1. In Ptolemy's geocentric model, the planet's motion along its deferent is all that is needed to understand retrograde motion.
2. Copernicus believed the earth was the center of all celestial motion.
3. According to Copernicus, retrograde motion occurs at opposition for the outer planets.
4. Galileo's observations of the phases of Venus supported Ptolemy's epicycles.
5. Among Galileo's discoveries with his telescope were sunspots.
6. Kepler's third law relates the square of the planet's orbital period in years to the cube of its average distance from the Sun in astronomical units.
7. Kepler relied heavily on the telescopic observations of Galileo in developing his laws of planetary motion.
8. According to Kepler's Laws, the planets move in circular orbits.
9. A planet (or comet) will speed up as it approaches the Sun
10. According to Kepler's third law, if you know the planet's orbital period, you can find its average distance from the Sun.
11. Kepler's third law allows us to find the average distance to a planet from observing its period of rotation on its axis.
12. According to Newton's first law an object traveling in a circle does not have a force acting on it.
13. According to Newton's second law, if you double the force acting on a body, the acceleration will double.
14. Compared to when it was on the surface, a satellite in an orbit about 4 times the earth's radius will experience about 1/16 the force due to gravity.
15. According to Newton's third law, when the Voyager probes passed Jupiter in 1979, they exerted exactly the same force on Jupiter as the giant planet did on them.
16. In Ptolemy's geocentric model, retrograde motion occurs when the planet is closest to us, on the inside portion of the
    A) deferent.
    B) equant.
    C) ellipse.
    D) ecliptic.
    E) epicycle.
17. In Ptolemy's geocentric model, the normal eastward motion of the planets was along
    A) the equant.
    B) a deferent.
    C) an epicycle.
    D) a retrograde loop.
    E) an ellipse.
18. Copernicus' Heliocentric theory explains that
    A) All planets lie between the Sun and Earth.
    B) Venus retrogrades when she overtakes us at inferior conjunction.
    C) The Sun lies at one focus of an ellipse.
    D) Mars will retrograde when it reaches a certain position on its epicycle.
    E) Planetary orbits are elliptical in shape.
19. According to Copernicus, retrograde motion for Venus must occur around
    A) greatest elongation, when the planet is farthest from the Sun.
    B) quadrature, when the planet is 90 degrees away from the Sun.
    C) opposition, when the planet lies opposite the Sun in the sky.
    D) superior conjunction, when the planet is on the far side of the Sun.
    E) interior conjunction, when it passes between us and the Sun.
20. According to Copernicus, the retrograde motion for Mars must occur
    A) at opposition, when the earth overtakes Mars and passes between Mars and the Sun.
    B) at superior conjunction, when Mars lies on the far side of the Sun.
    C) at greatest elongation, when Mars can get up to 47 degrees from the Sun.
    D) at inferior conjunction, when Mars laps the earth and passes between us and the Sun.
    E) at quadrature, when Mars lies exactly 90 degrees east or west of the Sun.
21. A fatal flaw with Ptolemy's model is its inability to predict the observed phases of
    A) the Moon in its monthly cycle.
    B) Mercury and Venus.
    C) Mars and Jupiter.
    D) the Sun during an eclipse.
    E) Jupiter and Saturn.
22. Which of these was NOT a telescopic discovery of Galileo?
    A) the rings of Saturn
    B) sunspots and the rotation of the Sun
    C) the craters and mare of the Moon
    D) the phases of Venus
    E) the four largest moons of Jupiter

23. Which of these observations of Galileo refuted Ptolemy's epicycles?
    A) the visibility of many more stars with the telescope
    B) the complete cycle of Venus' phases
    C) the revolution of Jupiter's moons around it
    D) the craters on the Moon
    E) the rotation of sunspots across the sun's surface

24. Galileo found the rotation period of the Sun was approximately
    A) a day.
    B) a week.
    C) a month.
    D) a year.
    E) three months.

25. Tycho Brahe's contribution to Kelpler's Laws of Planetary Motion were
    A) his observations of Jupiter's moons.
    B) a mathematical explanation of epicycles.
    C) a precise lunar calendar.
    D) the correct explanation of lunar phases.
    E) his detailed and accurate observations of the planet's position.

26. Kepler's first law worked, where Copernicus' original heliocentric model failed, because Kepler described the orbits as
    A) being on equants instead of epicycles.
    B) complex, with epicycles to account for retrograde motions.
    C) much larger than Copernicus had envisioned.
    D) around the Sun, not the earth.
    E) elliptical, not circular.

27. When a planet's orbit takes it closest to the Sun, it's called
    A) aphelion
    B) crossing the ecliptic.
    C) perihelion
    D) vernal equinox
    E) None of these; a planet's distance from the Sun never changes.

28. A planet whose distance from the Sun is 3 A.U. would have an orbital period of how many Earth-years?

29. The force of gravity varies with the
    A) inverse square of the distance separating the two bodies.
    B) inverse of the distance separating the two bodies.
    C) product of the two masses.
    D) Both A and B are correct.
    E) Both A and C are correct.

30. A circular orbit would have an eccentricity of
    A) between 0.5 and 1.
    B) 0.
    C) between 0 and 0 .5.
    D) exactly 1.0.
    E) infinity.

31. How much stronger is the gravitational pull of the Sun on Earth, at 1 AU, than it is on Saturn at 10 AU?
    A) 5X
    B) 10X
    C) 25X
    D) 100X
    E) 250X

32. If the distance between two asteroids is doubled, the gravitational force they exert on each other will
    A) be four times greater.
    B) be half as great.
    C) also be doubled.
    D) will be 1/16 as great.
    E) be one fourth as great.