Name: _____ **Date:** _____

Interstellar's Reality Check: 10th Grade Orbital Mechanics Quiz

Analyze complex gravitational interactions, tidal forces near event horizons, and the precession of Earth's axis beyond basic rotation cycles.

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1. Which phenomenon, caused by the gravitational torque of the Sun and Moon on Earth's equatorial bulge, accounts for the 26,000-year cycle in which the North Star changes?

A. Axial Precession
B. Milankovitch Eccentricity
C. Apsidal Precession
D. Nutation

2. The _____ limit refers to the minimum distance from a planet where a moon can orbit without being shredded by tidal forces.

A. Schwarzschild
B. Roche
C. Chandrasekhar
D. Kuiper

3. True or False: Earth reaches its perihelion (closest point to the Sun) during the Northern Hemisphere's winter, proving that distance from the Sun is not the primary driver of seasons.

A. True
B. False

4. During a Total Solar Eclipse, which specific layer of the solar atmosphere becomes visible once the Moon achieves complete occultation of the photosphere?

A. The Radiative Zone
B. The Convective Zone
C. The Corona
D. The Core

5. The _____ month, lasting approximately 27.3 days, measures the Moon's orbit relative to fixed stars, rather than its phases.

A. Synodic
B. Gregorian
C. Sidereal
D. Anomalistic

6. True or False: Proxigean spring tides occur when the Moon is at its furthest point (apogee) while aligned with the Sun and Earth.

A. True

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B. False

7. Synthesize the impact of the Earth's oblateness: How does the planet's rotation-induced 'bulge' affect the weight of an object at the Equator compared to the Poles?

A. The object weighs less at the Equator due to increased distance from the center and centrifugal force.
B. The object weighs more at the Equator because gravity is stronger where the Earth is wider.
C. The object weighs the same; mass and weight remain constant regardless of location.
D. The object weighs more at the Equator due to the higher concentration of atmospheric pressure.

8. Kepler's Second Law, the Law of Equal Areas, implies that Earth travels at its maximum orbital velocity during the _____, which occurs in January.

A. Aphelion
B. Equinox
C. Solstice
D. Perihelion

9. If Earth's axial tilt were to increase from 23.5° to 30°, what would be the impact on the Arctic Circle's geography and seasonal extremes?

A. The Arctic Circle would move toward the equator, causing more extreme seasonal variations.
B. The Arctic Circle would move toward the poles, reducing the area of perpetual night.
C. Seasons would disappear as the Earth became more vertically aligned.
D. The length of the tropical year would double due to increased drag.

10. True or False: A lunar eclipse can only occur when the Moon is in the 'New Moon' phase and passes through Earth's umbra.

A. True
B. False