# Exercise A8: The Year and Seasons

Student name: _____ Class: _____ Date: _____

*Check the box with the correct answer.*

**Question 1:** The Earth is closer to the Sun on June 21 and further from the Sun on December 21.

- ☐ **a.** True
- ☐ **b.** False

**Question 2:** What is the approximate percentage change in the Earth-Sun distance between June 21 and December 21?

- ☐ **a.** 15 percent
- ☐ **b.** 7 percent
- ☐ **c.** 3 percent
- ☐ **d.** 25 percent

**Question 3:** Which of the following statements is correct?

- ☐ **a.** Earth's orbit is a perfect circle and is in the equatorial plane of the Earth.
- ☐ **b.** Earth's orbit is highly elliptical and its plane is highly inclined to the equatorial plane of the Earth.
- ☐ **c.** The Earth's orbit is slightly elliptical and its plane is inclined to the equatorial plane of the Earth.
- ☐ **d.** The Earth's orbit is slightly elliptical and its plane is coincident with the Earth's equatorial plane.

**Question 4:** Which of the following statements is correct on June 21?

- ☐ **a.** The Southern Hemisphere is tilted towards the Sun.
- ☐ **b.** The South Pole experiences 24 hours of sunshine.
- ☐ **c.** The equator is directly under the Sun.
- ☐ **d.** The Northern Hemisphere is tilted towards the Sun.

**Question 5:** Which of the following statements is correct on December 21?

☐ **a.** The North Pole experiences 24 hours of sunshine.

☐ **b.** The Northern Hemisphere is tilted towards the Sun.

☐ **c.** The South Pole experiences 24 hours of darkness.

☐ **d.** The Southern Hemisphere is tilted towards the Sun.

**Question 6:** Observe the tilt of the Earth's equator with respect to the orbital plane and the direction in which the Earth's rotation axis points in space as it orbits around the Sun. Which of the following statements is true?

☐ **a.** The Earth's tilt remains the same and the rotation axis maintains the same orientation.

☐ **b.** The Earth's tilt remains the same but the rotation axis changes orientation.

☐ **c.** Both the angle and orientation of Earth's rotation axis change.

☐ **d.** Earth's degree of tilt changes but the orientation of the axis remains the same.

**Question 7:** Which of the following statements is true based upon your observations of the Earth revolving around the Sun?

☐ **a.** The hemisphere tilted away from the Sun experiences summer and the hemisphere tilted towards the Sun experiences winter.

☐ **b.** The hemisphere tilted towards the Sun experiences summer; at this time the pole in this hemisphere experiences 24 hours of darkness.

☐ **c.** The hemisphere tilted away from the Sun experiences winter; during this time the pole in this hemisphere experiences 24 hours of sunshine.

☐ **d.** The hemisphere tilted towards the Sun experiences summer and the hemisphere tilted away from the Sun experiences winter.

**Question 8:** How long is the day in New York City (the time between sunrise and sunset) at this time of year and how high does the Sun get in the sky? ***Hint:*** *The Sun is highest in the sky when it crosses the meridian. The meridian is shown on the sky for convenience.*

☐ **a.** The day is about 15 hours long and the Sun reaches an altitude of 72 degrees.

☐ **b.** The day is about 8 hours long and the Sun reaches an altitude of 27 degrees.

☐ **c.** The day is about 18 hours long and the Sun reaches an altitude of 90 degrees.

☐ **d.** The day is about 12 hours long and the Sun reaches an altitude of 49 degrees.

**Question 9:** How many hours of daylight does New York City receive in December and how high does the Sun get in the sky at this time?

☐ **a.** The day is about 18 hours long and the Sun reaches an altitude of 90 degrees.

☐ **b.** The day is about 12 hours long and the Sun reaches an altitude of 49 degrees.

☐ **c.** The day is about 15 hours long and the Sun reaches an altitude of 72 degrees.

☐ **d.** The day is about 9 hours long and the Sun reaches an altitude of 26 degrees.

**Question 10:** Which of the following statements explains why we experience the annual cycle of seasons in the Northern Hemisphere?

☐ **a.** The Earth's distance from the Sun varies because of its elliptical orbit.

☐ **b.** The sole reason is that the tilt of Earth's rotational axis to its orbital plane changes the flux of sunlight hitting the Northern hemisphere throughout the year.

☐ **c.** The sole reason is that the tilt of Earth's rotational axis changes the number of hours of daylight per day through the year.

☐ **d.** The tilt of the Earth's rotational axis to its orbital plane changes both the intensity of sunlight and the number of hours of sunlight received per day.

**Question 11:** Which of the following statements is incorrect?

☐ **a.** The Sun is found on the celestial equator, as seen from Earth.

☐ **b.** The Northern and Southern Hemispheres receive equal amounts of sunlight.

☐ **c.** Daytime and nighttime hours are equal.

☐ **d.** At this time of the year, the Sun will reach its highest elevation in the sky for Northern Hemisphere sites.

**Question 12:** Which of the following answers about seasonal variations on Mars is correct?

- ☐ **a.** Mars has seasons because its orbit, like that of the Earth, is elliptical.
- ☐ **b.** Mars does not have seasons because it is too far from the Sun.
- ☐ **c.** Mars has seasons because its rotation axis is tilted with respect to the plane of its orbit.
- ☐ **d.** Mars does not have seasons, because its spin axis is perpendicular to its orbital plane.