Laboratory Exercises in Astronomy – The Moon’s Orbit

UNLIKE CENTRIC, SIMPLIFIED GEOMETRICAL MORPHEUS

Because the Moon's elliptical orbit is not perfectly circular, its distance from Earth varies, with the closest point of approach occurring on the perigee and the farthest point occurring on the apogee. This variation in distance affects the apparent size of the Moon as seen from Earth, with the Moon appearing larger during a perigee full moon (supermoon) and smaller during an apogee full moon (micromoon). This effect is also responsible for the tidal forces that affect both the Moon and the tides on Earth, leading to periodic changes in the ocean's tides.

The Moon's orbit is also influenced by the gravitational pull of other celestial bodies, particularly the Sun. This gravitational interaction causes the Moon to slowly move in its orbit, a process known as tidal acceleration. As a result, the Moon’s orbit is precessing, causing the lunar nodes (the points where the Moon's orbit crosses the ecliptic) to move over time. This precession is responsible for the phenomenon of the Moon and the Sun appearing in the same location in the sky, known as a synodic period, which is approximately 27.3 days.

The Moon's orbit is also influenced by the gravitational forces of other planets, particularly Earth's neighbors in the solar system. These forces can cause the Moon's orbit to become unstable and lead to significant changes in the Moon's orbit over time. However, these changes are so gradual that they are not observable on human timescales.

In summary, the Moon's elliptical orbit is a result of the gravitational forces acting on it, and its orbit is not perfectly circular. The variations in distance from Earth and the resulting changes in the Moon's size as seen from Earth are due to the Moon's changing distance from Earth. The Moon's orbit also precesses, causing the Moon and the Sun to appear in the same location in the sky at regular intervals. The Moon's orbit is also influenced by the gravitational forces of other planets, leading to gradual changes in the Moon's orbit over time.