

Name:

**Directions:** Listed below are twenty (20) multiple-choice questions based on the material covered by the lectures this past week. Choose the correct response from those listed, **along with at least a one (1) sentence justification for your answer**. In the case of a question involving math, the calculation can serve as your justification. Each question is worth 5 points: 2 for the letter response and 3 for the justification. Collaboration with your peers is permitted, but all justifications must be in your own words. If you are unsure about a question, make an educated guess, and justify your guess (which can include why you can rule out certain choices from the list). If you get stuck, **please seek assistance from your peers, the TA, or the professor**. Note: It may be helpful to place your answers on a separate sheet of paper and staple it to this assignment sheet.

**WARNING:** Please **DO NOT** copy material word for word from sources such as textbooks, a peer's notes, online references (i.e. Google or Wikipedia), etc in any responses to homework, quiz, or exam questions. Ideas should be expressed in your own words. Not only does this protect you from illegal acts of plagiarism and/or accusations of cheating, but it also aids your future studying by having ideas expressed in a way that you, personally, can best understand. If for some reason you **MUST** quote text from a source in your answer, properly reference your quote.

1. The motions of the planets against the background stars in our sky can best be described as
  - A) regular and uniform eastward motion.
  - B) general eastward motion interrupted by occasional stationary periods when planets do not appear to move with respect to the stars.
  - C) regular patterns, with general eastward motion interrupted by periods of westward motion.
  - D) regular patterns, with general westward motion interrupted by periods of eastward motion.
2. The purpose of describing planetary orbits in terms of epicycles and deferents was to account for the
  - A) generally eastward motion of a planet compared to background stars while the whole sky appeared to move westward.
  - B) variation of brightness of a planet with time.
  - C) difference between the sidereal period and the synodic period of a planet.
  - D) pattern of direct and retrograde motion of a planet as it moved slowly against the background of stars.
3. One unsatisfactory feature of the Ptolemaic description of the planetary system, particularly from a philosophical point of view was
  - A) that it needed continuous updating of the parameters of epicycle and deferent sizes and speeds to match planetary motions over time periods of more than one or two decades.
  - B) the fact that, although it described planetary motions in general, it could not be used for prediction of future planetary positions.
  - C) the requirement of many unrelated parameters, such as epicycle and deferent sizes and speeds, with no unifying rules.
  - D) the fact that it placed Earth at the center of the system, whereas Greek philosophers were convinced that the Sun was at the center.

4. The occasional retrograde motion of Mars against the background stars is the result of the
  - A) observation of a moving Mars from Earth, whose orbital motion is faster than that of Mars.
  - B) observation of a rapidly moving Mars from a more slowly moving Earth.
  - C) variable speed of Mars because its orbit is elliptical.
  - D) observation of Mars from the rapidly rotating Earth.
  
5. Venus can occasionally pass in front of the Sun. It can only do so when it is at
  - A) greatest or maximum elongation.
  - B) opposition.
  - C) inferior conjunction.
  - D) superior conjunction.
  
6. A planet appears exactly half-lit (looking like the first- or last-quarter moon) when it is
  - A) in retrograde motion.
  - B) at inferior conjunction.
  - C) at greatest elongation.
  - D) at opposition.
  
7. When observed at greatest eastern elongation (see Fig. 4-6, Freedman and Kaufmann, *Universe*, 7th ed.), Venus is about  $45^\circ$  from the Sun. How long after sunset does Venus set on the western horizon?
  - A) about 3 hours
  - B) It does not set at this specific time in its orbit.
  - C) 1 hour
  - D) about 10 minutes
  
8. A spacecraft that has been put into a circular orbit around the Sun (in the same plane as Earth's orbit) with a sidereal period of 2.25 years is unobservable behind the Sun once every
  - A) 3.85 years.
  - B) 2.25 years.
  - C) 1.80 years.
  - D) 1.00 years.
  
9. The reason why Copernicus' heliocentric theory soon came to be regarded as preferable to the geocentric theory of Ptolemy is that the heliocentric theory
  - A) accounted for the same observed motions of the planets as the geocentric theory but did so much more accurately.
  - B) used complex constructions called epicycles and deferents to account for the observed motions of the planets and so was considered more reliable than the geocentric theory.
  - C) accounted for the same observed motions of the planets as the geocentric theory but did so in a much simpler way.
  - D) accounted for retrograde motion, which the geocentric theory was unable to explain.
  
10. Mars moves in an elliptical orbit around the Sun. The location of the Sun relative to this ellipse is at
  - A) the focus that is closer to the point where Mars is moving the slowest.
  - B) one end of the major axis of the ellipse.
  - C) the exact center of the ellipse.
  - D) the focus that is closer to the point where Mars moves the fastest.

11. The eccentricity of a planet's orbit describes
- A) its tilt with respect to the plane of Earth's orbit (the ecliptic plane).
  - B) its shape compared to that of a circle.
  - C) its motion at any specific point in its orbit as seen from Earth, i.e., whether direct, retrograde or stationary.
  - D) the tilt of the planet's spin axis with respect to its orbital plane.
12. In any one day, the line joining a planet to the Sun will sweep through a certain angle as seen from the Sun. At what position is the planet when this angle has its smallest value?
- A) perihelion
  - B) greatest elongation
  - C) inferior conjunction
  - D) aphelion
13. Which of the following statements is true, according to Kepler's third law?
- A) The smaller the orbit, the longer it takes for the planet to complete one revolution.
  - B) The smaller the radius of a planet, the more rapidly it rotates on its axis.
  - C) The larger the orbit, the longer it takes for the planet to complete one revolution.
  - D) The time to complete one revolution of its orbit depends on the size or radius of the planet.
14. Kepler's third law in general applies
- A) accurately only close to the Sun, and becomes less accurate with increasing distance from the Sun.
  - B) only to planets orbiting the Sun.
  - C) to all situations where two objects orbit each other solely under the influence of their mutual gravitational attraction.
  - D) only to situations similar to planets orbiting the Sun, where the mass of the orbiting body is small compared to the mass of the object being orbited.
15. If a new planet were to be discovered with a sidereal period of 200 years, what would be the radius of its orbit (assumed to be circular)?
- A) 2828 AU
  - B) 34.2 AU
  - C) 200 AU
  - D) 342 AU
16. Suppose an asteroid is discovered in an elliptical orbit with a period of exactly one year and at perihelion it is 0.5 AU from the Sun. Using Kepler's third law, how far from the Sun is this asteroid when at aphelion? (Drawing a diagram of the orbit, including the Sun, will help.)
- A) 1.0 AU
  - B) 1.5 AU
  - C) 2.5 AU
  - D) 2.0 AU
17. Halley's Comet returns to the Sun's vicinity every 76 years in an elliptical orbit. (See Fig. 4-22, Freedman and Kaufmann, *Universe*, 7th ed.) What is the semimajor axis of this orbit?
- A) 17.5 AU
  - B) 0.59 AU
  - C) 1 AU
  - D) 50.000 AU

18. Consider a comet in a long, thin elliptical orbit with a semi-major axis of one AU. What can you say about the sidereal period of this comet?
- A) It will be less than one year.
  - B) It will be one year.
  - C) It will be more than one year.
  - D) It is not possible to determine the comet's sidereal period without knowing the eccentricity of its orbit.
19. An object orbiting the Sun in a circle can be said to be
- A) always accelerating.
  - B) moving under the action of equal and opposite forces.
  - C) Weightless.
  - D) moving at a constant velocity.
20. On the Moon, where gravity is  $1/6$  of that on Earth, which of the following activities would an astronaut not find easier to carry out?
- A) long jumping
  - B) running
  - C) slowing down and stopping
  - D) high jumping

**Answer Key**

1. C
2. D
3. C
4. A
5. C
6. C
7. A
8. C
9. C
10. D
11. B
12. D
13. C
14. C
15. B
16. B
17. A
18. B
19. A
20. C