

Chp 1-Review Questions. Predicting the Motions of the Stars, Sun, and Moon

1. What is the difference between a hypothesis and a theory?
2. How are scientific theories tested?
3. How are constellations useful to astronomers? How many stars are not part of any constellation?
4. A fellow student tells you that only those stars in Figure 1-3b that are connected by blue lines are part of the constellation Orion. How would you respond?
5. Why are different stars overhead at 10:00 p.m. on a given night than two hours later at midnight? Why are different stars overhead at midnight on June 1 than at midnight on December 1?
6. What is the celestial equator? How is it related to Earth's equator? How are the north and south celestial poles related to Earth's axis of rotation?
7. Where would you have to look to see your zenith?
8. How do the stars appear to move over the course of the night as seen from the north pole? As seen from the equator? Why are these two motions different?
9. Using a diagram, explain why the tilt of Earth's axis relative to Earth's orbit causes the seasons as we orbit the Sun.
10. Give two reasons why it is warmer in summer than in winter.
11. What are the March and September equinoxes? What are the northern and southern solstices? How are these four points related to the ecliptic and the celestial equator?
12. How does the daily path of the Sun across the sky change with the seasons? Why does it change?
13. Describe how the seasons would be different if Earth's axis of rotation, rather than having its present $23\frac{1}{2}^\circ$ tilt, were tilted (a) by 0° or (b) by 90° .
14. Explain the difference between sunlight and moonlight.
15. Explain why the Moon exhibits phases.
16. At approximately what time does the Moon rise when it is (a) a new moon; (b) a first quarter moon; (c) a full moon; and (d) a third quarter moon?
17. If you lived on the Moon, would you see Earth go through phases? If so, would the sequence of phases be the same as those of the Moon as seen from Earth, or would the sequence be reversed? Explain using Figure 1-21.
18. What is the difference between a sidereal month and a synodic month? Which is longer? Why?
19. What is the difference between the umbra and the penumbra of a shadow?
20. Why doesn't a lunar eclipse occur at every full moon and a solar eclipse at every new moon?
21. Which type of eclipse—lunar or solar—do you think more people on Earth have seen? Why?
22. How is an annular eclipse of the Sun different from a total eclipse of the Sun? What causes this difference?

Chp 1-Discussion Questions. Predicting the Motions of the Stars, Sun, and Moon

1. Scientists assume that "reality is rational." Discuss what this means and the thinking behind it.
2. All scientific knowledge is inherently provisional. Discuss whether this is a weakness or a strength of the scientific method.
3. Examine a list of the 88 constellations. Are there any constellations whose names obviously date from modern times? Where are these constellations located? Why do you suppose they do not have archaic names?
4. In William Shakespeare's *Julius Caesar* (act 3, scene 1), Caesar says:

*But I am constant as the northern star,
Of whose true-fix'd and resting quality
There is no fellow in the firmament.*

Translate Caesar's statement about the "northern star" into modern astronomical language. Is the northern star truly "constant"? Was the northern star the same in Shakespeare's time (1564–1616) as it is today?

Chp 1-Collaborative Group Exercises. Predicting the Motions of the Stars, Sun, and Moon

1. A scientific theory is fundamentally different from the everyday use of the word "theory." List and describe any three scientific theories of your choice and creatively imagine an additional three hypothetical theories that are not scientific. Briefly describe what is scientific and what is nonscientific about each of these theories.
2. Using a bright light source at the center of a darkened room or a flashlight, use your fist held at arm's length to demonstrate the difference between a full moon and a lunar eclipse. (Use yourself or a classmate as Earth.) How must your fist "orbit" Earth so that lunar eclipses do not happen at every full moon? Create a simple sketch to illustrate your answers.
3. Imagine you are planning a trip to see a solar eclipse in the future. Using Table 1-2 showing when and where solar eclipses are visible, which solar eclipse would you most want to go see and why?