ASTRONOMY 111 Session 003 Fall 2007
Date: Oct. 1, 2007
Instructor: Dr. Jie Zhang

In-class Exam #1

I understand that this examination lasts from **7:20 PM to 8:30 PM**. I have not received, nor given any aid, nor assistance, nor answers, nor questions to anyone else during this examination period. I understand that any violation of the GMU honor code will result in my being reported directly to the honor committee, **without warning**. I understand that any honor code violation can cause me to fail the course, be suspended, and/or be expelled from the university; and, it will automatically be entered into my official records.

Test Form: **X**

Name (Print): _____

Signature: _____

Student ID: _____

In your **scantron**, please record the **ID number** (from far-left to right, the 8-digit G number without letter G), **name, subject and date**.

The class will resume at 8:40 PM. Please come back at this time.

Chap. 0: 1
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Chap. 4: 14

Note: Answer Keys --- asterisk symbol indicate the correct answer

Chap. 0

1. Your answer to question 1 must be “A”

Chap. 1

2. One important characteristic of a scientific theory is that it
   A is mathematical.
   B consists of at least three separate hypotheses.
   C *can be tested by observation.
   D need not have a connection with physical reality.

3. One arcsecond is equal to
   A *1/3600 degree.
   B 1/60 of a full circle.
   C 1/60 degree
   D 1/3600 of a full circle.

4. The Moon's angular diameter in our sky is measured to be half a degree. From this, we can find the
   A bulk density of the Moon (the average number of kilograms per cubic meter of Moon material).
   B distance to the Moon even if we have no other information about the Moon.
   C diameter of the Moon in kilometers even if we have no other information about the Moon.
   D *diameter of the Moon in kilometers if we know the Moon's distance.

5. The mean distance of Jupiter from the Sun, 778,300,000 km can be written in shorthand notation as
   A 7.783×10^{6} km.
   B 7.783×10^{7} km.
   C *7.783×10^{8} km.
   D 7.783×10^{9} km.

6. There are 1000 mm in one meter. This means that a distance of 5 mm is
   A 5×10^{3} meter.
   B 2×10^{-4} meter.
   C *5×10^{-3} meter.
   D 5×10^{-2} meter.

7. $10^{8} \times 10^{5} =$
   A 10^{3}
   B *10^{13}
   C 10^{40}
   D 10^{85}

8. One astronomical unit, or one AU is defined as the
   A distance traveled by light in one year.
   B *mean distance between the Sun and the Earth.
   C distance from which Earth-Sun distance will subtend an angle of one arcsecond.

D distance traveled by light in one second.

9. One light-year is the
   A *distance that light travels in one year
   B time taken for the Earth to orbit the Sun once.
   C distance between Earth and Sun.
   D time taken for light to travel from the Sun to the Earth.

10. The following distance units, arranged in size from smallest to largest, are
   A km, ly, AU, pc
   B ly, AU, pc, km
   C *km, AU, ly, pc
   D AU, pc, km, ly

(chap 2)

11. The 88 constellations in the sky are
    A actual groupings of stars physically bound together by gravity.
    B *patterns of stars that only appear to be close to each other
    C remarkably good representations of the pictures they symbolize.
    D a modern concept, only made firm since the advent of telescopes.

12. Diurnal motion of objects in the sky is caused by the
    A precession of Earth's axis.
    B motion of the Moon across the sky.
    C revolution of Earth around the Sun.
    D *rotation of Earth on its axis.

13. When we watch the nighttime sky, we find that
    A the stars and constellations remain fixed in our sky, not rising or setting in a time as short as one night because they are so far away.
    B most stars and constellations slowly rise in the west, pass overhead, and set in the east.
    C all stars and constellations reach their highest point in the sky at midnight.
    D *most stars and constellations slowly rise in the east, pass overhead, and set in the west.

14. If a star crossed the meridian at 1:00 am one night, then the next night it would cross at
    A 1:04 am.
    B 1:00 am.
    C *12:56 am
    D Stars don't cross the meridian. The meridian rotates with the sky.

15. As Earth rotates, the apparent motion of the pole star, Polaris, in a period of a day is
    A a slow drift across the sky, rising from the east and setting at the west.
    B a wobble back and forth in a straight line.
    C *a small circle with a radius of less than 1° in about 24 hours.
    D a large circle with a radius of about 10° in about 24 hours.

16. The celestial equator is a
    A *line in the sky that is perpendicular to Earth's spin axis.
    B line traced in our sky by the Moon each month against the background stars.
    C line traced in our sky by the Sun over one year against the background stars.
    D band of constellations through which the Sun and Moon move in our sky.

17. The celestial coordinates that together describe a star's position precisely and unambiguously are
    A *right ascension and declination.
    B sidereal time and latitude.
    C right ascension and sidereal time.
    D longitude and latitude.

18. The Sun crosses the celestial equator going south to north at the
    A *vernal equinox

B autumnal equinox.
C summer solstice.
D winter solstice.

19. The equinoxes are located at the intersections of the
A ecliptic and the horizon.
B ecliptic and the Moon's orbit.
C *ecliptic and the celestial equator.
D horizon and the celestial equator.

20. What is the primary cause of Earth's seasons?
A The orbit of Earth is an ellipse, so Earth is not always the same distance from the Sun.
B *Earth's rotation axis tilts with respect to the plane of its orbit around the Sun.
C Earth's precession axis precesses (wobbles).
D In accord with Kepler's Second Law, Earth moves faster during parts of its orbit around the Sun and more slowly during other parts.

21. Summertime in the northern hemisphere is when
A the Sun is closest to Earth.
B the Sun is closest to the ecliptic.
C the Moon is closest to Earth.
D *more direct sunlight shines on this hemisphere.

22. Precession is
A *the slow coning motion of the spin axis of Earth, similar to that of a spinning top.
B the daily spinning motion of Earth, producing the apparent motion of the Sun and the stars.
C another name for a parade.
D the motion of Earth along its orbital path during a year.

23. Compared to clocks in California in winter, those in New York (maintaining civil time, or mean solar time) will be
A the same.
B three hours behind.
C one hours ahead.
D *three hours ahead.

24. A solar day is the time it takes Earth to rotate around its axis between two consecutive solar positions (i.e. high noon to high noon or sunset to sunset). A sidereal day is the time it takes Earth to rotate around its axis between two consecutive positions of a distant star (i.e. Vega on the eastern horizon to Vega again on the eastern horizon). Which is longer?
A *A solar day is always longer.
B A sidereal day is always longer.
C They are always the same length.
D A sidereal day is longer when Earth is farther from the Sun (northern summer), but a solar day is longer when Earth is closer to the Sun (northern winter).

(chap. 3)

25. Which of the following is the correct sequence of appearances of Moon phases in the sky?
    A new moon, full moon, waxing crescent, waning crescent
    B *waxing crescent, first quarter, waxing gibbous, full moon
    C full moon, waxing gibbous, third quarter, waning crescent
    D new moon, waning crescent, first quarter, full moon

26. The phase of the Moon when the Sun and Moon are separated by 6 hours of right ascension is always
    A full moon.
    B new moon.
    C crescent.
    D *either first or third quarter.

27. A full moon is always at its highest in our sky at
    A *midnight.
    B sunset.
    C midday.
    D sunrise.

28. The Moon turns on its axis _____ times for every orbit about the Earth
    A 0
    B *1
    C 30
    D 365.25

29. In its orbit around Earth, the Moon.
    A always keeps the same side toward the Sun.
    B *always keeps the same side toward Earth.
    C always keeps the sunlit side toward Earth.
    D rotates once every 24 hours to keep in step with Earth.

30. The term “synodic month” refers to the
    A time from one lunar eclipse to the next.
    B *time from new moon to new moon.
    C month containing Easter, as defined by the ecclesiastical calendar.
    D time over which the Moon completes one orbit around Earth, relative to the stars.

31. A lunar eclipse is caused by the
    A Sun passing behind the Moon.
    B *Moon passing into the shadow of Earth.
    C Moon passing behind the Sun.
    D Earth moving into the Moon's shadow.

32. A solar eclipse can only occur when the Moon is
    A *new.
    B full.

C rising.
D setting.

33. Which of the following statements is NOT correct for eclipses in the Sun-Earth-Moon system?
    A Eclipses of Moon and Sun do not occur at quarter Moon phases.
    B An eclipse of the Sun occurs only at new Moon.
    C An eclipse of the Moon occurs only at full Moon.
    D *An eclipse of the Sun occurs only at full Moon.

34. If we were on the Moon during a partial lunar eclipse, when both the umbra and penumbra of the Earth's shadow touched the lunar surface, we would see
    A a total eclipse of the Sun by the Earth.
    B a partial eclipse of the Sun by the Earth.
    C an annular eclipse of the Sun by the Earth.
    D *either a partial or total eclipse of the Sun by the Earth, depending on where we were

35. A lunar eclipse does not occur at every full moon because
    A a lunar eclipse cannot occur after sunset.
    B the orbit of the Moon is not a perfect circle.
    C *the plane of the Moon's orbit is at an angle to the plane of Earth's orbit.
    D the path of the Sun is inclined at an angle of 5° to the ecliptic plane.

36. A total lunar eclipse can last more than an hour and a half, but a total solar eclipse never lasts more than 7 1/2 minutes. Why this difference?
    A A total solar eclipse always occurs when the Moon is at perigee, and it is moving fastest at that time.
    B A total solar eclipse always occurs when Earth is at perihelion, and it is moving fastest at that time.
    C Both Earth and the Moon move clockwise in their orbits, as seen from the north. Thus during a solar eclipse Earth and Moon are moving in opposite directions, and during a lunar eclipse they are moving in the same direction.
    D *Earth's shadow at the Moon's distance is much larger than the Moon's shadow at Earth's distance. As Earth rotates, this narrow lunar shadow sweeps quickly over any given spot.

(chap. 4)

37. An apparent eastward motion of a planet from night to night compared to the background stars (as viewed from Earth) is referred to as
    A rising (if in the east) or setting (if in the west).
    B *direct motion.
    C precession.
    D retrograde motion.

38. Retrograde motion is explained in the Copernican model of the solar system as
    A *a configuration that happens when the Earth overtakes a superior planet in its orbit.
    B a configuration that takes place when a planet is at maximum elongation.
    C a natural result of planets moving in ellipses around the Sun.
    D when a planet slows down at aphelion.

39. Nicolaus Copernicus was the first person to
    A *develop a mathematical model for a Sun-centered solar system.
    B use a telescope to observe the sky at night.
    C use ellipses to describe the orbits of the planets.
    D describe planetary orbits using the force of gravity.

40. In which part of the sky does Venus appear at sunset when it is at greatest eastern elongation?
    A It is not visible, because it is on the other side of the Sun.
    B *western
    C southern
    D eastern

41. When a planet is seen at opposition, it is always near its
    A closest point to the Sun.
    B *closest point to Earth.
    C farthest point from Earth.
    D farthest point from the Sun.

42. Kepler's first law states that a planet moves around the Sun in
    A an elliptical orbit, with the Sun on the minor axis of the ellipse.
    B an elliptical orbit, with the Sun at the center of the ellipse.
    C a circle, with the Sun at the center.
    D *an elliptical orbit, with the Sun at one focus.

43. According to Kepler's second law, an object in an elliptical orbit around the Sun is traveling fastest when it is at what position?
    A Since it travels at a constant speed throughout its orbit, there is no such position.
    B when it is at vernal equinox.
    C aphelion, farthest from the Sun, since it has to move farther per day at that position
    D *perihelion, closest point to the Sun

44. 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.

45. Venus shows changes in angular size and also shows phases similar to those of the Moon. When Galileo first saw these changes, he concluded that
A Venus orbits the Moon.
B *Venus orbits the Sun.
C the Moon really orbits Venus, not Earth after all.
D Venus, like the Moon, orbits Earth.

46. Newton's 2^{nd} law stated that if a force were applied to an object in space, the resultant acceleration would depend on the
A initial speed of the object.
B initial position of the object.
C *mass of the object.
D size of the object.

47. Earth exerts a force on you as you stand on its surface. What is the size of the force exerted on Earth by you, when compared to the above force?
A zero, you do not exert a force on Earth
B *the same
C very small, because your mass is small compared to that of Earth
D twice as large, because of Earth's rotation

48. The law of gravitation expounded by Newton for the force F between two objects of masses M and m with separation (between centers) of R is given, with G being a constant, by
A *$F = GMm/R^2$
B $F = GMmR^2$
C $F = GM/mR^2$
D $F = Gm/MR^2$

49. Suppose that a planet of the same mass as Earth were orbiting the Sun at a distance of 10 AU. The gravitational force on this planet due to the Sun would be
A 100 times the gravitational force the Sun exerts on Earth.
B 10 times the gravitational force the Sun exerts on Earth.
C 1/10 of the gravitational force the Sun exerts on Earth.
D *1/100 of the gravitational force the Sun exerts on Earth.

50. The high tides on Earth's oceans occur at
A *full or new moon.
B full moon but not new moon.
C any time.
D quarter moon.