Astronomy 1143 Quiz 1 Review

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January 29, 2015

What is Science?

1. Explain the difference between astronomy and astrology.

    (a) Astrology: nonscience using zodiac sign to predict the future/personality traits.

    (b) Astronomy: scientific study of planets, stars, galaxies, and the universe.

2. What number is the metric system based around? What are some of the more widely-used prefixes?

    (a) 10

    (b) milli-: 1/1000th, centi-: 1/100th, kilo-: 1000

3. What special attribute of certain constellations puts them in the zodiac?

    (a) They lie in the plane of the Sun's orbit around the Earth (the ecliptic plane).

Observational Astronomy: The Night Sky

1. What is the ecliptic plane?

    (a) The plane of the Sun's orbit projected on the sky. Since all the planets have low inclination, it is also where they lie, as well as the zodiac.

2. Why is the ecliptic tilted with respect to the celestial equator? How big is this tilt in degrees?

    (a) Because the Earth's rotation is tilted with respect to its revolution around the Sun.

    (b) 23.5 degrees.

3. Where does the ecliptic plane intersect the celestial equator?

    (a) The Vernal Equinox (0 degrees right ascension, 0 degrees declination)

4. What are the primary coordinates for finding a place on Earth? How about the celestial sphere?

    (a) Earth: longitude and latitude.

    (b) Celestial sphere: right ascension and declination.

5. In what constellation would you find Polaris?

    (a) Ursa Minor.

6. What is the angular size of an object? What is it for the Moon?

    (a) It is the angle subtended in your field of view by the object.

    (b) The moon is about 30' in the sky.

7. How big is an arcminute? An arcsecond?

    (a) 1' = 1/60th of a degree.

    (b) 1" = 1/60th of an arcminute = 1/3600th of a degree.

8. What is stellar parallax? Why is it useful?

    (a) Stellar parallax is the apparent change in position of stars brought about by the motion of the Earth around the Sun.

    (b) It can be used to determine the absolute distance to stars.

9. Why couldn't the Greeks see parallax?

    (a) Even for the nearest star, the parallax is far too small to see with the naked eye.

10. What is a parsec? How many light years are in a parsec?

    (a) A parsec is the distance an object must have from Earth to have a parallax of 1" = 1 arcsecond.

    (b) 1 pc = 3.26 ly

The Heliocentric Model

1. In simple terms, what are the geocentric and heliocentric models?

    (a) Geocentric: the planets and Sun all orbit around the Earth.

    (b) Heliocentric: the planets, Earth included, all orbit around the Sun.

2. Who was the first major proponent of the heliocentric model? What were the key facets of his model?

    (a) Copernicus.

    (b) His model had a central Sun with the planets orbiting it. It also included epicycles, like Ptolemys geocentric model, to preserve circular motion.

3. Explain the main observational problem that Mars presented for the Geocentric and early Heliocentric models.

    (a) Retrograde motion: Mars would abruptly change its direction of motion on the sky and then flip back periodically.

4. What did Ptolemy add to the geocentric model explain this problem?

    (a) By adding epicycles, i.e. circular orbits within circular orbits, to the planets' motion around the Earth.

5. Who correctly solved this problem? How? Using whose data?

    (a) Johannes Kepler solved this by incorporating elliptical orbits rather than perfectly circular ones, compiled from Tycho Brahe's data.

6. Which of Galileo's observations supported the heliocentric model?

    (a) Phases of Venus.

    (b) Satellites of Jupiter (something else in the solar system has objects orbiting it besides the Earth).

7. Define: superior planet, inferior planet, conjunction, opposition, quadrature, perihelion, aphelion, and eccentricity.

   (a) Superior planet: one whose orbit around the Sun is outside that of the Earth's.

   (b) Inferior planet: one whose orbit around the Sun is internal to that of Earth's.

   (c) Conjunction: occurs when the Sun is directly between the Earth and a superior planet, an inferior planet is between the Earth and the Sun (inferior conjunction) or the Sun is between an inferior planet and the Earth (superior conjunction).

   (d) Opposition: occurs when the Earth is directly between the Sun and a superior planet.

   (e) Quadrature: occurs when the Sun and a superior planet are 90 degrees apart.

   (f) Perihelion: the closest a body comes to the Sun in its orbit.

   (g) Aphelion: the farthest a body gets from the Sun in its orbit.

   (h) Eccentricity: a measure of how much a 1 sided object deviates from being a perfect circle. Is 0 for a circle, 1 for a straight line, and determined by the ratio of semiminor to semimajor axis.

8. Venus is on the opposite side of the Sun compared to the Earth. What is the name for this configuration of an inferior planet?

   (a) Superior conjunction.

9. What is a synodic period of a planet? Sidereal period?

   (a) Synodic period: time it takes for a planet to return to the same spot on the night sky. Similar to "solar day".

   (b) Sidereal period: time it takes for a planet to return to the same spot in its orbit around the Sun with respect to a fixed observer (the stars).

10. Are planetary orbits perfectly circular as proposed by Copernicus?

    (a) No, they are on elliptical orbits.

11. Explain Kepler's 3 Laws.

    (a) 1st Law: All the planets are on elliptical orbits, with the Sun at one of the focii.

    (b) 2nd Law: In their orbits around the Sun, every planet sweeps out equal area in equal time.

    (c) 3rd Law: The square of the period of any orbit is proportional to the semimajor axis of said orbit to the third power.

12. What is the proportionality between period and semimajor axis in Kepler's 3rd Law?

    (a) Period squared is proportional to the semimajor axis cubed.