above Earth's North Pole. Position 1 represents a specific location of the Moon in its orbit.



Which phase of the Moon will be seen from Earth when the Moon is at position 1?

- A)  B)  C)  D) 
-

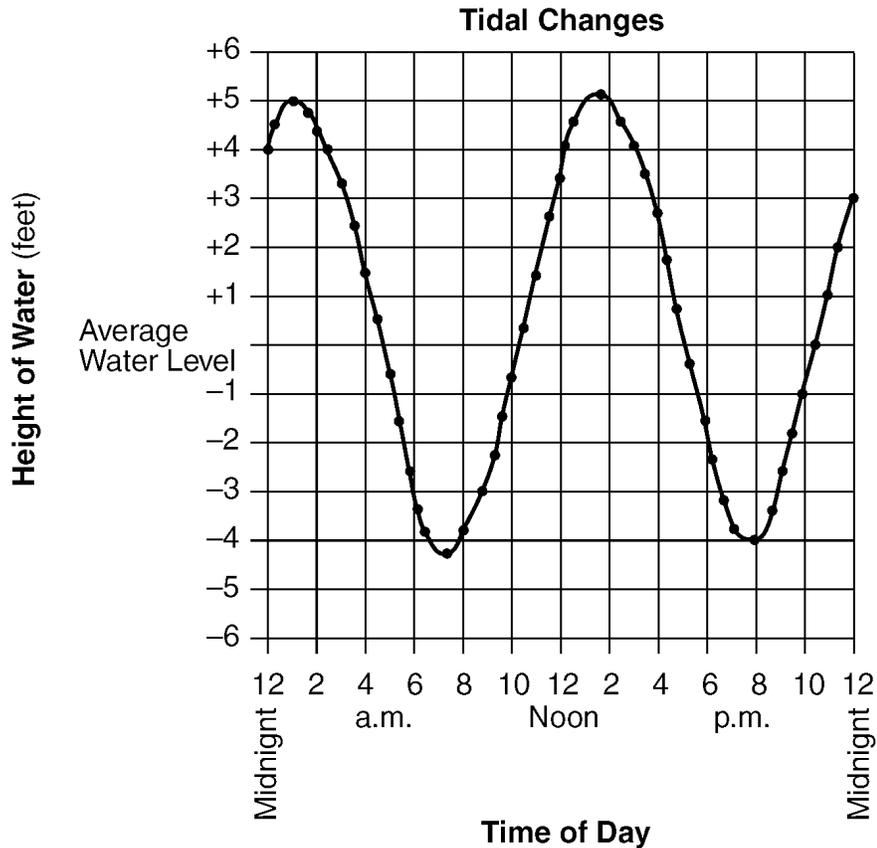
-
45. Base your answer to the following question on The diagram below shows the Moon at four positions in its orbit around Earth.



(Not drawn to scale)

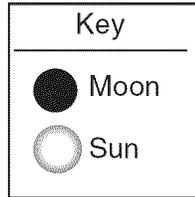
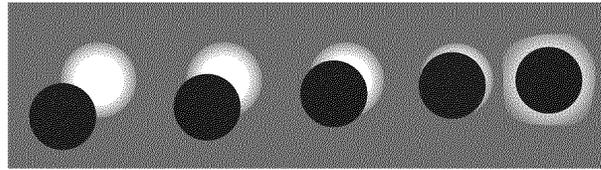
- An observer on Earth could see a solar eclipse when the Moon is at position
- A) 1 B) 2 C) 3 **D) 4**
46. One complete cycle of the phases of the Moon takes approximately one
- A) day B) week **C) month** D) year
47. The time required for the Moon to show a complete cycle of phases when viewed from Earth is approximately
- A) 1 day B) 1 week **C) 1 month** D) 1 year
-

Base your answers to questions **48** and **49** on the graph below. The graph shows the recorded change in water level (ocean tides) at a coastal city in the northeastern United States during 1 day.



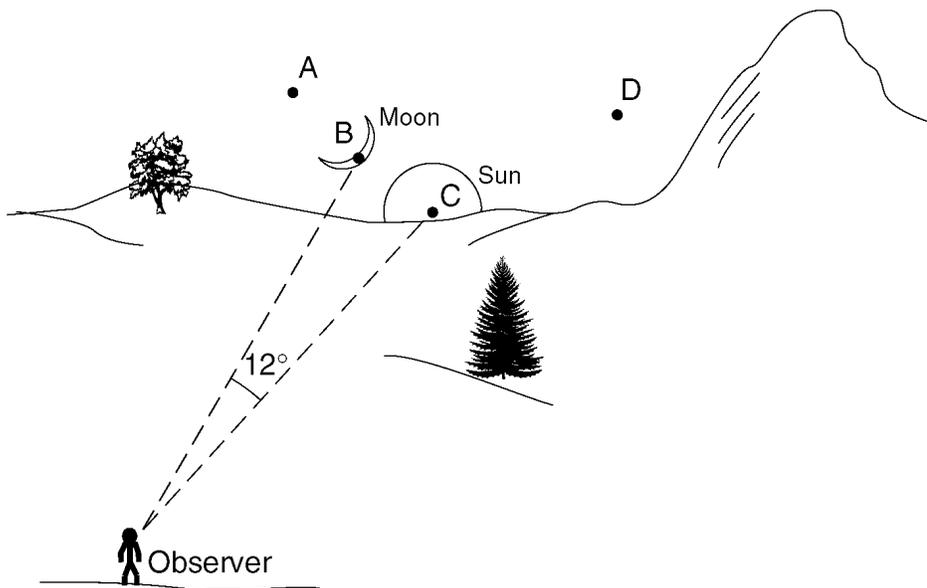
48. According to the pattern shown on the graph, the next high tide will occur on the following day at approximately
- A) 12:30 a.m. **B) 2:00 a.m.** C) 3:15 a.m. D) 4:00 a.m.
49. Which inference about tides is best made from this graph?
- A) The hourly rate of tidal change is always the same.
B) The rate of tidal change is greatest at high tide.
C) The tidal change is a random event.
D) The tidal change is cyclic.

50. What is represented by the diagram below?



- A) changing phases of the Sun B) changing phases of the Moon
C) **stages in an eclipse of the Sun** D) stages in an eclipse of the Moon

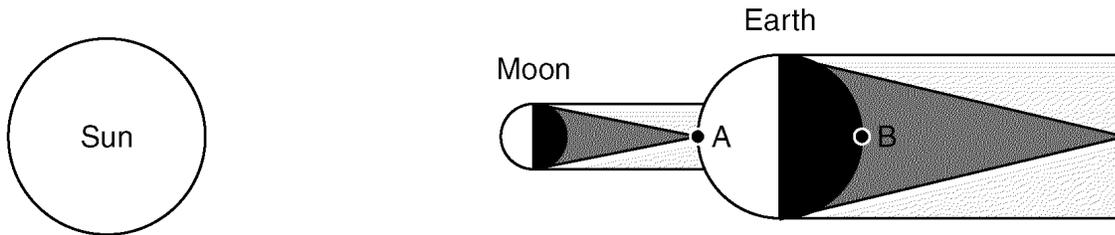
51. The diagram below shows the positions of the Moon and the Sun at sunset during an evening in New York State. Points A, B, C, and D represent positions along the western horizon.



At sunset on the following evening, the Moon will be located at position

- A) A B) B C) C D) D

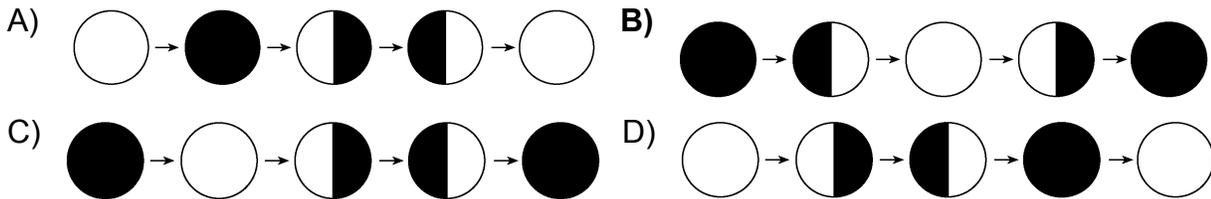
52. The diagram below shows the relative positions of the Sun, the Moon, and Earth when an eclipse was observed from Earth. Positions *A* and *B* are locations on Earth's surface.



(Not drawn to scale)

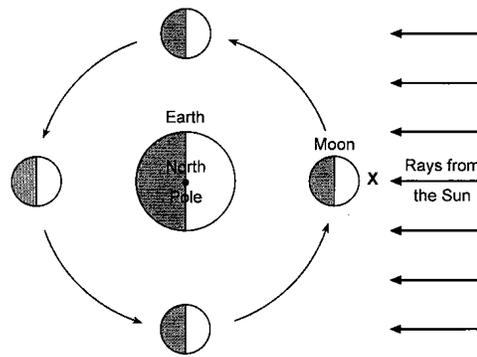
Which statement correctly describes the type of eclipse that was occurring and the position on Earth where this eclipse was observed?

- A) A lunar eclipse was observed from position *A*.
 B) A lunar eclipse was observed from position *B*.
C) A solar eclipse was observed from position *A*.
 D) A solar eclipse was observed from position *B*.
53. Which diagram sequence correctly shows the order of Moon phases, as viewed from Earth, for a period of 1 month? [Note that some phases have been omitted.]



54. A cycle of Moon phases can be seen from Earth because the
- A) Moon's distance from Earth changes at a predictable rate
 B) Moon's axis is tilted
 C) Moon spins on its axis
D) Moon revolves around Earth

55. The diagram below shows the Moon at four positions in its orbit around Earth as viewed from above the North Pole.



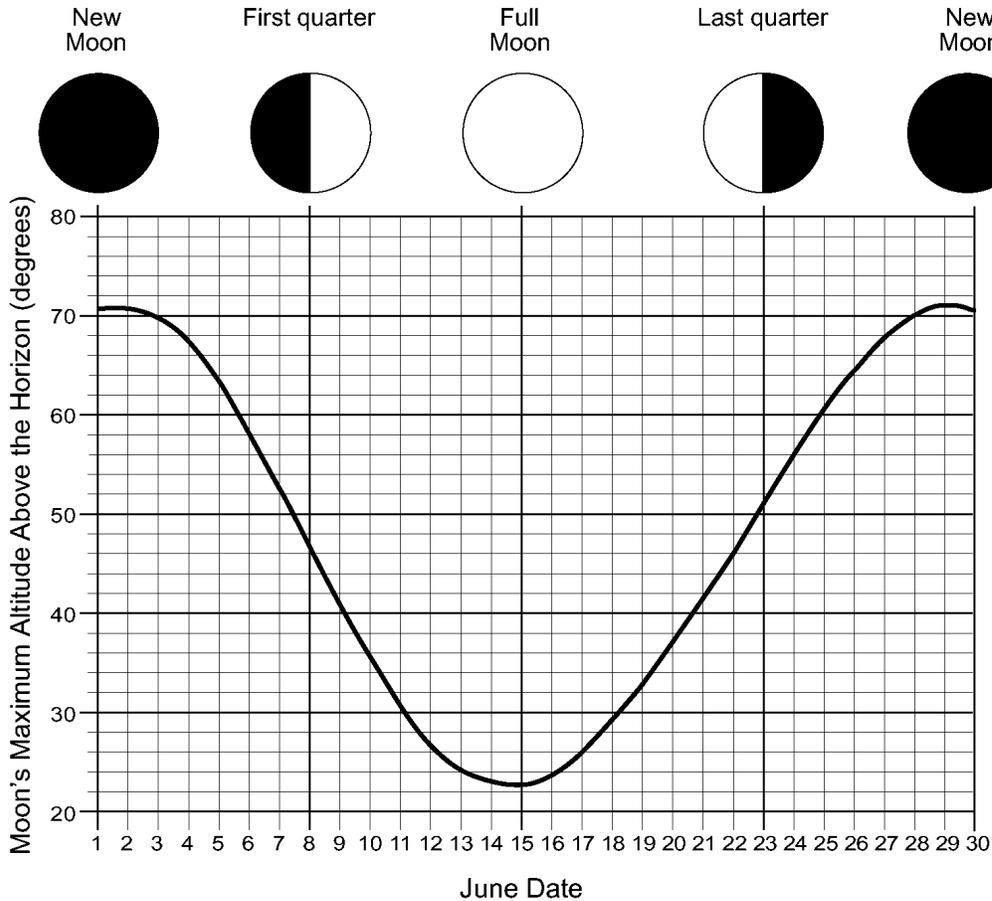
(Not drawn to scale)

Beginning with the Moon at position X (the new-Moon phase), which sequence of Moon phases would be seen by an observer on Earth during 1 month?

- A)
- C)

- B)
- D)

Base your answers to questions **56** through **59** on the graph below, which shows the maximum altitude of the Moon, measured by an observer located at a latitude of 43° N during June in a particular year. The names and appearance of the four major Moon phases are shown at the top of the graph, directly above the date on which the phase occurred.



56. Which terms describe both the changes in the maximum altitude of the Moon and the changes in the Moon's phases over a period of several years?

- A) **cyclic and predictable**
- B) cyclic and unpredictable
- C) noncyclic and predictable
- D) noncyclic and unpredictable

57. Which city is closest in latitude to the location where these observations were made?

- A) Binghamton
- B) New York City
- C) Albany
- D) **Syracuse**

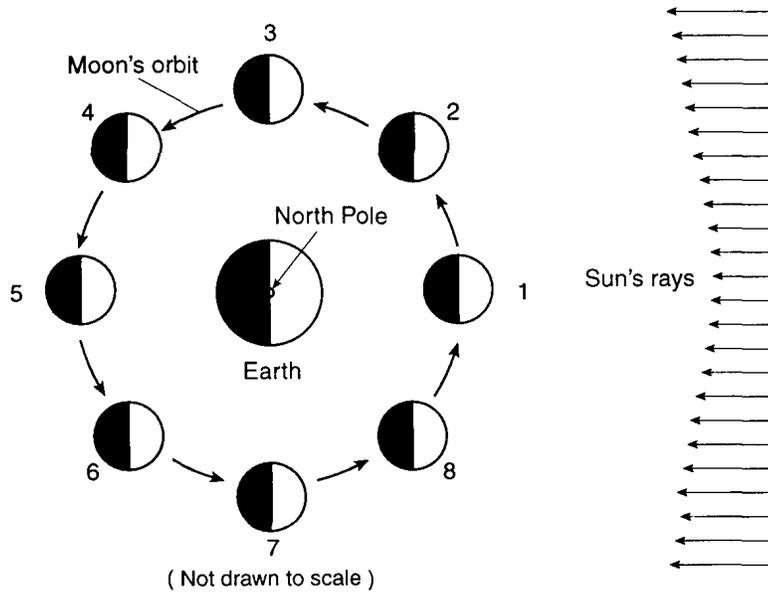
58. Which diagram best represents the Moon's phase observed on June 11?

- A)
- B)
- C)
- D)

59. What was the maximum altitude of the Moon on June 22?

- A) 40° B) 43° C) 46° D) 50°
-

60. Base your answer to the following question on The diagram below shows the Moon orbiting Earth as viewed from space above the North Pole. The Moon is shown at eight different positions in its orbit.



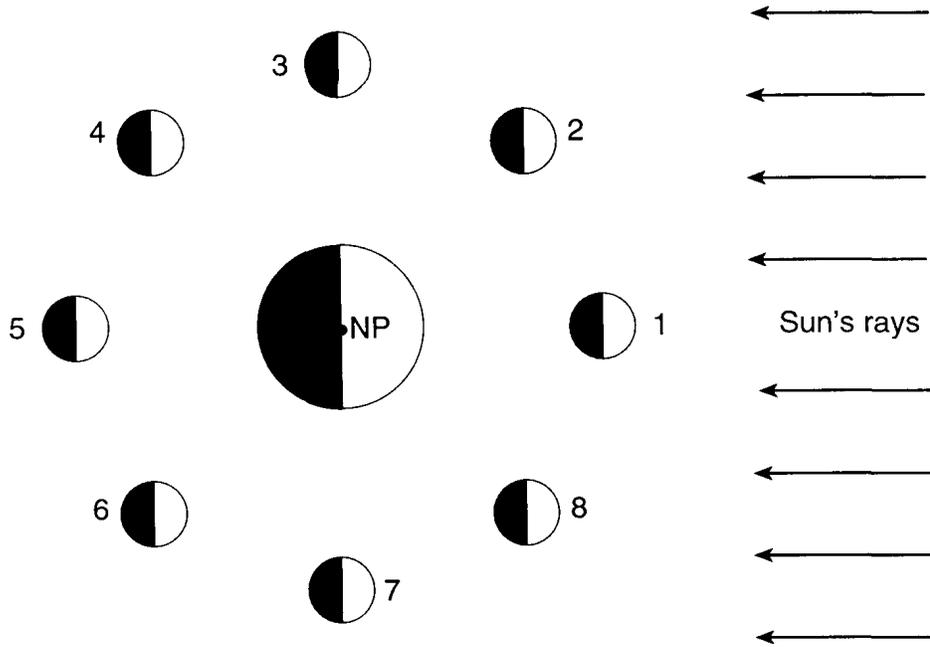
At which two positions of the Moon is an eclipse of the Sun or Moon possible?

- A) 1 and 5 B) 2 and 6 C) 3 and 7 D) 4 and 8

61. The passage of the Moon into Earth's shadow causes a

- A) lunar eclipse B) solar eclipse
C) new Moon D) full Moon
-

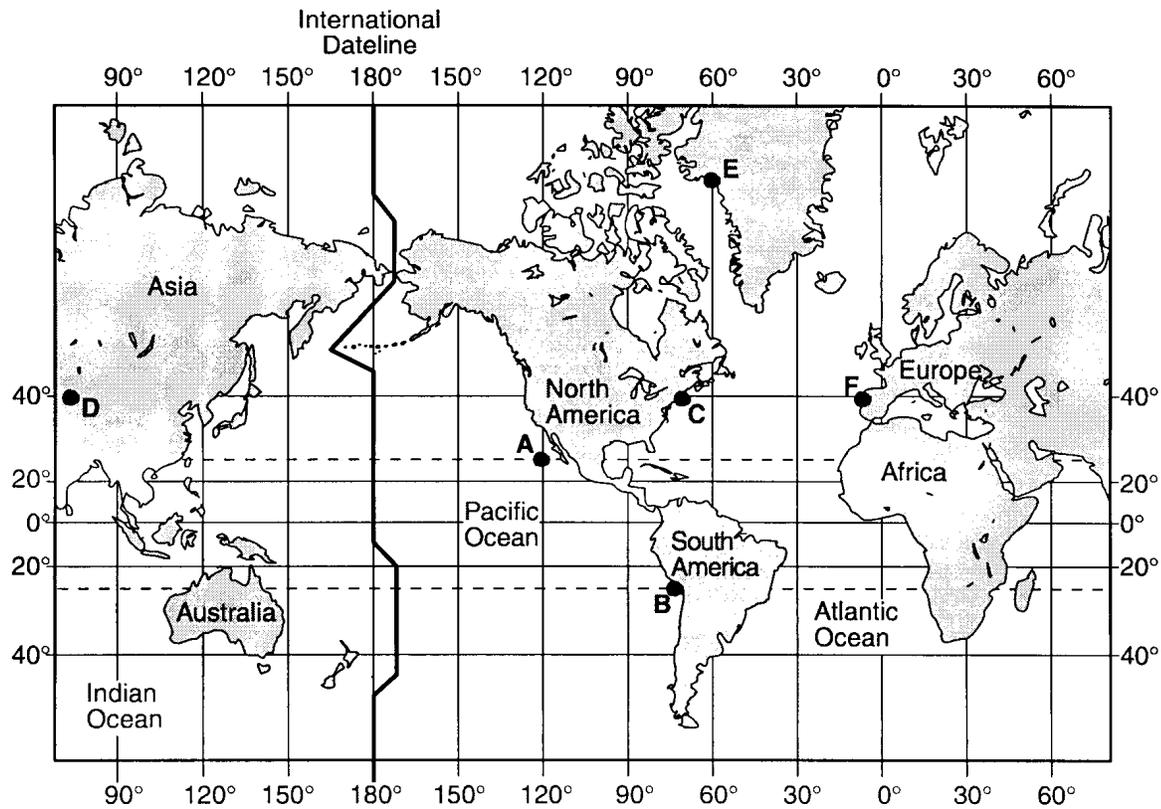
62. The diagram below shows the Moon in different positions as it revolves around Earth, as observed from above the North Pole (NP).



Which image correctly represents the Moon at position 8, as observed from Earth?

- A)
- B)
- C)
- D)

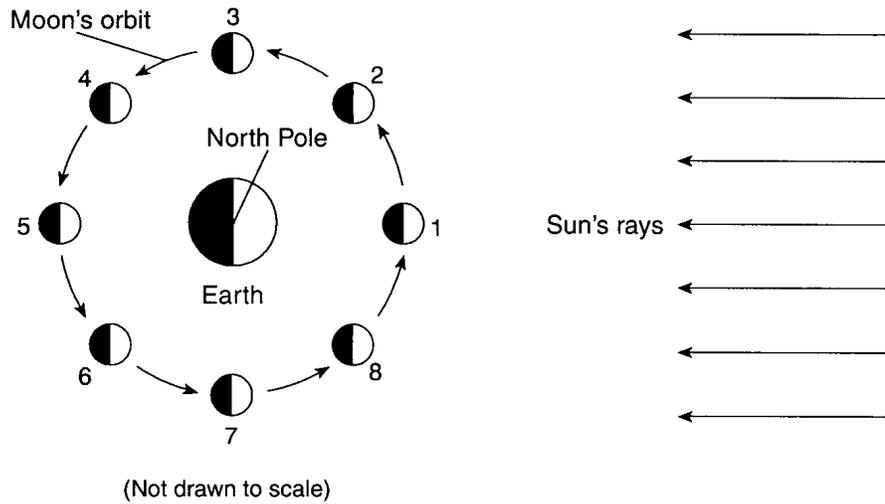
63. Base your answer to the following question on the map below. Letters *A* through *F* are locations on Earth's surface.



An observer at location *C* sees a full Moon at its highest point in the sky. When the observation is being made at location *C*, at which other location would it be impossible for a second observer also to see the full Moon?

- A) *A* B) *B* C) *F* D) *D*

Base your answers to questions **64** through **67** on the diagram below, which represents the Moon orbiting Earth as viewed from space above the North Pole. The Moon is shown at eight different positions in its orbit.



Key	
	Lighted, visible part of the Moon
	Dark, invisible part of the Moon

64. When the Moon is in position 2, which phase would be visible to an observer in Maine?

- A)
- B)
- C)
- D)

65. Which motion causes the Moon to show phases when viewed from Earth?

- A) rotation of Earth
- B) rotation of the Sun
- C) revolution of Earth
- D) revolution of the Moon**

66. As the Moon changes location from position 2 to position 6, the visible portion of the Moon as observed from Earth

- A) decreases, only
- B) increases, only
- C) decreases, then increases
- D) increases, then decreases**

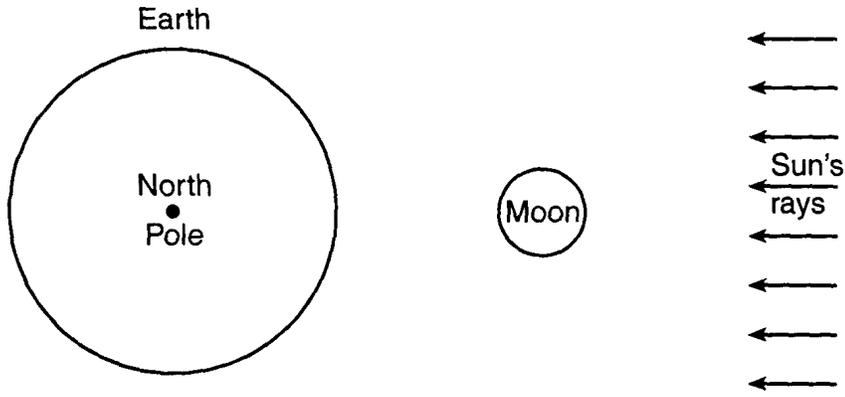
67. The approximate time required for the Moon to move from position 3 to position 7 is

- A) 1 hour
- B) 2 weeks**
- C) 3 months
- D) 4 days

68. If the distance between the Moon and Earth were double its present distance, the Moon's cycle of phases would occur

- A) in reverse order and more slowly
- B) in reverse order and more quickly
- C) in the same order but more slowly**
- D) in the same order but more quickly

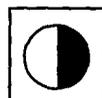
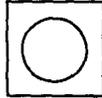
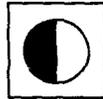
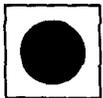
69. The diagram below shows Earth, the Moon, and the Sun's rays as viewed from space.



(Not drawn to scale)

For observers on Earth, which phase of the Moon is represented by the diagram?

- A) New B) First quarter C) Full D) Last quarter



-
72. Why does the Moon show these phases when viewed by an observer on Earth?
- A) The Moon rotates on its axis.
 - B) Earth's orbit is nearly circular.
 - C) The Sun lights only half of Earth.
 - D) The Moon revolves around Earth.**
73. The Moon goes through a complete cycle of phases approximately every
- A) 14 days
 - B) 23 days
 - C) 29 days**
 - D) 365 days
74. During 1996, the maximum intensity of moon-light was received on Earth twice in the month of
- A) February
 - B) June**
 - C) October
 - D) December
-

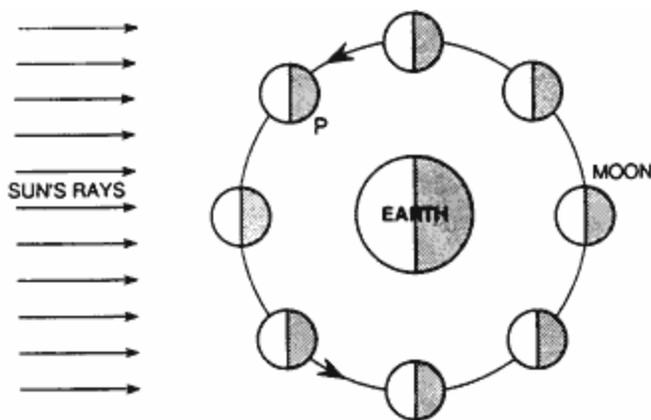
79. Which statement best explains why different phases of the Moon can be observed from the Earth?

- A) The size of the Earth's shadow falling on the Moon changes.
- B) The Moon moves into different parts of the Earth's shadow.
- C) Differing amounts of the Moon's sunlit surface are seen because the Moon revolves around the Sun.
- D) Differing amounts of the Moon's sunlit surface are seen because the Moon revolves around the Earth.**

80. The new-moon phase occurs when the Moon is positioned between the Earth and the Sun. However, these positions do not always cause an eclipse (blocking) of the Sun because the

- A) Moon's orbit is tilted relative to the Earth's orbit**
- B) new-moon phase is visible only at night
- C) night side of the Moon faces toward the Earth
- D) apparent diameter of the Moon is greatest during the new-moon phase

81. The diagram below shows the relative positions of the Earth, Moon, and Sun for a 1-month period.

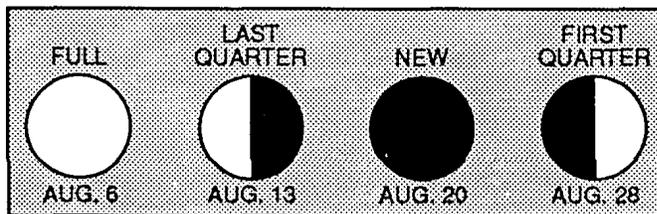


Which diagram best represents the appearance of the Moon at position *P* when viewed from the Earth?

- A)
 - B)
 - C)
 - D)**
-

82. Which motion causes the apparent rising and setting of the Moon each day, as seen from a location in Kansas?
- A) the Earth revolving around the Sun
 - B) the Moon revolving around the Earth
 - C) the Earth rotating on its axis**
 - D) the Moon rotating on its axis

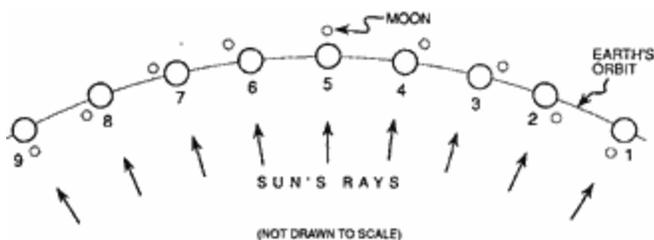
83. The diagrams below show the phases of the Moon as viewed by an observer in New York State at different times in August.



Which phase could have been observed on August 17?

- A) **NEW CRESCENT**
- B) **NEW MOON**
- C) **OLD GIBBOUS**
- D) **OLD CRESCENT**

Base your answers to questions 84 through 87 on the diagram below which represents nine positions of the Earth in orbit around the Sun during one complete orbit of the Moon around the Earth.



84. The Earth rotates on its axis, causing the Moon to appear to rise each day. Moonrise occurs about 52 minutes later each day because as the Earth completes one rotation, the Moon also
- A) completes one rotation on its axis
 - B) wobbles on its axis
 - C) is inclined $23\frac{1}{2}^\circ$
 - D) revolves part way around the Earth**

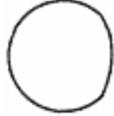
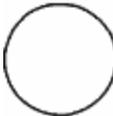
85. During the time that the Earth travels from position 1 to position 9, an observer on the Earth will see the lighted portion of the Moon

- A) decrease, only B) increase, only
C) decrease, then increase **D) increase, then decrease**

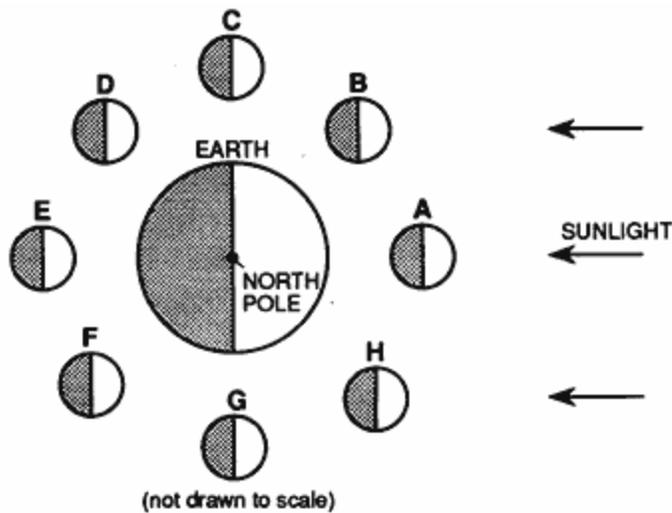
86. At which position might the Moon block part of the Sun, making a solar eclipse visible from Earth?

- A) 1** B) 2 C) 3 D) 4

87. Which phase of the Moon will be seen from the Earth at position 5?

- A)  B)  C)  **D) **
-

88. The diagram below represents eight positions of the Moon as it revolves around the Earth.



When viewed from the Earth, which phase of the Moon will be seen when the Moon is at point E?

- A) first quarter **B) full moon** C) new moon D) last quarter
-

Answer Key

The Moon

1. D
 2. 4 or 8
 3. 29 d to 30 d
 4. 8
 5. 
 6. B
 7. B
 8. D
 9. A
 10. B
 11. D
 12. B
 13. A
 14. C
 15. A
 16. B
 17. A
 18. C
 19. A
 20. C
 21. A
 22. B
 23. A
 24. D
 25. A
 26. C
 27. C
 28. B
 29. A
 30. C
 31. C
 32. A
 33. C
 34. A
 35. C
 36. D
 37. C
 38. B
 39. A
 40. C
 41. B
 42. D
 43. C
 44. D
 45. D
 46. C
 47. C
 48. B
 49. D
 50. C
 51. A
 52. C
 53. B
 54. D
 55. B
 56. A
 57. D
 58. C
 59. C
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 61. A
 62. D
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 64. B
 65. D
 66. D
 67. B
 68. C
 69. A
 70. B
 71. C
 72. D
 73. C
 74. B
 75. A
 76. D
 77. D
 78. C
 79. D
 80. A
 81. D
 82. C
 83. D
 84. D
 85. D
 86. A
 87. D
 88. B
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