# Laws of Planetary Motions Review
## ANSWERS AND EXPLANATIONS

1. (3) – Kepler's Law #1 states that all orbits are ellipses – not circles.

2. (4) – Mars is farthest from the Sun – it has a longer orbit and travels slower.

3. (1) – Midnight on Earth would be a point right in the middle of the dark side of the Earth. If you were standing on the Earth at midnight, you could see the Moon and Mars because they would be in your field of view. Polaris is always visible in the northern sky in New York. Mercury, Venus, and the Sun are on the other side of the Earth and cannot be seen.

4. (3) – eccentricity = d/L (use ruler on ESRT) e= 0.9cm/3.6cm = .250

5. (3) – By definition, our Solar System is heliocentric (sun-centered) and orbits are ellipses (Kepler).

6. (1) – A has a shorter orbit than B and therefore would take less time than B to revolve around the Sun.

7. (3) – Planet Q would be closest to the star at point C and will have the greatest velocity at that point (Kepler's Law #2).

8. (3) – eccentricity = d/L e= 60mm/90mm = .67

9. (1) – Earth's orbit has an eccentricity of .017 which is less eccentric (rounder than) planet Q's orbit (.67).

10. (2) – According to the diagram, planet Q is farthest from the star at point A and closest at point C. The graph should show the least gravitational attraction at A and the most gravitational attraction at C. Graph (2) illustrates this.

11. (3) – Kepler's Law #3 states that planets that are farther from the Sun have a longer period of revolution.

12. (3) – Read the graph – July has the smallest apparent diameter.

13. (3) – Read the graph again – As you proceed from June to September, the graph line goes down and then back up.

14. (2) – Apparent diameter is how big a celestial object looks based on how far away it is. If apparent diameter decreases (becomes smaller), the observer must be get farther away.

15. (4) – Since the orbit of the Earth is slightly elliptical, sometimes the Earth is a little closer to the Sun and sometimes it is a little father. This change in distance affects the apparent diameter of the Sun.

16. (1) – Either you just remember that we are closest to the Sun in wintertime and therefore orbital velocity would be highest, or once again you can use the information from the graph. The peak of the graph occurs in January indicating the largest apparent diameter of the Sun, and therefore Earth at its closest to the Sun. Then apply Kepler's Law #2 – the closer a planet is to the Sun, the faster it moves.

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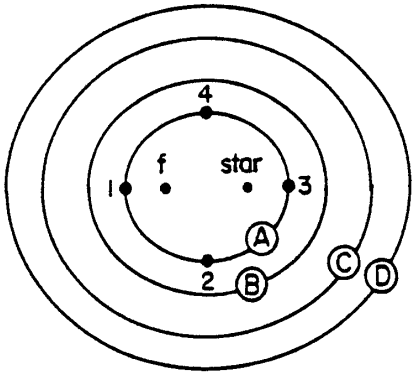
17. (3) is closer to the Sun - Kepler's 3rd Law states that the closer a planet is to the Sun, the shorter its period of revolution because the planet has a shorter orbit and travels faster. Solar System Data chart on page 15 of the E.S.R.T. reminds you that Mercury is closest to the Sun.

18. (4) it decreases – Perihelion is when the Earth is closest to the Sun and aphelion is when the Earth is farthest from the Sun. If the Earth was moving toward aphelion, the gravitational attraction between the Earth and Sun would decrease because of the larger distance between them (Newton's Law of Universal Gravitation).

19. (1) A, B, C, D – Kepler's 3rd Law states that the farther a planet is from the Sun, the longer its period of revolution. Look at the diagram: A has the shortest orbit, while D has the longest.



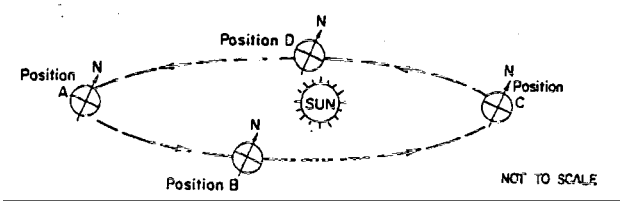
( DRAWN TO SCALE)

20. (1) A – Newton's Law of Universal Gravitation states that the closer objects are, the greater the gravitational attraction between them. Planet A is closest to the starand there fore would be attracted the most.

21. (3) – When Kepler's 2nd Law is translated, it says that a planet will have the greates orbital velocity when it is closest to the star. Position 3 is closest to the star.

22. (3) 0.50 – e = d/L – Use the E.S.R.T. to measure and you get 1.5 / 3 – e = .500

23. (2) increase – When Earth moves to position C it is getting closer to the Sun. (Position C represents perihelion – winter in then northern hemisphere). Kepler's 2nd Law says that a planet will have the greatest orbital velocity when it is closest to the star. So as the Earth gets closer to position C, its orbital velocity is greater.




24. (3) C – The angular or apparent diameter of an object is how big the object looks based on the observer's distance from that object. The closer something is, the greater its apparent diameter (it looks bigger). The Sun would look the largest when observed from the Earth at point C.

25. (4) Mars – Just look up the answer on the Solar System Data chart on page 15 of the E.S.R.T. Mars' orbital eccentricity is .093, which is higher than Jupiter's orbital eccentricity-.048.

26. (2) – Newton's Law of Universal Gravitation states that the closer objects are, the it also states that gravitational attraction is greater when the objects have more mass.