Extended Response

7.1 Kepler's Laws of Planetary Motion 35.

The orbit of Halley''s Comet has an eccentricity of 0.967 and stretches to the edge of the solar system.
Part A. Describe the shape of the comet's orbit.
Part B. Compare the distance traveled per day when it is near the sun to the distance traveled per day when it is at the edge of the solar system.
Part C. Describe variations in the comet's speed as it completes an orbit. Explain the variations in terms of Kepler's second law of planetary motion.

a. Part A. The orbit is circular, with the sun at the center. Part B. The comet travels much farther when it is near the sun than when it is at the edge of the solar system. Part C. The comet decelerates as it approaches the sun and accelerates as it leaves the sun.
b. Part A. The orbit is circular, with the sun at the center. Part B. The comet travels much farther when it is near the sun than when it is at the edge of the solar system. Part C. The comet accelerates as it approaches the sun and decelerates as it leaves the sun.
c. Part A. The orbit is very elongated, with the sun near one end. Part B. The comet travels much farther when it is near the sun than when it is at the edge of the solar system. Part C. The comet decelerates as it approaches the sun and accelerates as it moves away from the sun.

36.

For convenience, astronomers often use astronomical units (AU) to measure distances within the solar system. One AU equals the average distance from Earth to the sun. Halley's Comet returns once every 75.3 years. What is the average radius of the orbit of Halley's Comet in AU?

a. 0.002 AU
b. 0.056 AU
c. 17.8 AU
d. 653 AU

7.2 Newton's Law of Universal Gravitation and Einstein's Theory of General Relativity 37.

It took scientists a long time to arrive at the understanding of gravity as explained by Galileo and Newton. They were hindered by two ideas that seemed like common sense but were serious misconceptions. First was the fact that heavier things fall faster than light things. Second, it was believed impossible that forces could act at a distance. Explain why these ideas persisted and why they prevented advances.

a. Heavier things fall faster than light things if they have less surface area and greater mass density. In the Renaissance and before, forces that acted at a distance were considered impossible, so people were skeptical about scientific theories that invoked such forces.

b. Heavier things fall faster than light things because they have greater surface area and less mass density. In the Renaissance and before, forces that act at a distance were considered impossible, so people were skeptical about scientific theories that invoked such forces.
c. Heavier things fall faster than light things because they have less surface area and greater mass density. In the Renaissance and before, forces that act at a distance were considered impossible, so people were quick to accept scientific theories that invoked such forces.
d. Heavier things fall faster than light things because they have larger surface area and less mass density. In the Renaissance and before, forces that act at a distance were considered impossible because of people's faith in scientific theories.

38.

The masses of Earth and the moon are 5.97×10^{24} kg and 7.35×10^{22} kg, respectively. The distance from Earth to the moon is 3.80×10^{5} km. At what point between the Earth and the moon are the opposing gravitational forces equal? (Use subscripts e and m to represent Earth and moon.)

a. 3.42×10^{5} km from the center of Earth
b. 3.80×10^{5} km from the center of Earth
c. 3.42×10^{6} km from the center of Earth
d. 3.10×10^{7} km from the center of Earth