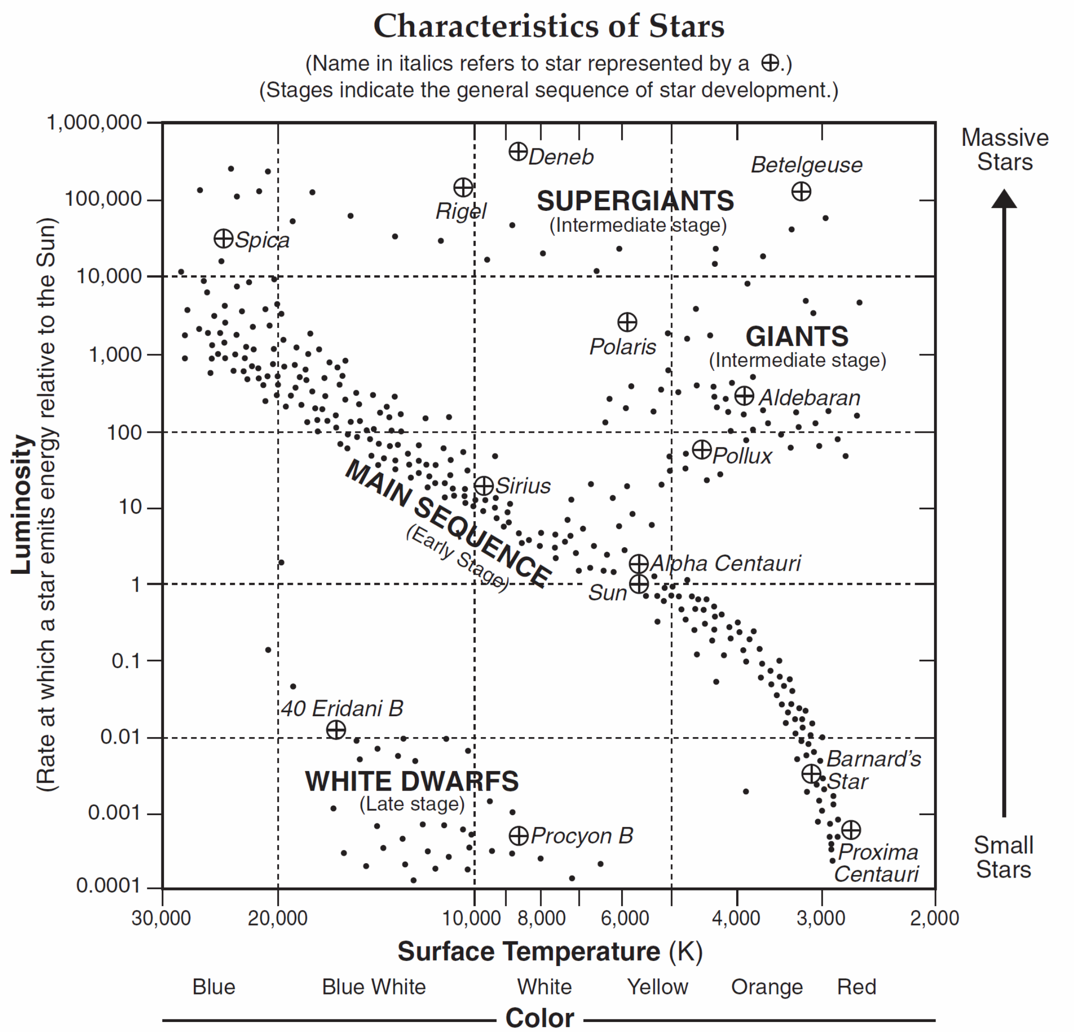
Regents Review Packet #2
Free Response

Base your answers to questions **1** through **4** on the Characteristics of Stars graph in your answer booklet and on your knowledge of Earth science.



1. Describe how the relative surface temperature and the relative luminosity of *Aldebaran* would change if it collapses and becomes a white dwarflike *Procyon B.*

2. Describe *one* characteristic of the star *Spica* that causes it to have a greater luminosity than *Barnard's Star.*

3. Identify *two* stars from the Characteristics of Stars graph that are at the same life-cycle stage as the Sun.

4. The star *Canopus* has a surface temperature of 7400 K and a luminosity (relative to the Sun) of 1413. Above,use an **X** to plot the position of *Canopus* on the graph, based on its surface temperature and luminosity.

Base your answers to questions **5** through **8** on the passage and data table below and on your knowledge of Earth science. The data table shows the apparent hourly change in the direction of a pendulum's swing, in degrees per hour (0 /h), for six different Northern Hemisphere latitudes.

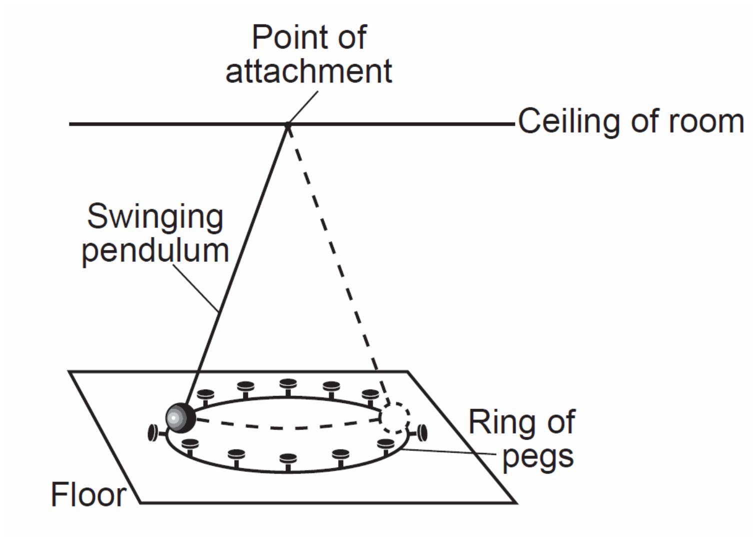
Foucault's Pendulum

In 1851, Jean-Bernard-Leon Foucault attached a heavy iron ball to a steel wire hanging from the high ceiling of a church in Paris to demonstrate an apparent motion caused by Earth's rotation. This pendulum could swing freely back and forth. A spike on the bottom of Foucault's pendulum produced straight lines in sand spread on the floor. The position of each new line appeared to gradually shift in a clockwise direction. Eventually, the pendulum returned to its original path, completing a 360° pattern in approximately 32 hours. At other northern latitudes, a Foucault pendulum will complete a 360° pattern of swing in different amounts of time. In the Northern Hemisphere, the number of degrees that a pendulum appears to change its clockwise direction of swing each hour varies with latitude.

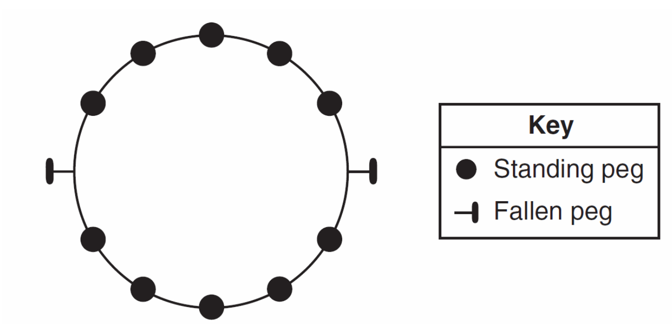
Data Table

Latitude (°N)	**ApparentRateofChange intheDirectionofSwing (°/h)**
15	3.9
30	7.5
45	10.6
60	13.0
75	14.5
90	15.0

5. The diagram below represents a swinging pendulum located in Earth's Northern Hemisphere. The pendulum knocked over two pegs during its first swing.



The diagram represents a top view of the same pegs. Circle the next *two* pegs that would fall as the pendulum appears to change its direction of swing in the Northern Hemisphere.

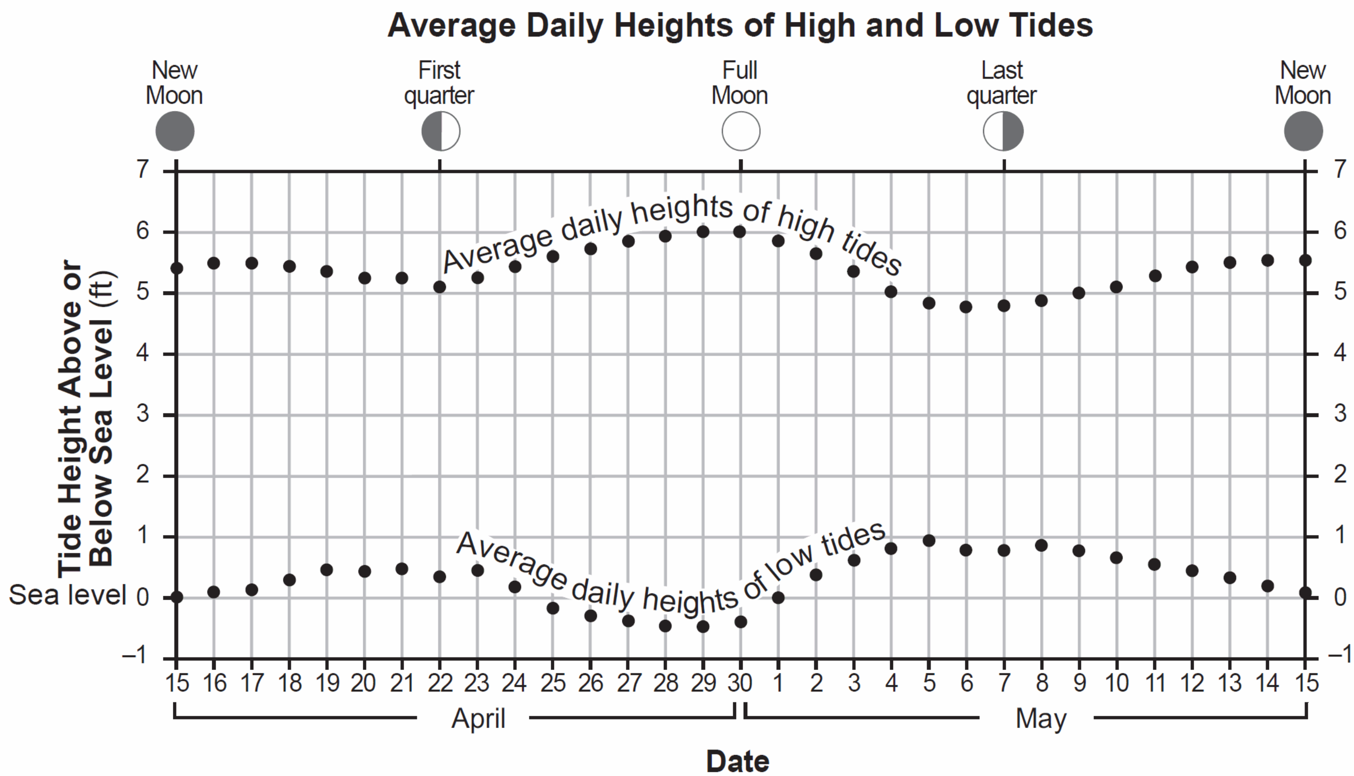


6. Identify *one* location on Earth where the apparent direction of a pendulum's swing would complete a 360° circular pattern in 24 hours.

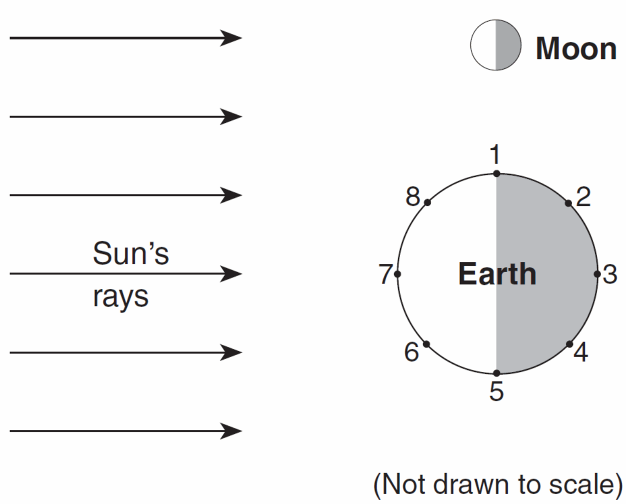
7. Based on the data table, state the approximate apparent rate of change in the direction of a pendulum's swing, in degrees per hour, at Riverhead, New York.

8. Based on the data table, state the relationship between latitude and the apparent rate of change in a Foucault pendulum's direction of swing.

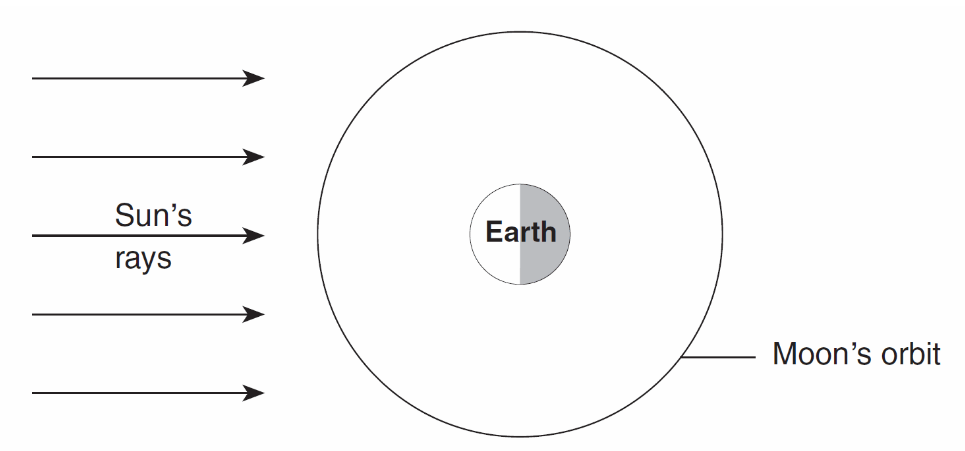
Base your answers to questions **9** and **10** on the graph below and on your knowledge of Earth science. The graph shows the average daily heights above or below sea level of high and low tides from April 15 to May 15, for a New York State location. Five Moon phases are indicated at the dates on which they occurred.



9. On the diagram,circle the *two* numbers on Earth's surface that best represent the locations of high tide when the Moon is in the position shown on the diagram.



10. On the diagram,place an **X** on the Moon's orbit to indicate the Moon's position on April 15.



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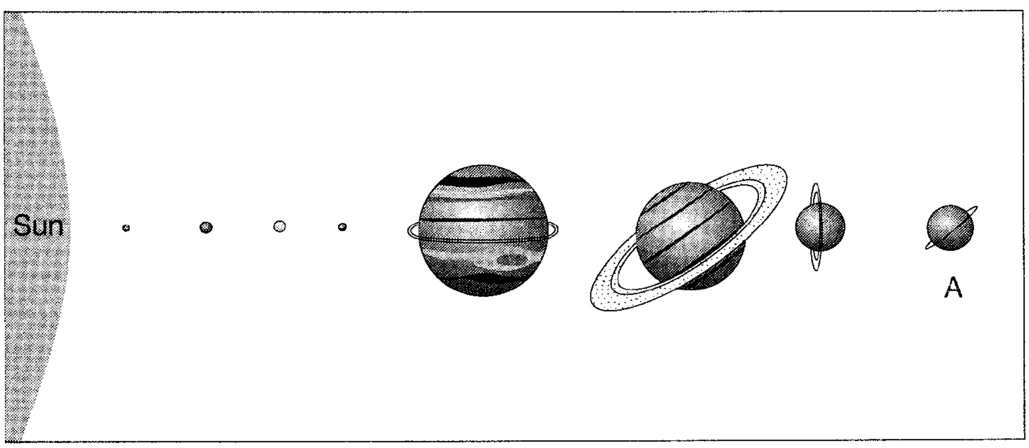
Base your answers to questions **11** through **13** on the side-view model of the solar system in your answer booklet and on your knowledge of Earth science. The planets are shown in their relative order of distance from the Sun. Letter *A indicates one of the planets.*



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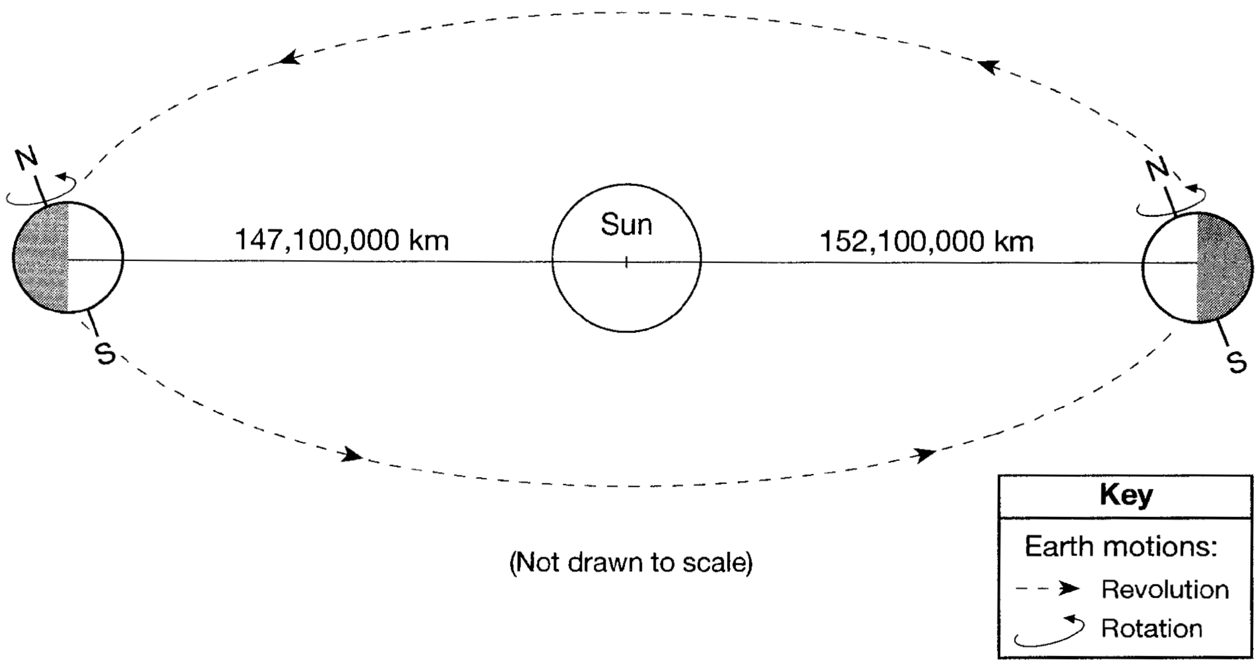
11. Identify the process that occurs within the Sun that converts mass into large amounts of energy.

12. How many million years ago did Earth and the solar system form?

13. The center of the asteroid belt is approximately 503 million kilometers from the Sun. Draw an **X** on the model between two planets to indicate the center of the asteroid belt.

Base your answers to questions **14** and **15** on the diagram in your answer booklet and on your knowledge of Earth science. The diagram represents a model of Earth's orbit around the Sun. Arrows represent two motions of Earth. Distances from the center of the Sun to the center of Earth are indicated in kilometers. Earth is represented when it is closest to the Sun and when it is farthest from the Sun.



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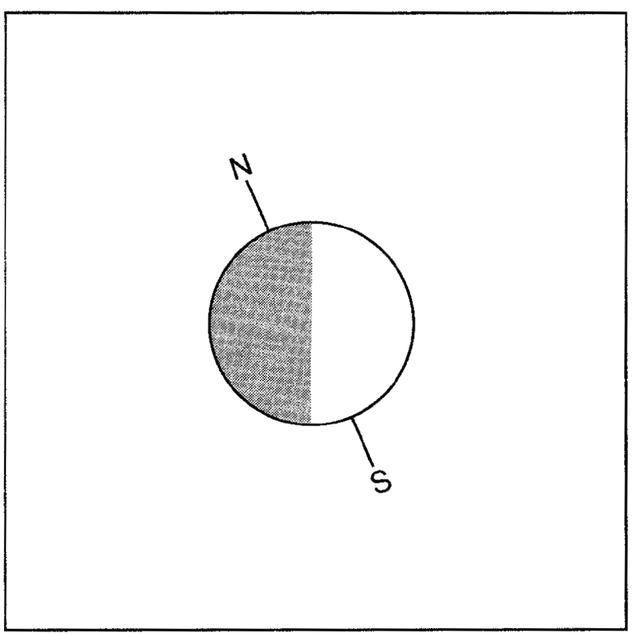
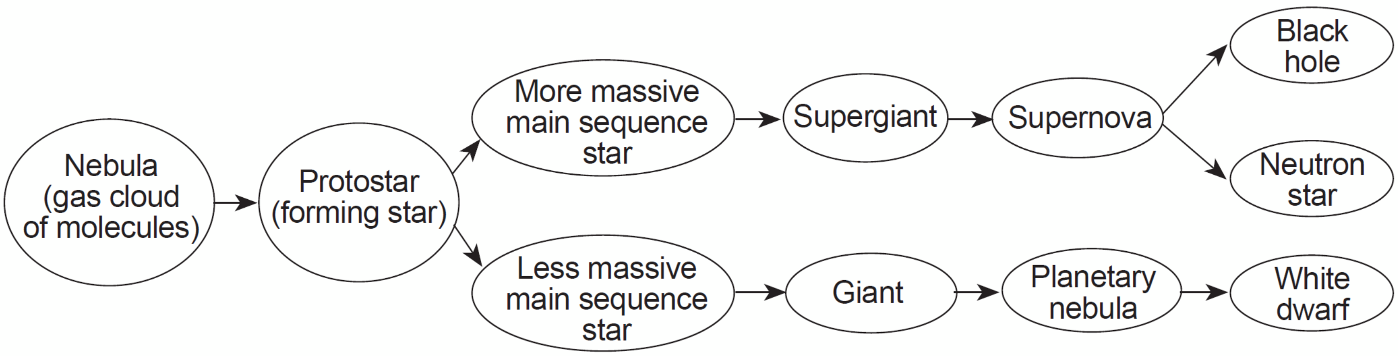
14. The diagram represents Earth at one position in its orbit around the Sun. Starting at the North Pole, draw a straight arrow that points to the location of *Polaris.*



15. How many degrees is Earth's axis tilted to a line perpendicular to the plane of Earth's orbit? ________

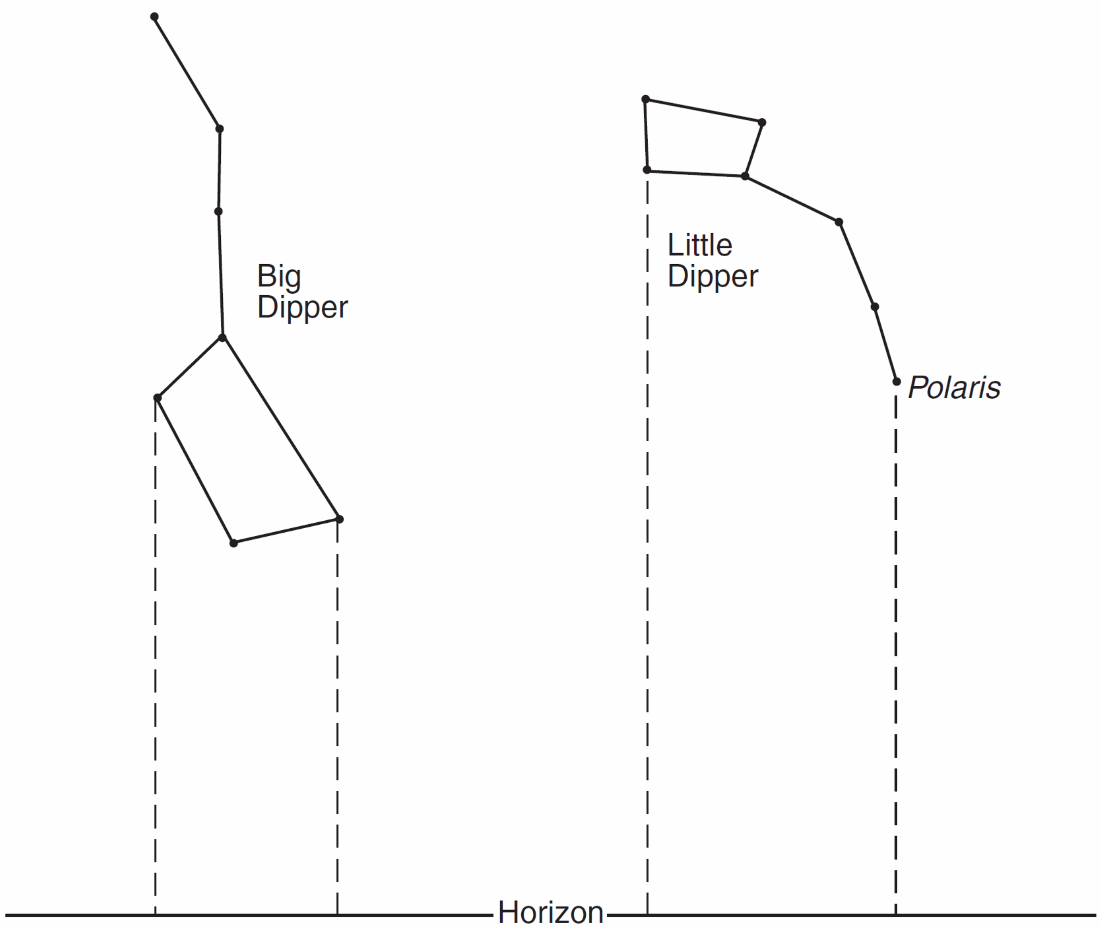
Base your answers to questions **16** and **17** on the flowchart below and on your knowledge of Earth science. The flowchart shows the evolution of stars.



16. Describe how the **diameter** and **luminosity** of a main sequence star change as the star becomes either a giant or a supergiant.

17. Identify the force responsible for the contraction of a nebula (a gas cloud of molecules) to form a protostar.

18. Base your answer to the following question on the diagram in below and on your knowledge of Earth science. The diagram represents the star patterns of the Big Dipper and the Little Dipper relative to Earth's horizon. Dashed vertical reference lines are shown for four of the stars. *Polaris* is labeled.



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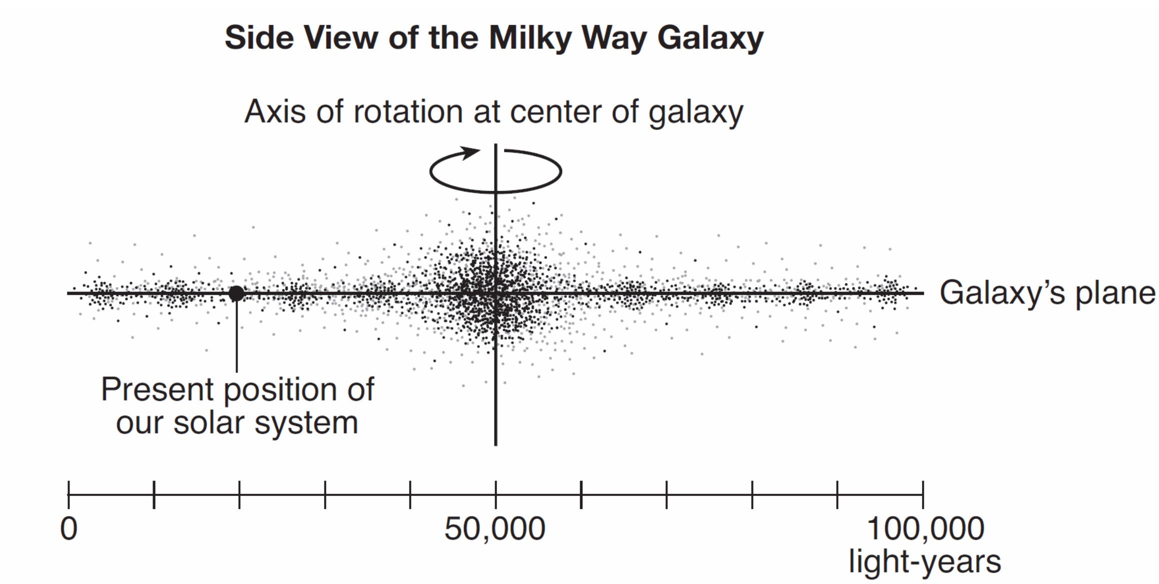
On the diagram, place an **X** at a point on the horizon line to indicate due north.

Base your answers to questions **19** through **21** on the diagram below and on your knowledge of Earth science. The diagram represents the present position of our solar system in a side view of the Milky Way Galaxy. The distance across the Milky Way Galaxy is measured in light-years.

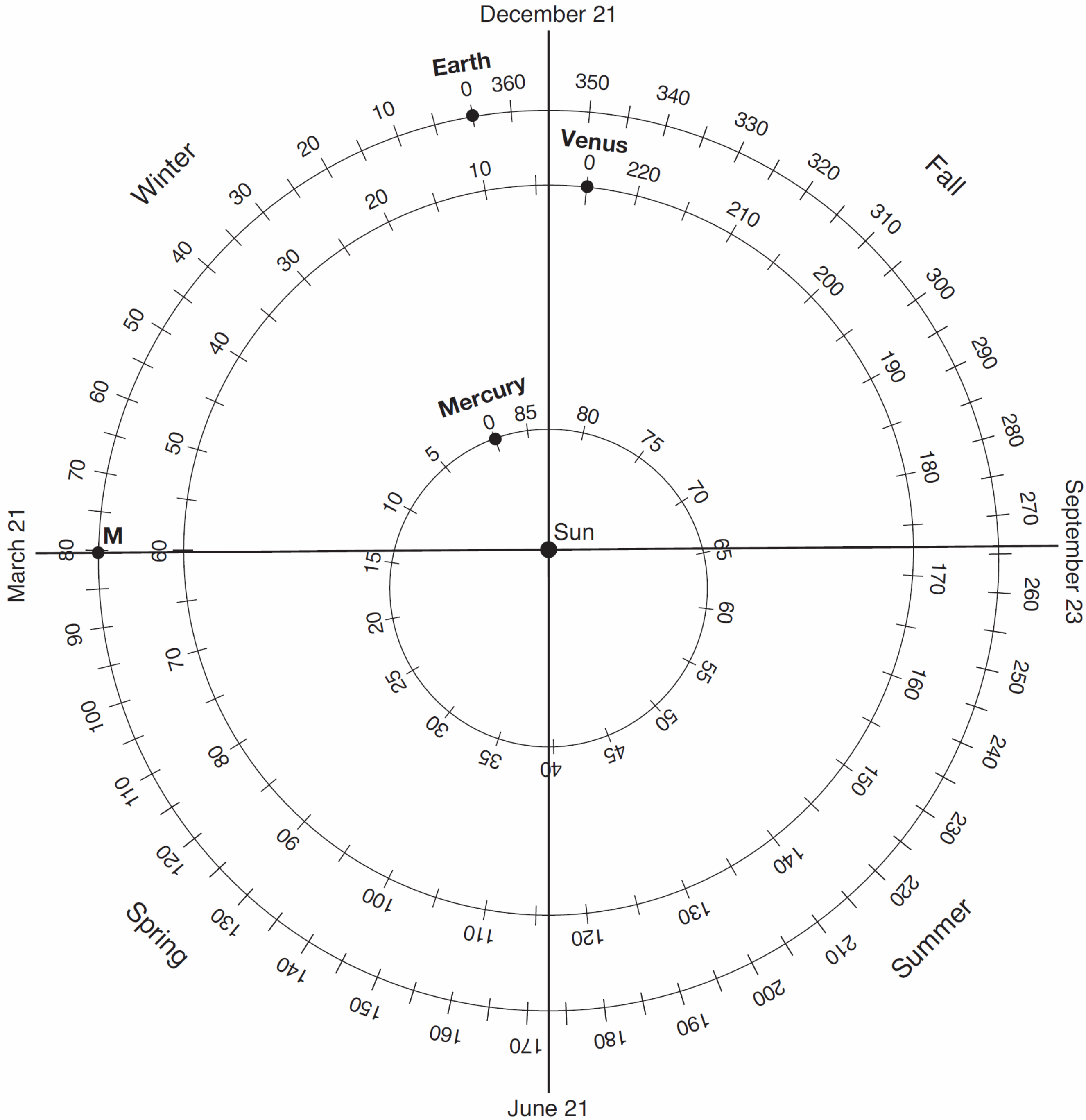


19. List the following astronomical features, in order of relative size, from smallest to largest.
    Sun
    Jupiter
    Milky Way Galaxy
    Universe
    Our solar system

20. Galaxies are classified based on their shape. What is the shape of the Milky Way Galaxy when viewed from directly above?

21. What is the distance, in light-years, from the center of the Milky Way Galaxy to our solar system?

Base your answers to questions **22** through **24** on
the diagram in your answer booklet and on your knowledge of Earth science. The diagram represents the orbits of Earth, Venus, and Mercury. Earth, Venus, and Mercury are shown with a dot on each of their orbital paths. The numbers on each orbital path indicate the planet's positions on successive days in its revolution. Point *M* is a position on Earth's orbit. Each season in the Northern Hemisphere on Earth is labeled.



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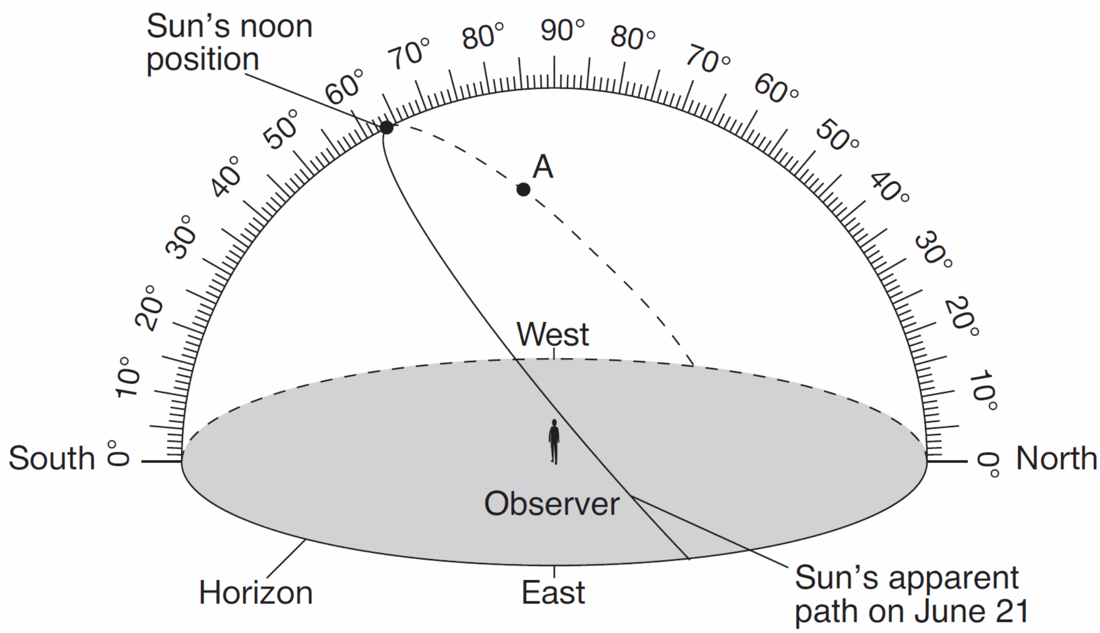
22. What latitude on Earth receives the vertical rays from the Sun when Earth is at position *M*?

23. Approximately how many revolutions does Mercury make around the Sun during one Earth year?

24. On the diagram place an **X** on each planet's orbital path to show the positions of Earth, Venus, and Mercury on the 55th day of *each planet's orbit.*

Base your answers to questions **25** through **27** on the diagram in your answer booklet and on your knowledge of Earth science. The diagram is a model of the sky (celestial sphere) for an observer at 50° N latitude. The Sun's apparent path on June 21 is shown. Point *A* is a position along the Sun's apparent path. Angular distances above the horizon are indicated.

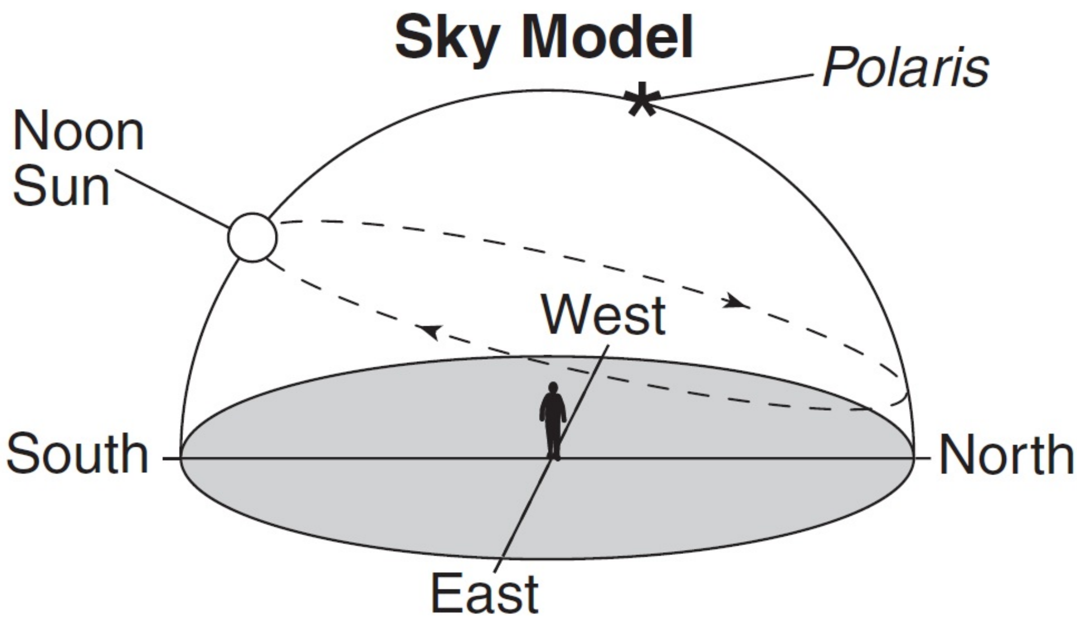


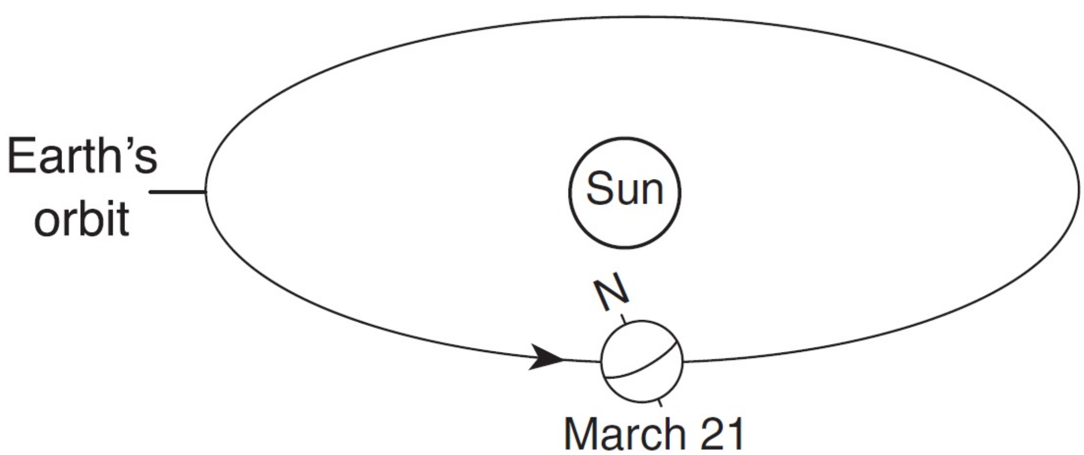
25. Describe the general relationship between the length of the Sun's apparent path and the duration of daylight.

26. The Sun travels 45° in its apparent path between the noon position and point *A*. Identify the time when the Sun is at point *A*. Include a.m. or p.m. with your answer.

27. On the celestial sphere diagram place an **X** on the Sun's apparent path on June 21 to show the Sun's position when the observer's shadow would be the longest.

Base your answers to questions **28** through **30** on
the sky model below and on your knowledge of Earth science. The model shows the Sun's apparent path through the sky as seen by an observer in the Northern Hemisphere on June 21.





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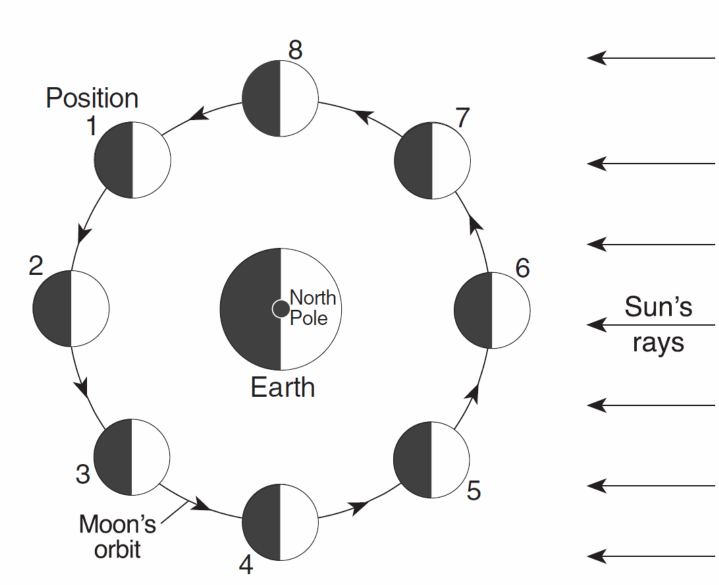
28. Identify the cause of the apparent daily motion of the Sun through the sky.

29. The diagram represents the position of Earth in its orbit on March 21. Place an **X on Earth's orbit to represent Earth's orbital position when the apparent path of the Sun in the sky model was observed.**

30. Describe the evidence, shown in the sky model, which indicates that the observer is *not* located at the North Pole.

Base your answers to questions **31** and **32** on
the diagram in your answer booklet, which represents eight positions of the Moon in its orbit around Earth.



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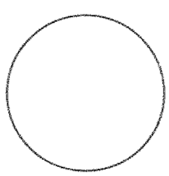
31. The table below shows times of ocean tides on March 4 for a city on the Atlantic coast of the United States.

Ocean Tides on March 4

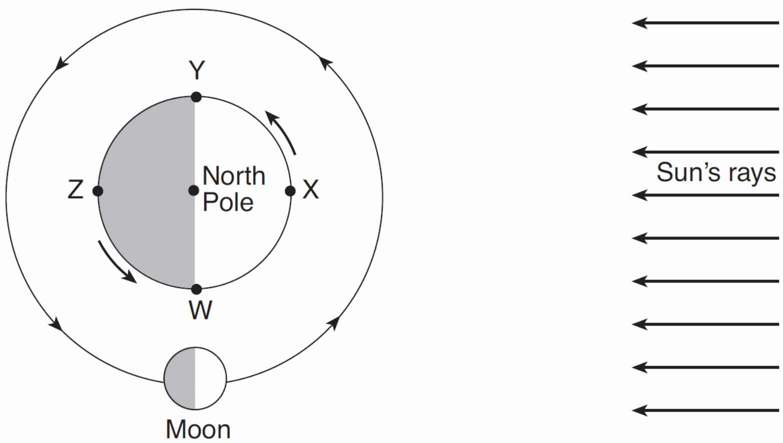
Tide	Time
high	12:00 a.m.
low	6:13 a.m.
high	12:26 p.m.

Determine the time when the next low tide occurred. Include a.m. or p.m. in your answer, if needed.

32. On the diagram, shade the portion of the Moon that is in darkness to show the phase of the Moon at position 3, as viewed from New York State.



Base your answers to questions **33** through **35** on the diagram below, which shows one position of the Moon in its orbit around Earth. Letters *W*, *X*, *Y*, and *Z* are locations on Earth's surface.



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33. Write "high" or "low" to indicate whether a high ocean tide or low ocean tide is occurring at locations *W*, *X*, *Y*, *Z*.

34. What is the solar time at location Y? Include a.m. or p.m. in your answer.

35. On the diagram of the Moon below, shade the part of the Moon that appears dark to an observer in New York State when the Moon is at the position shown in the diagram above.