

Correct answers in boldface. Be sure to write your name and student ID number on the first blank at the bottom of the form. Please mark the version (A) in the "Key ID" space at the top of the Scantron. If you need to erase an answer, please do so carefully and remove all of the old mark.

1. Mars is 1.5 AU from the Sun. Using the graph at right, how long does it take Mars to orbit the Sun?
- a. 1 year **b. 1.9 years** c. 1.25 years
d. 4 years e. More information is needed

2. The most persuasive reason ancient astronomers thought the earth was fixed in space and did not orbit the sun was
- a. observations of eclipses of the moon showed that the earth stood still

b. the stars did not change direction relative to each other over the year (there was no parallax)

- c. the earth is a complex body with water, air, and other properties, while the other bodies in space are just bright points of light
d. space is unchanging while the earth changes all the time
e. their gods placed the earth at the center of the solar system

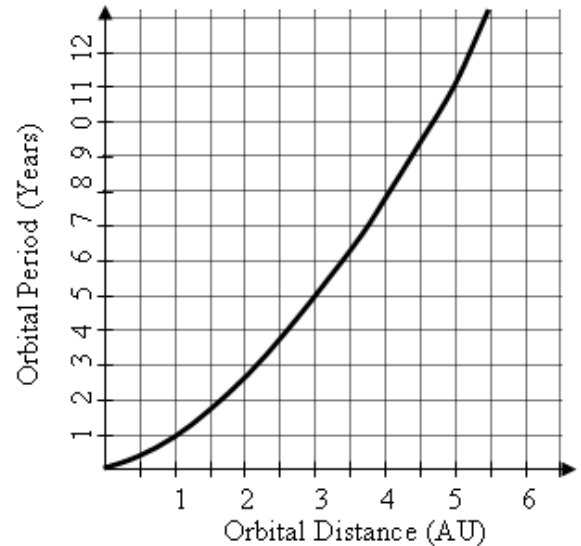
3. Aristarchus' ideas about the solar system
- a. were accepted by the other Greek scientists b. were rejected because they were wrong
c. were rejected because he was really an Egyptian who had emigrated to Greece
d. were rejected because they contradicted other theories
e. both c. and d.

4. People like the Celts and Maya built huge monuments to illustrate astronomy (like Stonehenge or the snake shadow on Chichen Itza)
- a. to improve the accuracy of their observations **b. to impress the people with their skill**
c. to educate the people in astronomical theory
d. so their astronomer/priests could live luxuriously in the monuments when they were not being used for astronomy
e. to provide the people with something to do while the government paid them welfare

5. Creation myths
- a. were a kind of popularization of early scientific theories, so everyone would be interested
b. are independent of the kind of detailed observation and revision that is used in science
c. are examples of early scientific thought
d. evolved into advanced science
e. have generally been proven eventually by scientists

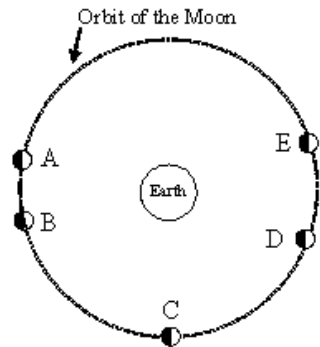
6. _____ had an important influence on our calendar
- a. Hipparchus, great Greek astronomer **b. Pope Gregory**
c. Alexander the Great, conquerer of the ancient world d. Pericles, leader of Athens
e. Aristarchus, Greek astronomer who proposed a correct model of the solar system

7. To see the greatest possible number of stars over the course of a year, you should live at the
- a. equator** b. south pole c. it does not really matter d. north pole



8. Examine the figure below. Which moon position results in the moon appearing to people on earth as shown in the upper right corner of the figure?

- A. B. C. D. E.



9. Two planets are observed going around a star. Planet Xoron has an orbital period that is half as long as Planet Krypton. Which planet has a larger average orbital radius?

- a. Xoron b. They will both be the same **c. Krypton** d. Not enough information to tell

10. Copernicus' theory for the solar system

- a. made much more accurate predictions than previous theories
 b. was obviously a big improvement over previous theories
c. was attractive initially for aesthetic reasons only
 d. introduced new physical principles to understand the motions of the planets
 e. was much simpler than previous theories

11. During the period each year when we see Mars undergoing apparent retrograde motion in our sky, what is really going on in space?

- a. The Earth and Mars are getting closer together.
 b. Mars is moving around the Sun in the opposite direction from which Earth is moving around the Sun.
 c. Earth and Mars are on opposite sides of the Sun.
d. Earth is catching up with and passing by Mars in their respective orbits.
 e. Mars is going around on an epicycle

12. Ptolemy's work was preserved by

- a. burying it in dry desert sands b. placing it in a library **c. Islamic scholars** d. Copernicus
 e. because it was written on very durable papyrus

13. The central underlying assumption(s) in Ptolemy's model were

- a. planets move along only circular paths b. planets move always at the same speed
 c. planets undergo retrograde motion d. both a. and c.
e. both a. and b.

14. The period-radius relationship analogous to Kepler's third law but for the wheel of your bicycle would be

- a. the period of revolution goes in proportion to the radius
 b. the period of revolution goes in proportion to the square of the radius
 c. the square of the period of revolution goes as the cube of the radius
 d. there is no fixed relation between the period of revolution and the radius
e. the period of revolution is independent of the radius

15. Parallax was difficult to observe because
- a. the orbit of the earth is tiny compared to the distances to the nearest stars**
 - astronomers measured the wrong stars
 - parallax is only obvious in earth-centered solar systems
 - it is just one of those things that no one thought was important
 - astronomers did not know where to look
16. Ptolemy's solar system model
- was not scientific
 - b. provided a good fit to the available observations**
 - made no reference to observations - was just a theoretical construct
 - was not quantitative - it just gave a general description of the planetary motions
 - had obvious flaws that worried ancient astronomers
17. Aristotle became the foundation for much of Medieval science because
- He was the only Greek scientist whose writings survived
 - He was the only Greek scientist who got anything right
 - His views were endorsed by the Romans
 - d. He collected a lot of Greek science into a convenient summary**
 - His writings anticipated the teachings of the Church
18. Newton's laws were a "simple" explanation for the motions of the planets because
- once they were published, it was obvious that they did the job
 - they did not use much math
 - c. although it required calculus to prove it, they fit the facts with a minimum of assumptions**
 - they were based on everyday experience
 - they were just common sense
19. Galileo's discovery of the phases of Venus proved that
- Venus orbits the earth, like the moon
 - Tycho's model for the solar system was wrong
 - Venus has a dark side
 - d. Venus comes between the earth and sun on its orbit**
 - Venus undergoes eclipses
20. If a planet is in a circular orbit at a distance of 1 AU (earth orbit) from a star, compare the force of gravity on it with another planet in a circular orbit twice as big (2 AU)
- a. four times more**
 - four times less
 - twice as big
 - two times less
 - cannot determine from the facts given
21. Ancient civilizations that had a strong interest in astronomy
- were more advanced than any others
 - were ruled in enlightened ways
 - c. tended to develop sophisticated number systems and mathematics as part of their astronomy**
 - lived in desert areas where the sky was clear
 - also developed excellent science in other areas
22. Galileo dropped objects from the leaning tower of Pisa to show
- That heavy and light objects fall at the same rate
 - How air resistance slows the fall of objects
 - To see if freely falling objects behaved like those he had studied on inclined planes
 - d. He did not drop things from the tower - some one else did to attack Galileo's theories**
 - To determine the local vertical and hence measure how far the tower was leaning
23. If you were on the moon, could you observe annular eclipses of the sun?
- a. no**
 - yes

24. If the moon is rising during sunset, what phase will it be one week later?
a. new b. first quarter c. full **d. last quarter**
25. Why doesn't a total lunar eclipse occur every month?
a. There is one every month
b. Because we are not necessarily pointed toward the moon when they occur
c. because the moon only seldom lines up exactly between the sun and the earth
d. Because of the tilt of the orbit of the moon relative to the orbit of the earth around the sun
e. Because some of them occur on the far side of the moon
26. When it is winter in Tucson, it is
a. winter all over the world **b. summer in Australia (southern hemisphere)** c. winter in Australia
d. spring in Australia e. fall in Australia
27. The seasons are primarily due to
a. the earth getting closer to and farther away from the sun as it goes around its orbit
b. the tilt of the axis of the earth so one hemisphere is toward the sun in one part of the orbit and the other hemisphere tilts toward the sun in the other part
c. greenhouse effects d. changes in the output of the sun e. large scale movements of air
28. 5.63×10^{-5} is
a. -5.635 **b. 0.0000563** c. 563000 d. 0.000563 e. 0.0563
29. Kepler's great breakthrough in explaining the motions of the planets came because
a. For the first time, he put the sun at the center of the system
b. he developed a new understanding of the underlying causes for the relative sizes of the planet orbits
c. he realized that gravity could hold the planets in their orbits
d. he was the first to use mathematics to calculate planet orbits
e. he realized that the planet orbits are ellipses, not combinations of circles
30. Two stars are identical in all respects but one: Star A is two times further away from us than Star B. What are the relative brightnesses of these two stars?
a. Star A is four times fainter than Star B b. Star B is two times fainter than Star A
c. Star A is two times fainter than Star B d. Star B is four times fainter than Star A
e. The stars appear equally bright
31. Which of the following moves the fastest?
a. blue photons b. red photons c. x-rays d. radio waves **e. all of the previous move at the same speed**
32. When you are listening to the radio, you are hearing
a. sound waves b. radio waves c. amplitude modulation d. frequency modulation
33. When mass is annihilated
a. It disappears into another universe b. It just disappears
c. It is converted into energy, as shown by $E = mc^2$ d. It returns some time later
e. We don't know what happens, since we have never annihilated mass
34. Which controls accelerate a car, according to Newton's Laws?
a. the accelerator b. the brake c. the clutch d. the steering wheel **e. all but the clutch**

35. Most early cultures had some interest in astronomy because
- they used it to synchronize their farming with the seasons**
 - they found it an interesting application of the scientific method
 - it provided a common topic they could discuss with other cultures
 - it was a way to probe their origins
 - none of the above
36. Scientists
- always progress steadily toward improved theories
 - tend to work within certain frameworks of thought that usually produce progress but occasionally are wrong**
 - usually depend almost entirely on the writings of past authorities
 - get theories by studying concepts revealed in religious books and activities
 - work in ways that other people have no chance of understanding
37. "Conservation of Energy" means that
- Laws should be passed to preserve energy for future generations
 - The sum of the energy associated with motion (kinetic) and that associated with the ability to do work (potential) stays the same in a system**
 - Energy can be converted into matter
 - An object in motion tends to retain the motion in the same direction and at the same speed.
 - Energy must be supplied to keep the planets moving in their orbits
38. An object completely at rest may have some energy
- because of its position relative to the earth**
 - because of its kinetic energy
 - because energy is present everywhere
 - if it has no electrical charge
 - only if light is shining on it
39. Suppose you go outside and look at three stars. Star A is blue, star B is yellow, and star C is red. Which star is the hottest and which is the coldest?
- A is hottest and B is coldest
 - C is hottest and A is coldest
 - B is hottest and C is coldest
 - A is hottest and C is coldest**
40. If a star is moving towards you at constant speed, how do the wavelengths of the absorption lines change as the star gets closer and closer?
- they get farther and farther to the blue
 - they stay shifted the same amount to the blue**
 - they move toward the red
 - they move towards their rest wavelengths
41. A box contains a collection of molecules (for example, the box might be full of air). We have a gauge that records how much force is exerted on the walls of the box by molecules. We take data for awhile and then notice that the force decreased. What might have happened?
- nobody knows
 - the temperature decreased**
 - the pressure increased
 - the temperature increased
 - more molecules were forced into the box
42. An object that emits light with a peak wavelength at 250nm has a temperature _____ that of an object whose emission peaks at 500nm. (1nm = 10^{-9} meters)
- the same as
 - 4 times
 - 2 times**
 - one half
 - Cannot be computed from the information given.

43. If you know the energy of a photon, you can compute
a. its position b. its frequency c. its wavelength d. its position, frequency, and energy
e. its frequency and wavelength
44. At what temperature does an object produce radiation?
a. 212° F or 100° C b. 32°F or 0° C c. 5500° K d. at no temperature
e. at any temperature above absolute zero
45. The number of visible emission lines with different wavelengths that an atom can produce
a. is always one b. is always two c. is always three d. is always four
e. depends on the numbers and arrangements of electrons in the atom
46. Our modern calendar
a. Is based on the ancient Egyptian calendar
b. Was brought down unchanged from the Babylonian astronomers
c. Has been strongly influenced by Mayan records.
d. Is based on a calendar set up by Julius Caesar in ancient Roman times
e. Is still not well tuned to the mismatch of the day to the year and will need adjustment soon
47. Prior to the Greeks, astronomers concentrated on:
a. there were no astronomers
b. making predictions based on previous observations but without worrying about underlying physical reasons for the motions
c. developing physical ideas of how and why the planets moved so they could make predictions in new situations
d. introducing astronomical ideas into national literature
e. looking for new planets
48. Einstein is not given credit for solving the problem of planetary motions because
a. Einstein's theory of relatively is not as good a theory as Newton's laws of motion
b. Newton was a better scientist than Einstein
c. Newton's laws provided an accurate explanation without Einstein's additions
d. It's just politics – Newton was English and Einstein was German
e. Einstein's theories are still under test
49. When an object is about to fall and is high above the ground,
a. Its potential energy is at a maximum and its kinetic energy is at a minimum
b. Both its potential and kinetic energies are at a maximum
c. Both its potential and kinetic energies are at a minimum
d. Its potential energy is at a minimum and its kinetic energy is at a maximum
e. There is no fixed relation between its kinetic and potential energies
50. A year was set to be the time for
a. the earth to rotate on its axis **b. the earth to orbit the sun** c. the sun to rotate on its axis
d. 365 days to pass e. the moon to orbit the earth