

Name: _____ Date: _____

Stellar Systems and Solstice Secrets: 9th Grade Space Science

Go beyond basic orbits to analyze orbital harmonics and axial anomalies. Students synthesize gravitational physics to predict planetary behavior across the cosmos.

1. Milankovitch cycles describe long-term changes in Earth's orbit. Which specific parameter refers to the 'wobble' of Earth's axis that changes the timing of the seasons relative to perihelion?

- A. Obliquity
- B. Axial Precession
- C. Orbital Eccentricity
- D. Apsidal Precession

2. The _____ point refers to the specific location in an elliptical orbit where Earth is physically closest to the Sun, currently occurring in early January.

- A. Aphelion
- B. Equinox
- C. Perihelion
- D. Zenith

3. True or False: If Earth's axial tilt were to increase from 23.5 to 24.5 degrees, the Arctic Circle would shift further south toward the equator.

- A. True
- B. False

4. When modeling the Barycenter of the Earth-Moon system, why is the center of mass located approximately 1,700 kilometers below Earth's surface rather than in open space between them?

- A. The Moon's orbital velocity is too high to allow an external center.
- B. Earth's magnetic field pulls the center of gravity inward.
- C. The massive ratio of Earth's mass to the Moon's mass (approx. 81:1).
- D. The effect of the Sun's tidal pull cancels out the external barycenter.

5. A _____ tide occurs when the gravitational pull of the Sun and the Moon are at right angles to each other, resulting in the smallest tidal range.

- A. Spring
- B. Neap
- C. Proxigean
- D. Diurnal

6. If a student observes a Total Solar Eclipse, they must be standing within which specific part of the Moon's shadow?

- A. Penumbra

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- B. Antumbra
- C. Umbra
- D. Corona

7. True or False: The Sidereal Day, which measures Earth's rotation relative to distant stars, is exactly 4 minutes shorter than the standard Solar Day.

- A. True
- B. False

8. Which phenomenon provides direct evidence of Earth's rotation by demonstrating the change in the plane of oscillation of a high-mass bob over time?

- A. Stellar Parallax
- B. Foucault Pendulum
- C. Doppler Shift
- D. Keplerian Motion

9. The ____ is the point in the Moon's orbit where it is furthest from Earth, which often results in an annular rather than total solar eclipse.

- A. Perigee
- B. Apogee
- C. Nadir
- D. Ecliptic

10. True or False: The 'Analemma'—the figure-eight shape seen in time-lapse photos of the Sun—is caused solely by Earth's daily rotation on its axis.

- A. True
- B. False