

Name: _____ Date: _____

When the Heliocentric Model Hits the Fan: College Orbital Mechanics Quiz

Calculate orbital perturbations and analyze barycentric motion to understand why our celestial neighborhood isn't as stable as it looks in textbooks.

1. The Milankovitch cycle known as 'precession' involves a 26,000-year wobble of Earth's axis. Which star will serve as the North Star in approximately 12,000 years due to this shift?

- A. Polaris
- B. Vega
- C. Sirius
- D. Betelgeuse

2. The _____ is the common center of mass around which two or more bodies orbit, which for the Earth-Moon system lies about 1,700 km below Earth's surface.

- A. Aphelion
- B. Geocenter
- C. Barycenter
- D. Lagrange Point

3. True or False: The Earth is at its perihelion (closest approach to the Sun) during the Northern Hemisphere's winter month of January.

- A. True
- B. False

4. Which phenomenon provides direct physical evidence of Earth's rotation by demonstrating the change in the plane of a swinging weight over time?

- A. The Keeling Curve
- B. The Doppler Effect
- C. Foucault's Pendulum
- D. Stellar Parallax

5. A _____ day is the time it takes for Earth to rotate once relative to the distant stars, lasting approximately 23 hours and 56 minutes.

- A. Solar
- B. Sidereal
- C. Synodic
- D. Anomalistic

6. What is the primary cause of 'proxigean' spring tides, which result in exceptionally high water levels?

- A. Solar flares striking the ionosphere
- B. The Moon being at perigee during a New or Full Moon

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- C. The Earth being at aphelion during a Neap tide
- D. Underwater seismic activity near the equator

7. True or False: If the Earth's axial tilt (obliquity) were to decrease to 0 degrees, the planet would no longer experience distinct seasonal variations.

- A. True
- B. False

8. In the context of the Earth-Moon-Sun system, what occurs at the L1 Lagrange point?

- A. The Moon's shadow is permanently fixed
- B. Gravitational forces and centrifugal force reach equilibrium
- C. Earth's magnetic field is weakest
- D. Tidal forces from Jupiter cancel out Earth's gravity

9. The variation in Earth's orbital path from a nearly perfect circle to a more elliptical shape is known as _____, and it operates on a roughly 100,000-year cycle.

- A. Obliquity
- B. Inclination
- C. Eccentricity
- D. Retrograde

10. True or False: A total solar eclipse can be seen from the exact same geographic location on Earth approximately every 18 months.

- A. True
- B. False