

OpenStax Astronomy, Ch.2: WS Problems (Apr-2021)

Review Questions

1. From where on Earth could you observe all of the stars during the course of the year? What fraction of the sky can be seen from the North Pole?
2. Explain, according to both geocentric and heliocentric cosmologies, why we see retrograde motion of the planets.
3. What were four of Galileo's discoveries that were important to astronomy?
4. Explain the origin of the magnitude designation for determining the brightness of stars. Why does it seem to go backward, with smaller numbers indicating brighter stars?
5. Ursa Minor contains the pole star, Polaris, and the asterism known as the Little Dipper. From most locations in the Northern Hemisphere, all of the stars in Ursa Minor are circumpolar. Does that mean these stars are also above the horizon during the day? Explain.
6. How many degrees does the Sun move per day relative to the fixed stars? How many days does it take for the Sun to return to its original location relative to the fixed stars?
7. How many degrees does the Moon move per day relative to the fixed stars? How many days does it take for the Moon to return to its original location relative to the fixed stars?
8. Explain how the zodiacal constellations are different from the other constellations.
9. Is the ecliptic the same thing as the celestial equator? Explain.
10. What is an asterism? Can you name an example?
11. What are two ways in which Aristotle deduced that Earth is spherical?
12. How did Hipparchus discover the wobble of Earth's axis, known as precession?
13. Why did Ptolemy have to introduce multiple circles of motion for the planets instead of a single, simple circle to represent the planet's motion around the Sun?
14. What phases would Venus show if the geocentric model were correct?
15. What is a constellation as astronomers define it today? What does it mean when an astronomer says, "I saw a comet in Orion last night?"
16. Draw a picture that explains why Venus goes through phases the way the Moon does, according to the heliocentric cosmology. Does Jupiter also go through phases as seen from Earth? Why?
17. Show with a simple diagram how the lower parts of a ship disappear first as it sails away from you on a spherical Earth. Use the same diagram to show why lookouts on old sailing ships could see farther from the masthead than from the deck. Would there be any advantage to posting lookouts on the mast if Earth were flat? (Note that these nautical arguments for a spherical Earth were quite familiar to Columbus and other mariners of his time.)
18. Parallaxes of stars were not observed by ancient astronomers. How can this fact be reconciled with the heliocentric hypothesis?
19. Although the Copernican system was largely correct to place the Sun at the center of all planetary motion, the model still gave inaccurate predictions for planetary positions. Explain the flaw in the Copernican model that hindered its accuracy.

20. During a retrograde loop of Mars, would you expect Mars to be brighter than usual in the sky, about average in brightness, or fainter than usual in the sky? Explain.
21. The Great Pyramid of Giza was constructed nearly 5000 years ago. Within the pyramid, archaeologists discovered a shaft leading from the central chamber out of the pyramid, oriented for favorable viewing of the bright star Thuban. Thinking about Earth's precession, explain why Thuban might have been an important star to the ancient Egyptians.
22. Explain why more stars are circumpolar for observers at higher latitudes.
23. Suppose Eratosthenes had found that, in Alexandria, at noon on the first day of summer, the line to the Sun makes an angle 30° with the vertical. What, then, would he have found for Earth's circumference?