

Assessment

Circular Motion and Gravitation**Section Quiz: Motion in Space**

Write the letter of the correct answer in the space provided.

- _____ 1. According to Copernicus, how do planets move?
- a. Planets move on small circles called epicycles while simultaneously orbiting Earth.
 - b. Planets move in circular orbits around Earth.
 - c. Planets move in circular orbits around the sun.
 - d. Planets move in elliptical orbits with the sun at one focus.
- _____ 2. Kepler's laws of planetary motion reconciled
- a. Ptolemaic theory with Copernican theory.
 - b. Ptolemaic theory with Copernicus' data.
 - c. Copernican theory with Newton's law of universal gravitation.
 - d. Copernican theory with Tycho Brahe's data.
- _____ 3. Which of the following correctly expresses Kepler's second law?
- a. Planets travel in elliptical orbits with the sun at one focus.
 - b. A planet sweeps out equal areas of its orbit in equal time intervals.
 - c. A planet's orbital period is proportional to the planet's distance from the sun.
 - d. A planet's orbital period is independent of the planet's mass.
- _____ 4. Which of the following correctly expresses Kepler's third law?
- a. $T \propto 1/r$
 - b. $T^2 \propto r^2$
 - c. $T^2 \propto r^3$
 - d. $T^3 \propto r^2$
- _____ 5. Newton's law of universal gravitation
- a. can be used to derive Kepler's third law of planetary motion.
 - b. can be derived from Kepler's laws of planetary motion.
 - c. can be used to disprove Kepler's laws of planetary motion.
 - d. does not apply to Kepler's laws of planetary motion.
- _____ 6. The speed of an object orbiting another object depends on
- a. only the mass of the orbiting object.
 - b. only the mass of the object being orbited.
 - c. the masses of each object and the distance between them.
 - d. the mass of the object being orbited and the distance between the objects.

Circular Motion and Gravitation *continued*

- _____ 7. How would the period of an object in a circular orbit change if the radius of the orbit doubled?
- The period would increase by a factor of 2.
 - The period would decrease by a factor of 4.
 - The period would increase by a factor of $2\sqrt{2}$.
 - The period would decrease by a factor of $2\sqrt{2}$.

- _____ 8. If you were to stand on a bathroom scale in an elevator that is accelerating downward, the bathroom scale would measure
- your weight.
 - your mass.
 - the force due to gravity between you and Earth.
 - the normal force between you and the scale.

9. Explain why an astronaut in orbit experiences apparent weightlessness.

10. A satellite with a mass of 2.5×10^3 kg orbits Earth at an altitude of 139 km. Calculate the orbital period and orbital speed of the satellite. ($m_E = 5.97 \times 10^{24}$ kg; $r_E = 6.38 \times 10^6$ m; $G = 6.673 \times 10^{-11}$ N•m²/kg²)