EXAM #2 (practice)
ASTR 1101-001 Spring 2008
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1. In Ptolemy's geocentric model of the universe, which of the following astronomical objects were placed in an orbit around the Earth?
   A. The Moon
   B. The Sun
   C. The planet, Venus
   D. The planet, Jupiter
   E. All of the above
   F. None of the above

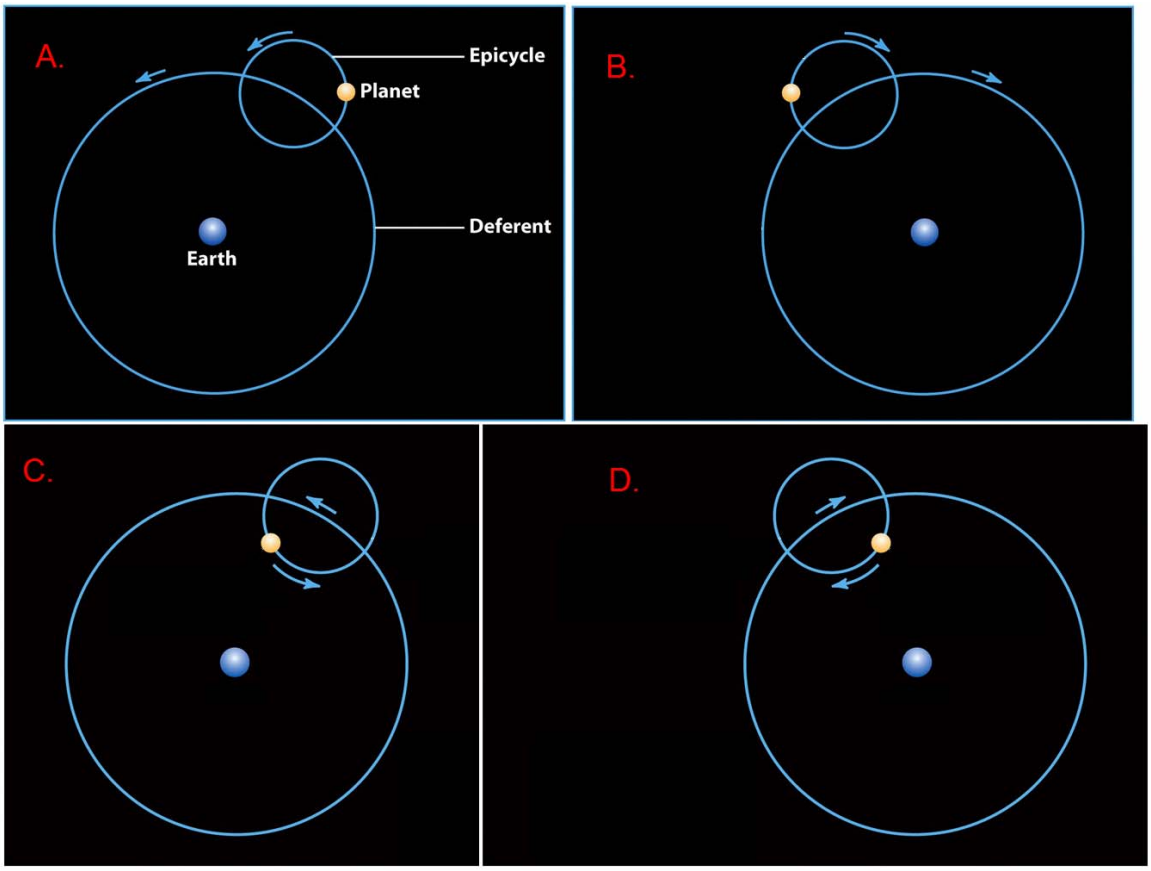
2. In Copernicus's heliocentric model of the universe, which of the following astronomical objects was placed in an orbit around the Earth?
   A. The Moon
   B. The Sun
   C. Venus
   D. Jupiter
   E. All of the above
   F. None of the above

3. In his geocentric model, Ptolemy included 'epicycles' and the concept of 'epicyclic motion' of the planets principally to explain why …
   A. the angular separation between Venus and the Sun is never very large
   B. the Sun rises in the east and sets in the west every day
   C. the planets Mars, Jupiter, and Saturn occasionally exhibit retrograde motion across the sky
   D. Venus exhibits a variety of phases, like our Moon

4. In his heliocentric model, Copernicus included 'epicycles' and the concept of 'epicyclic motion' of the planets principally to explain why …
   A. the angular separation between Venus and the Sun is never very large
   B. the planets do not move at a constant speed around their individual orbits
   C. the planets Mars, Jupiter, and Saturn occasionally exhibit retrograde motion across the sky
   D. Venus exhibits a variety of phases, like our Moon

5. In Ptolemy's geocentric model, how long does it take the stars (that are fixed on the celestial sphere) to complete one "orbit" around the Earth?
   A. one year
   B. 24 hours
   C. 4 minutes less than 24 hours
   D. 4 minutes more than 24 hours
   E. one month
   F. the stars do not orbit the Earth in Ptolemy's geocentric model

Figure 1



6. Which frame of **Figure 1** properly illustrates a planet that is exhibiting retrograde motion in Ptolemy's geocentric model? [**Circle all that apply**!]
   A. Frame 'A'
   B. Frame 'B'
   C. Frame 'C'
   D. Frame 'D'

7. In Ptolemy's geocentric model, how long does it take the sun to complete one "orbit" around the Earth?
   A. one year
   B. 24 hours
   C. 4 minutes less than 24 hours
   D. 4 minutes more than 24 hours
   E. one month
   F. the sun does not orbit the Earth in Ptolemy's geocentric model

8. In Copernicus's heliocentric model, how long does it take the stars (that are fixed on the celestial sphere) to complete one "orbit" around the Earth?
   A. one year
   B. 24 hours
   C. 4 minutes less than 24 hours
   D. 4 minutes more than 24 hours
   E. one month
   F. the stars do not orbit the Earth in Copernicus's heliocentric model

9. How does Copernicus's heliocentric model explain the fact that the planet Venus never wanders very far (in angular separation) from the Sun?
   A. The deferent of Venus's orbit revolves about the Earth at the same rate as the Sun
   B. Venus orbits the Sun, but in an orbit whose size is smaller than the Earth's orbit
   C. Venus orbits the Sun, but in an orbit whose size is larger than the Earth's orbit
   D. Venus has no natural satellites

10. Which new observation made by Galileo (with the aid of a telescope) provided strong support for Copernicus's heliocentric model of planetary motion?
   A. Galileo saw sunspots on the Sun
   B. Galileo saw mountains and craters on the Moon
   C. Galileo noticed that the planet Saturn has rings
   D. Galileo noticed that Venus exhibits phases like those of our Moon
   E. Galileo discovered a new planet that was closer to the Sun than Mercury

11. Which of the following was <u>not</u> a new observation made by Galileo (with the aid of a telescope)?
   A. Galileo saw sunspots on the Sun
   B. Galileo saw mountains and craters on the Moon
   C. Galileo noticed that the planet Saturn has rings
   D. Galileo noticed that Venus exhibits phases like those of our Moon
   E. Galileo discovered a new planet that was closer to the Sun than Mercury

12. Suppose that, on June 1 of 2008, you observe a planet rising in the east at sunset, then you observe this same Sun-Earth-planet alignment 13 months later, on July 1 of 2009. What is the <u>synodic period</u> of this planet's orbit?
   A. 13 months
   B. 1 year
   C. 13 years
   D. 5 years
   E. None of the above. (Explain!)

13. Suppose that, on June 1 of 2008, you observe a planet rising in the east at sunset, then you observe this same Sun-Earth-planet alignment 13 months later, on July 1 of 2009. What is the sidereal period of this planet's orbit?
    A. 13 months
    B. 1 year
    C. 13 years
    D. 5 years
    E. None of the above. (Explain!)

14. How many years pass between identical linear alignments of two planets and the Sun if the sidereal orbital periods of the two planets are 5 years and 10 years?
    A. 1 year
    B. 5 years
    C. 10 years
    D. 50 years
    E. None of the above. (Explain!)

15. Suppose a new planet is discovered orbiting the Sun and its measured synodic orbital period is 1.143 years. What is the semi-major axis of this new planet's orbit?
    A. 1.143 AU
    B. 2 AU
    C. 3 AU
    D. 4 AU
    E. None of the above. (Explain!)

16. Suppose the time that it takes you to drive a distance d = 280 miles is t = 4 hours. What is your average speed of travel?
    A. 50 mph
    B. 60 mph
    C. 63 mph
    D. 70 mph
    E. None of the above. (Explain!)

17. Suppose you drive along a road that marks the outer edge of a circular field of sugarcane. If the sugarcane field has a radius r = 1 mile and it takes you t = 6 minutes to drive all the way around the field, what is your average speed of travel?
    A. 10 mph
    B. 38 mph
    C. 63 mph
    D. 100 mph
    E. None of the above. (Explain!)

18. If a planet that moves along a circular orbit whose radius is r = 1 AU takes 1 year to complete an orbit, what is that planet's average speed?
    A. 30,000 m/s
    B. 67,000 mph
    C. 30 km/s
    D. All of the above.
    E. None of the above. (Explain!)

19. Suppose two planets ('puppy' and 'cat') are discovered orbiting another star and their measured orbital speeds are 32 km/s (puppy) and 16 km/s (cat). Which planet has the larger of the two orbits?
    A. puppy
    B. cat
    C. there is not enough information to answer this question.

20. Which planet has the longer orbital period?
    A. puppy
    B. cat
    C. there is not enough information to answer this question.

21. What is the ratio of the orbital radii of the two orbits?
    A. puppy is twice as far from the central star as cat
    B. puppy is half as far from the central star as cat
    C. puppy is one-fourth as far from the central star as cat
    D. puppy is four times as far from the central star as cat
    E. puppy and cat are the same distance from the central star

22. Using Kepler's 3rd Law of planetary motion in conjunction with the orbital periods listed in **Table 1**, calculate the size of the semi-major axis of the orbit of each planet listed in **Table 1**.

Table 1

Planet	P (years)	a (AU)
Venus	0.615	
Earth	1.000	1.000
Mars	1.88	
Jupiter	11.9	
Saturn	29.5	

23. Suppose NASA wants to place five spacecraft in circular orbits around the Sun at the five separate distances from the Sun, as indicated by the semi-major axis lengths listed in **Table 2**. What would the orbital periods be for these five spacecraft? (Fill in the middle column of **Table 2**).

Table 2

Spacecrafts orbiting Sun	**P (years)**	**a (AU)**
Explorer		0.100
Home		1.000
Discovery		4.
Columbia		30.
Atlantis		100.

24. Suppose NASA wants to place five spacecraft in circular orbits around the Earth with the five separate orbital periods listed in **Table 3**. What would the radius of each orbit be? (Fill in the right-hand column of **Table 3**; express the radii in units of the Earth's radius $R_\oplus$).

Table 3

Spacecrafts orbiting Sun	**P**	**a ($R_\oplus$)**
EH-1	1.5 hours	1.00
EH-2	10 hours	
EH-3	24 hours	
EH-4	1 day	
EH-5	30 days	

Potentially Useful Relations

1 AU = 1.5×10^{11} meters
1 year = 3.156×10^{7} seconds
$\pi = 3.14159$
1 m/s = 2.2 mph
Circumference of a circle = $2\pi r$