Name: _____ Dragon ID: _____

Astronomy 104 Mid-Term #1 Study Guide
Spring Semester 2009

Cabanela Lecture Midterm #1 in class Tuesday, Feb. 10
Craig Lecture Midterm #1 in class Wednesday, Feb. 11

The midterm covers Chapters 1-4, but not all topics from each chapter are on the test. The detailed list below was what you should know how to do. A practice exam is attached. We should warn you we expect the practice exam will take about 75 minutes. The actual midterm will be a bit shorter, since you will only be allowed about 50 minutes for it.

Objective (what you should be able to do on the test)	**Reading from the textbook**
List some of the objects in the solar system.	1.1, 1.2, 1.3
Explain what makes an idea a scientific idea.	3.4
Describe annual and daily motion of sun and stars.	3.2 and planetarium lab
Describe Ptolemy's geocentric model of the solar system.	3.2, 3.3
Describe Copernicus' heliocentric model of the solar system.	3.3
Evaluate a geocentric model in terms of the predictions it makes and whether they are verified.	3.4
List the assumptions that ancient Greeks made in constructing their model of the solar system.	3.3
Describe Copernicus' heliocentric model of the solar system.	3.3
Describe how the motion of planets differs from other objects in the sky.	2.4
Explain why retrograde motion occurs in Copernicus' model of the solar system.	2.4
Describe Galileo's observations (we will not discuss all of them in detail, but **you should be able to describe all of the observations listed in pages 75-77 of the book**)	3.3
Explain how Galileo's observations support a heliocentric model.	3.3
Use Kepler's First Law to identify the shape of the orbit of a planet.	3.3
Use Kepler's second law to deduce how much of its time an object spends on each part of its orbit.	3.3
Use Kepler's third law to deduce the period of a new asteroid (or other object) given its distance from the sun.	3.3
Use Kepler's third law to deduce the distance from the Sun of a new asteroid (or other object) given its orbital period.	3.3
Explain that Kepler's Laws were based solely on observation with no understanding of why they were correct.	3.3

Astronomy 104 PRACTICE Mid-Term #1
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[NOTE: This practice mid-term has more questions than the actual mid-term will. However, on both the Multiple Choice section is worth 30 points total, and the Essay section is worth 20 points total.]

DO NOT OPEN THIS EXAM UNTIL TOLD TO DO SO BY INSTRUCTOR.

Exam Rules:

a. Exam will start at the beginning of your lecture period and must be turned in 50 minutes after the exam begins.
b. Bring you student ID to the exam. It will be checked as you turn in the exam.
c. **Exam is Closed Book and Closed Notes**.
d. **Cell phones must be off and out of sight (not even "vibrate").**
e. **No electronic devices allowed with exception of a calculator except at discretion of instructor.**
f. I expect everyone to be honorable and not copy answers from someone else's exam. I consider it a personal insult for you to cheat and thus cheating will be dealt with by giving the cheater an "F" for the entire course.

Exam Hints:

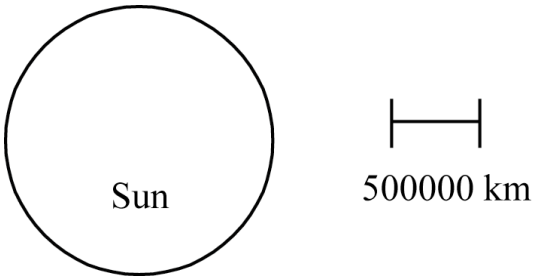
a. If you have trouble with a problem, skip it and go to the next one, come back to it later.
b. Don't be afraid to raise your hand and ask a question of the instructor if you have a problem with interpreting a question.

Multiple Choice Questions:

1. A light-year is
   a. the average distance between the Earth and the Sun
   b. the time it takes light to travel 9.5×10^{12} kilometers
   c. a distance, not a time.
   d. the average size of a galaxy.

2. The majority of the volume of our galaxy, the Milky Way, is occupied by
   a. the planets.
   b. the Sun.
   c. stars.
   d. other galaxies.
   e. empty space.

3. The average distance to Moon (from Earth) is approximately 382,500,000 meters. This would be written in scientific notation as
   a. 382.5 thousand kilometers.
   b. 3.825×10^{8} meters
   c. 3.825×10^{10} meters.
   d. 3.825×10^{9} meters
   e. 3.825 million meters.



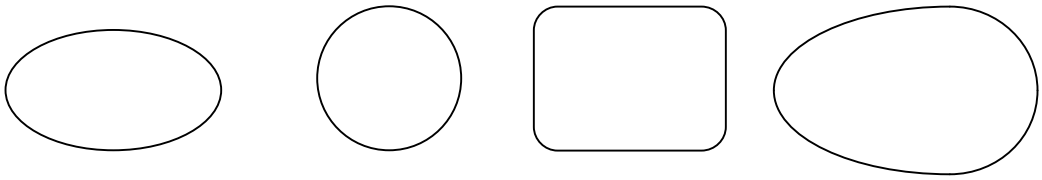
4. Based on the diagram above, the diameter of the Sun is about
   a. 150 km
   b. 1,500,000 km
   c. 150,000,000 km
   d. 1.5×10^{9} km

5. Why do astronomers use units like "Astronomical Units" and "Light Years" instead of kilometers or miles when discussing distances?
   a. Because it allows us to represent astronomical distances with relatively manageable numbers.
   b. Because they don't like metric units.
   c. Because it makes conversions between units easy.
   d. All of the above.
   e. None of the above.

6. In a geocentric theory for the solar system the object at the center of the solar system is
   a. the sun.
   b. the earth.

7. Choose the words that most accurately fill in this sentence: Over the course of the year, the Sun moves from _____ along a path in the sky called the _____.
   a. East to West; celestial equator
   b. East to West; ecliptic
   c. West to East; celestial equator
   d. West to East; ecliptic

8. In the heliocentric model, the motion of the Sun across the sky over the course of a year is due to
   a. The rotation of the Earth on its axis.
   b. The tilt of the Earth's axis.
   c. The revolution of the Earth about the Sun.
   d. The precession of the Earth's axis of rotation.



a b c d

Figure for question 10.

9. To the naked eye, planets are different than stars because planets
   a. appear to be round discs, stars are just points.
   b. move in the sky from night to night
   c. are different colors than stars.

10. Which of the shapes above is clearly an ellipse with non-zero eccentricity?

11. Which of the shapes above most closely resembles the orbits of most planets in our solar system?

12. An idea is scientific if it
   a. Can be tested by experiment
   b. Is more simple than other ideas
   c. Definitely correct

13. Which of the following is **NOT** consistent with the major hallmarks of science?
   a. Scientific explanations should be based solely on natural causes.
   b. A scientific model must make testable predictions.
   c. Science consists of proven theories that are understood to be true explanations of reality.
   d. Science progresses through the creation and testing of models that explain observation as simply as possible.
   e. None of the Above

14. Which of the following statements about scientific theories is **NOT** true?
   a. A theory must make predictions that can be checked by observation or experiment.
   b. A theory cannot be taken seriously by scientists if it contradicts other theories developed by scientists over the past several hundred years.
   c. A theory can never be proved beyond all doubt; we can only hope to collect more and more evidence that might support it.
   d. If even a single new fact is discovered that contradicts what we expect according to a particular theory, then the theory must be revised or discarded.
   e. A theory is a model designed to explain a number of observed facts.

15. In the geocentric theory for describing the solar system, epicycles were necessary to explain
    a. why the sun moves across the sky over the course of a year
    b. why the stars rise and set every day
    c. why the planets sometimes move in retrograde motion
    d. why the planets move across the sky over the course of a year

16. According to Kepler's First Law, planets move on orbits around the sun that are
    a. Circles
    b. Hyperbolas
    c. Ovals
    d. Ellipses

17. Kepler's second law, which states that as a planet moves around its orbit it sweeps out equal areas in equal times, means that
    a. a planet's period does not depend on the eccentricity of its orbit.
    b. planets that are farther from the Sun move at slower average speeds than nearer planets.
    c. a planet travels faster when it is nearer to the Sun and slower when it is farther from the Sun.
    d. the period of a planet does not depend on its mass.
    e. planets have circular orbits.

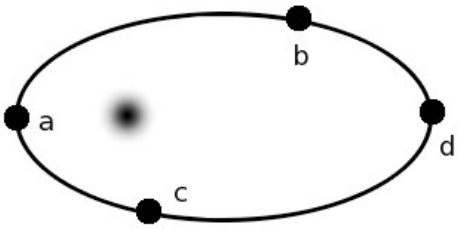
18. Kepler's third law, $P^2 = ka^3$ (where k is a constant) means that
    a. all planetary orbits with the same average distance from the Sun (semimajor axis) have the same period.
    b. planets that are farther from the Sun move at slower average speeds than nearer planets.
    c. the period of a planet does not depend on its mass.
    d. a planet's period does not depend on the eccentricity of its orbit.
    e. All of the above are correct.

19. Imagine looking at a triple star system, in which two small stars orbit around a much larger star. One of the small stars, A, is close to the large star, and the other small star, B, is far from the large star. Star A takes _____ time to go around the large star compared to star B.
    a. more
    b. the same
    c. less

20. The observation that Planets with a shorter period than Earth are closer to the Sun than Earth is a consequence of which of Kepler's laws?
    a. First law
    b. Second law
    c. Third law

21. Which of Galileo's observations conclusively indicates that planets go around the Sun, not the Earth
    a. Moons of Jupiter
    b. Phases of Venus
    c. Sunspots
    d. The Milky Way is composed of stars

22. Consider the orbit shown below. At what point in the orbit is the star moving fastest?

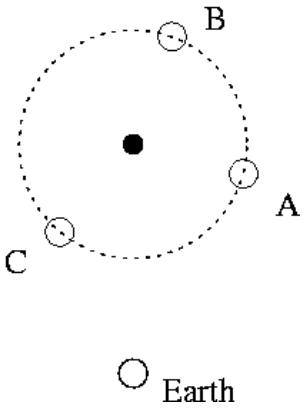


23. Copernicus revived the idea that
    a. the Sun goes around the Earth.
    b. the Earth goes around the Sun.

24. Copernicus' model of the solar system did not gain immediate acceptance in part because it
    a. could not explain retrograde motion.
    b. did not predict planetary positions better than Ptolemy's model.
    c. could not explain the daily motion of stars.

25. Which of the following was not an observation that Galileo made?
    a. Venus goes through phases.
    b. Jupiter has moons.
    c. Planets move in elliptical orbits.
    d. There are many faint stars in the sky you cannot see without a telescope.

26. Which of the following was **not** an observation that Galileo made?
    a. Venus goes through phases
    b. Jupiter has moons.
    c. Planets move in elliptical orbits
    d. There are many faint stars in the sky that you can not see without a telescope.



27. The picture above shows the Earth, the Sun, and the orbit of the planet Mercury. At which of the points will Mercury appear almost full (i.e. almost all of Mercury's face would be lit up)?
    a. A
    b. B
    c. C

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Discussion Questions for PRACTICE Mid-Term #1:

(Turn this section in with "computer graded" sheet)

On the actual mid-term exam, there will be three short answer questions of which you must answer two for full credit. If you answer all three, your best two answers will be used in determining your score.

Answer the questions below as fully and clearly as you can. You will be graded both on clarity (using full sentences that make sense) and on completeness and correctness.

D1. Why, in the heliocentric theory for the solar system, does the position of the sun appear to change over the course of a year? Feel free to include a diagram as *part* of your explanation, if you wish; a diagram is not necessary.

D2. How is the complicated motion of planets in the sky (a.k.a. retrograde motion) explained terms of a heliocentric theory to the solar system.

D3. Explain in your own words what makes scientific theories different than other "ideas".

D4. Give an example of an idea that is not scientific although it tries to explain something about the universe around us. Why is it <u>not</u> a scientific idea?

D5. Describe Galileo's observations of Venus and explain their significance in understanding the solar system.