

Astronomy 121 – Test # 1

Fifty Minutes – Closed Book

This is a closed book exam. You have 50 minutes to do all parts. You may not consult any papers, books, other materials, or any other person. Use a #2 pencil to bubble in the correct answers for each question. If you change an answer, be sure to erase the incorrect answer completely. Give your name, Test #1, the date, and class (ASTR 121-2) at the top of the bubble sheet. Most importantly, give your UVa computing ID (mine is cls7i) in the boxes on the right and **bubble it in along the right side**. Left justify the UVa computing ID (start at the far left of the spaces.) Please write out and sign the pledge in the rectangle at the back of the form.

Multiple Choice Questions

Complete the following sentences by choosing one of the four phrases labeled A,B,C,D. Choose the answer which makes the sentence **true**. Bubble in the correct letter on the line with the corresponding question number of the bubble sheet.

- 1) The complete Greek theory of planetary motions including epicycles was developed by
A) Archimedes. B) Copernicus. C) Ptolemy. D) Alexander of Tyre.
- 2) Summer in the northern hemisphere is when A) the Earth is closest to the Sun in its elliptical orbit. B) sunlight falls more directly upon this hemisphere, heating it more than average. C) sunlight heats the atmosphere the most by passing through it at an oblique angle. D) the clearest skies occur, because of climate.
- 3) Leap Seconds are added to the year to compensate for A) the slowing down of the Earth's rotation. B) the increasing of the Saros cycle. C) the speeding up of the Sun's precession. D) the changing in the Moon's nutation.
- 4) The day is A) the period of the orbit of the Earth about the Sun. B) the period of rotation of the Earth. C) the period of rotation of the Moon. D) the period of the orbit of the Moon about the Earth.
- 5) Object *A* is subjected to a force due to object *B*. All of the following generally are true *except* A) *A* will apply a force to *B*. B) *A* will accelerate. C) the larger *A*'s mass, the smaller its acceleration. D) *A* and *B* will collide.
- 6) The so-called "dark side" of the Moon A) sometimes faces towards the Earth and gets just as much light as the near side. B) sometimes faces towards the Earth and gets no light (it is always dark). C) always faces away from the Earth and gets no light (it is always dark). D) always faces away from the Earth and is never visible, but gets just as much light as the near side.
- 7) The approximate radius of the Earth is A) 92 million miles. B) 920 km. C) 64 km. D) 6400 km.

- 8) On a night when the Moon is full, the Moon will rise at A) dawn. B) midnight. C) noon. D) dusk.
- 9) Solar and lunar eclipses do not occur once a month because A) it is sometimes cloudy. B) precession affects the Moon's orbit. C) the Moon's orbit is tilted with respect to the orbit of the Earth about the Sun. D) the Moon does not orbit every month.
- 10) Assume that Mars is undergoing retrograde motion and is near the Moon on the sky. The phase of the Moon must be A) waning crescent. B) waxing crescent. C) nearly full. D) new.
- 11) According to Kepler's laws, the orbits of planets are A) parabolas. B) oblate. C) hyperbolas. D) ellipses.
- 12) Occam's Razor A) cut off the tip of Tycho Brahe's nose. B) is the principle that scientific theories should be as simple as possible. C) is the principle that scientific measurement should be irreproducible. D) is the principle that scientific theories should be as complex as possible.
- 13) Recently, an amazing geared mechanism for calculating the motions of the Moon and Sun was found near A) Stonehenge. B) Antikythera. C) Rome. D) Prague.
- 14) In general, the closer a planet is to the Sun, the A) slower it moves. B) faster it moves. C) bigger it looks. D) smaller it looks.
- 15) Solar eclipses can only occur when the phase of the Moon is A) third quarter. B) first quarter. C) new. D) full.
- 16) The variation of the Earth's seasons is due to A) the variation in radioactive heating in the Earth's core. B) the fact that the Earth is closer to the Sun in the summer. C) the tilt of the Earth's axis of rotation. D) a variation in the convective wind patterns.
- 17) Parallax is A) retrograde motion when a planet passes the Earth. B) two deficiencies. C) the apparent change in the frequency of a signal when we move towards the source. D) the apparent shift in the position of stars as the Earth orbits the Sun.
- 18) All of the following years are Leap Years *except* A) 1900. B) 1952. C) 1996. D) 2000.
- 19) Inertia refers to A) the tendency of some words to have too many vowels. B) the tendency of an object to continue its motion. C) the tendency of gravity to slow down objects. D) the tendency of all objects to slow down.
- 20) In order to explain retrograde motion, Ptolemy assumed the planetary orbits were A) circles. B) conic sections. C) epicycles. D) ellipses.
- 21) The precession of the Earth's axis causes all of the following *except* A) a change in which star is the Pole star. B) astrological signs to be incorrect when compared to the actual position of the Sun at birth. C) astronomers to need to correct the pointing of their telescopes. D) earthquakes at intervals set by the Saros.
- 22) The basic scientific unit of distance is the A) arcminute. B) meter. C) furlong. D) degree.

- 23) The first reasonably accurate measurement of the size of the Earth was made by A) Eratosthenes. B) Plato. C) Ptolemy. D) Aristotle.
- 24) All of the following are effects of the tilt of the Earth's axis and the Earth's orbit about the Sun *except* A) the seasonal variations on the Earth. B) the aurora on the Earth. C) the equinoxes and solstices. D) the variations in the length of the day (daylight portion).
- 25) All of the following are eccentricities of great scientists *except*: A) Brahe died from the indirect effects of too much drink. B) Brahe was buried without the tip of his nose. C) Galileo was buried without one of his fingers. D) Kepler was burned at the stake.
- 26) The point directly overhead on the sky is called the A) Tropic of Cancer. B) horizon. C) celestial pole. D) zenith.
- 27) The inferior planets consist of A) Venus and Mars. B) Mercury and Venus. C) Earth and the Moon. D) Jupiter and Saturn.
- 28) One surviving purely lunar calendar is the A) Islamic calendar. B) Julian calendar. C) Metonic calendar. D) Gregorian calendar.
- 29) The most distant spacecraft which humans have launched is A) Messenger 3. B) Voyager 1. C) Viking 2. D) Saturn 5.
- 30) The idea that the Sun is the center of the Solar System, and not the Earth, is due to A) Ptolemy. B) Kepler. C) Galileo. D) Copernicus.
- 31) The year is the time it takes the A) Earth to rotate. B) the Moon's phases to change. C) the Earth to go around the Sun. D) the Moon to go around the Earth.
- 32) The basic scientific unit of time is the A) light year. B) arcsecond. C) second. D) astronomical unit.
- 33) Gamma-ray burst are associated with A) the death of dwarf planets. B) the death of precessions. C) the birth of black holes. D) the birth of constellations.
- 34) All of the following are true of the lunar month *except* A) it is the time between lunar eclipses. B) it is the period of the orbit of the Moon around the Earth. C) it is the time the Moon takes to go through its phases. D) it is the period of rotation of the Moon.
- 35) Based on the date of the recent lunar eclipse, the next time when the Moon will be full will be roughly A) March 5. B) March 20. C) March 12. D) February 27.
- 36) The achievements of Isaac Newton include all of the following *except* A) inventing calculus. B) developing the atomic theory. C) developing the laws governing motion. D) developing the theory of gravity.
- 37) During a Solar eclipse, A) a very large ball of rock gets between the Earth and the Sun. B) the Earth passes through its own shadow. C) the Sun stops making light. D) the Earth's rotation is slowed.

- 38) An astronaut standing at the center of the near side of the Moon would A) see the Earth rise every 27.3 days and take 14 days to cross the sky. B) never see the Earth at all. C) always see the Earth directly overhead, never moving. D) see the Earth rise every 29.5 days and take 15 days to cross the sky.
- 39) The International Date Line runs through A) the middle of the Atlantic Ocean. B) the middle of the Indian Ocean. C) the middle of equatorial Africa. D) the middle of the Pacific ocean.
- 40) Lunar eclipses have all the following properties *except* A) they occur at full moon. B) they can be total or partial. C) they can be annular. D) they can be seen from anywhere on Earth where the moon is visible at that time.
- 41) All of the following are true of the Summer Solstice *except* A) it is the longest day (daylight portion) of the year. B) it marks the beginning of summer. C) it is when the Sun is furthest to the south. D) it occurs on about June 22.
- 42) The month is based on the A) the motions of the planet Venus. B) the motion of the Earth around the Sun. C) the rotation of the Earth. D) the period of the phases of the Moon.
- 43) The retrograde motion of a planet occurs when it is A) nearest to the Earth. B) nearest to the Sun. C) near the perihelion of its orbit. D) on the other side of the Sun from the Earth.
- 44) The number 3×10^5 is the same as A) .000003 B) 300000. C) .00003 D) 30000.
- 45) The Saros cycle is A) the sunspot cycle. B) the period of extinctions on the Earth of about 26 million years. C) the period of repetition of eclipses. D) 11 years.
- 46) The Leap Year was added to the calendar to compensate for the fact that A) the lunar 'month' is not an even number of solar 'days'. B) the 'year' is not an even number of solar 'days'. C) February had too few days. D) the 'year' is not an even number of lunar 'months'.
- 47) On the night of February 20, 2008, Charlottesville experienced A) a lunar precession. B) a total solar eclipse. C) a solar zodiac. D) a total lunar eclipse.
- 48) Retrograde motion occurs in the apparent motion of A) the stars. B) the Moon. C) the Sun. D) the other planets.
- 49) Galileo was able to prove that the Ptolemaic theory must be wrong by A) measuring the size of Mercury. B) showing that Venus had gibbous phases. C) observing the motions of the moons of Mars. D) dropping cannon balls from the Leaning Tower of Pisa.
- 50) Which is the correct list in order of *increasing* distance from the Earth? A) Moon, Sun, Stars, Pluto. B) Sun, Moon, Pluto, Stars. C) Moon, Sun, Pluto, Stars. D) Stars, Moon, Sun, Pluto.
- 51) The planets orbit around the Sun because of the Sun's A) luminosity. B) solar wind. C) gravity. D) magnetic field.

- 52) An arcminute is equal to A) 1/60 of a full circle. B) 1/60 arc second. C) 1/60 degree. D) 60 degrees.
- 53) Among other things, your professor Craig Sarazin has studied A) iridium flares. B) gamma-ray bursts. C) stellar transmutations. D) exoplanetary excretions.
- 54) The first person to use a telescope to do astronomy was A) Hipparchus. B) Kepler. C) Brahe. D) Galileo.
- 55) The force of gravity between two objects increases when A) either of their masses increase. B) the distance between them increases. C) their magnetic fields increase. D) their volumes increase.
- 56) Precession is A) retrograde motion. B) the motion of plates on the crust of the Earth. C) the motion of the Moon around the Sun. D) the motion of the Earth's rotation axis around the sky taking 26,000 years.
- 57) The Tropic of Cancer is A) the furthest northerly point that the Sun rises to be directly above. B) a Victorian novel of manners. C) the equator of the Earth. D) the lower boundary of the Arctic region.
- 58) An arcsecond is a measure of A) length along a circle. B) time interval between successive orbital positions. C) time interval between oscillations of a standard clock. D) angle.
- 59) The first people to develop a scientific view of the Universe were A) Sumerians. B) Egyptians. C) Greeks. D) Romans.
- 60) After the passage of a *sidereal* day, the following have returned to their same position in the sky: A) stars. B) Sun. C) Moon. D) comets.
- 61) The Astronomical Unit (AU) is the A) distance from the Earth to the Sun. B) diameter of the Sun. C) diameter of the Earth. D) distance from the Earth to the Moon.
- 62) The ancient structure Stonehenge was used to time A) solstices. B) Milky Way transits. C) eclipses. D) lunar tides.
- 63) Inferior planets are A) fainter than superior planets. B) planets which undergo retrograde motion when they are far from the Sun on the sky. C) always near the Sun on the sky. D) smaller than superior planets.
- 64) All of the following are true of the orbital period of a planet *except* A) it is greater for more massive planets. B) it is one year for the Earth. C) it is the time the planet takes to go around the Sun. D) it is greater for planets further from the Sun.
- 65) According to Newton's Laws, if no force acts on an object, it will A) move on a circular orbit. B) keep going at the same speed and direction. C) slow down and come to a stop. D) accelerate.
- 66) The legacy of Copernicus includes all the following ideas *except* A) scientific theories should predict the results of future experiments. B) mankind occupies a unique position in the Universe. C) mankind may occupy no special position in the Universe. D) the laws of nature are simple.

- 67) The Saros cycle is about A) 8 days. B) 18 years. C) 27,000 years. D) two months.
- 68) Kepler's second law states that as a planet goes around the Sun, in equal times it sweeps out equal A) radii. B) velocities. C) areas. D) periods.
- 69) Which is the correct list in order of *increasing* size? A) Neptune, Sun, Jupiter, Earth, Moon. B) Moon, Earth, Neptune, Jupiter, Sun. C) Earth, Moon, Sun, Neptune, Jupiter. D) Sun, Jupiter, Neptune, Earth, Moon.
- 70) The apparent path of the Sun across our sky, day by day throughout the year, is known as A) the zenith. B) the celestial equator. C) the great circle. D) the ecliptic.
- 71) The Moon rotates A) not at all. B) once a month. C) once a day. D) once a year.
- 72) A total lunar eclipse very similar to the one which occurred in Charlottesville on February 20, 2008 will occur on A) August 15, 2008. B) March 3, 2026. C) March 13, 2044. D) March 24, 2062.
- 73) When the Moon is more than half full, it is said to be A) waxing. B) waning. C) gibbous. D) crescent.
- 74) Charlottesville is at longitude 78° W and latitude 38° N. If you dug a hole straight through the center of the Earth, where would it come out? A) 78° E, 38° S. B) 78° E, 38° N. C) 102° W, 38° S. D) 102° E, 38° S.
- 75) After the Sun, the next nearest star is A) just beyond Jupiter. B) in the Kuiper Belt. C) more than 200,000 times further away. D) in another galaxy.
- 76) Galileo made all of the following discoveries *except* A) sunspots. B) the moons of Mars. C) the craters of the Moon. D) the rings of Saturn.
- 77) An object is undergoing an acceleration in all of the following circumstances *except*: A) it is slowing down very rapidly. B) it is speeding up. C) it is moving very rapidly at a constant speed in a fixed direction. D) it is changing its direction of motion.
- 78) For complicated reasons having to do with accidentally dropping an astronomy text on the head of a professor from an upper dorm window, you find yourself in the office of the Dean one afternoon. Just then, an eccentric alumnus runs in and says he will donate \$237,000 to U.Va. if the Dean can write this number in scientific notation. The Dean is a historian, and is at a loss, but you help him and win his undying gratitude by showing him that the number is A) 2.37×10^{-4} . B) 2.37×10^5 . C) 2.37×10^2 . D) $10^{2.37}$.
- 79) Newton's generalized Kepler's First Law by showing that all of the following were possible orbits *except* A) parabolas. B) ellipses. C) hyperbolas. D) epicycles.

Diagram Question

Below is a diagram of the Moon orbiting around the Earth. The arrows show the direction of the orbit. The diagram is not drawn to scale. The positions of the Sun and Earth are marked. Four positions in the orbit are labeled A, B, C, and D. Give the correct position (A, B, C, D) corresponding to each of these question. Bubble in the correct position (A, B, C, D) on the line with the corresponding question number of the bubble sheet.

Phases: which position corresponds to these phases?

- 80) Full Moon?
- 81) New Moon?
- 82) First Quarter, Half Moon?
- 83) Third Quarter, Half Moon?

Eclipses: at which positions are these eclipses possible?

- 84) Lunar?
- 85) Solar?

Moon Rise: at which position would the Moon rise over the horizon at

- 86) Dawn?
- 87) Midnight?

