

Name \_\_\_\_\_

## The Sun's Gravitational Dance: How it Shapes the Planets

### Short Answer Key

1. Kepler's Second Law states that planets move faster when closer to the Sun and slower when farther away. This means that as a planet orbits the Sun in an elliptical path, it covers equal areas in equal times, resulting in varying speeds in different parts of its orbit.
2. Earth's distance from the Sun, approximately 93 million miles (150 million kilometers), is ideal because it allows Earth to receive the right amount of sunlight and warmth. This distance maintains a stable climate, with temperatures suitable for liquid water and the survival of life forms.
3. The Sun's gravity assists in space exploration by influencing the trajectories of spacecraft. Spacecraft can use the gravitational pull of planets, like Earth or Jupiter, to alter their paths and gain speed or change direction, which helps conserve fuel and energy during long interplanetary journeys.
4. The Sun's gravity, along with the Moon's gravity, creates tides on Earth. The gravitational force of the Sun and the Moon causes the ocean waters to bulge, leading to high and low tides. The Moon's closer proximity results in stronger gravitational effects, primarily responsible for daily tidal variations, while the Sun's influence contributes to monthly and seasonal variations.
5. Gravitational interactions among celestial bodies, like Jupiter's influence on asteroids and comets, can redirect their orbits or cause collisions. This is significant for understanding the dynamics of our solar system and the potential hazards posed by space objects. Jupiter's massive presence acts as a gravitational shepherd, helping to protect the inner planets from potential impacts.

