

HOMEWORK 2 SOLUTIONS

1. **A** Geocentric means "Earth-centered" meaning that the Earth is the center of the universe and everything revolves around it. If Earth was a planet revolving around the Sun then the Earth wouldn't be the center and thus that is not a geocentric model.

5. **C** Kepler inherited Tycho Brahe's data and used it to develop a more accurate model of the solar system. After finding an error of eight arcminutes when assuming circular orbits, he reworked his calculations and found the orbits to actually be elliptical.

11. **C** The force is one-fourth as much if the Earth is twice as far away because Newton's Law of Gravity is an inverse square law:

$$F = \frac{GMm}{(2d)^2} = \frac{GMm}{4d^2}$$

12. **B** Newton's theory describes most phenomena perfectly well, but in extreme cases (like near the Sun) the theory breaks down and is therefore incomplete. Einstein's theory only solved these problems and it may turn out that someday we will discover his theory to be incomplete as well.

21.

$$P^2 = a^3 \quad P = 557 \text{ years}$$

$$a = P^{2/3}$$

$$a = (557)^{2/3}$$

$$\mathbf{a=67.7 \text{ AU}}$$

EXTRA CREDIT

22. a.

$$P^2 = a^3 \quad P = 76.0 \text{ years}$$

$$a = P^{2/3}$$

$$a = (76.0)^{2/3}$$

$$\mathbf{a=18.0 \text{ AU}}$$

b. Halley's Comet spends most of its time near its aphelion distance because this is where its speed is the lowest (due to Kepler's Second Law).