

Astronomy 121 – Test # 2

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 #2”, 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 down 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 ages of rocks can be determined from their A) hardness. B) radioactivity. C) color. D) roughness.
- 2) A satellite (moon) orbits a planet with an orbital period of 5 (Earth) days. If the satellite rotates synchronously, its rotation period (in Earth days) is A) 5 days. B) 10 days. C) 1 days. D) 50 days.
- 3) All of the following are characteristics of rockets *except* A) they need a very large amount of fuel as compared to their payload. B) they carry their own fuel. C) they push against the ground to propel themselves. D) they push against the burned fuel to propel themselves.
- 4) The greenhouse effect is an increase in the surface temperature of a planet because A) its thick atmosphere absorbs infrared radiation. B) its thick atmosphere absorbs solar radiation. C) of radioactive heating from its interior. D) of pollution by phosgene gas.
- 5) Bode’s law is A) that planetary orbits are ellipses. B) the law that Terrestrial planets are all located closer to the Sun than Jovian planets. C) an approximate, empirical law giving the distances of planets from the Sun. D) a law giving the masses and diameters of the planets.
- 6) For a satellite in low Earth orbit (just above the surface and atmosphere) the orbital period is about A) 2 days. B) 2 and 1/2 weeks. C) 3 years. D) 1 and 1/2 hours.
- 7) Astronauts inside the Space Station are weightless because A) there is no magnetic field in the Space Station. B) they are in free-fall. C) there is no gravity in space. D) they are very far away from the Earth.

- 8) Reasons for putting telescopes in space include all of the following *except* A) avoiding “seeing”. B) avoiding the glow of the atmosphere. C) it is cheaper to build big telescopes in orbit. D) the ability to observe radiation, such as ultraviolet, which is absorbed in the atmosphere.
- 9) The brightness of light we see from an object A) measures the amount of force the object exerts on us. B) decreases when the distance from us to the object increases. C) measures the mass of the object. D) decreases when the luminosity of the object increases.
- 10) Most exoplanets have been detected by A) signals for aliens on the planets. B) their intense X-ray emission. C) their total eclipses of their parent star. D) the wobble they induce in the motion of their star.
- 11) The primary source of our knowledge of the center of the Earth is the study of A) deep wells. B) earthquakes. C) solar flares. D) craters.
- 12) The tides on the Earth due to the Sun are A) there are no tides due to the Sun. B) about 1/2 as big as those of the Moon. C) very, very much smaller than those of the Moon. D) much bigger than those of the Moon.
- 13) As compared to radio waves, gamma rays have A) lower frequencies. B) longer wavelengths. C) higher speeds. D) greater photon energies.
- 14) The density of a substance measures A) its mass per unit volume. B) its weight. C) its impenetrability to light. D) its mass.
- 15) At any given time, all of the preceding sunspots in the northern hemisphere of the Sun will have the same A) diameter. B) convection cell. C) magnetic polarity. D) color.
- 16) If you started with 100 radioactive atoms with a half-life of 20 seconds, after 40 seconds how many radioactive atoms would be left? A) 0. B) 100. C) 50. D) 25.
- 17) All of the following are true of the escape of atmospheres from planets *except* A) escape affects light molecules or atoms more than heavy ones. B) escape is more likely from a less massive planet than a more massive planet. C) escape is more likely from a cold planet than a hot planet. D) molecules escape whose thermal speed exceeds the escape speed from the planet.
- 18) The radiation belts are A) radioactivity in the Earth’s iron core. B) an alternative to nuclear suspensors. C) the cause of the sky being blue. D) solar wind particles in space trapped by the Earth’s magnetic field.
- 19) The fact that the average density of the Earth is considerably higher than the density of its surface rocks indicates that the Earth has undergone A) differentiation. B) integration. C) dynamation. D) convection.
- 20) Astronauts inside the Space Station are weightless. The force of gravity on the astronauts is A) exactly zero. B) much less than when they are standing on Earth. C) about the same as when they are standing on Earth. D) much more than when they are standing on Earth.
- 21) Particularly high (spring) tides occur A) twice a year. B) once a month. C) twice a month. D) once a year.

- 22) The interior of the Earth is heated by A) magnetic fields. B) chemical reactions. C) radioactivity. D) plate tectonics.
- 23) You are at the seashore at around sunset with a first quarter Moon in the sky. What kind of tide are you experiencing? A) high tide. B) low tide. C) between low and high tide. D) a fall tide.
- 24) Weight is all of the following *except* A) dependent on which planet or moon you are on. B) the force of gravity on an object. C) proportional to mass. D) a form of heat.
- 25) The temperature at the surface of the Sun is about A) 750 K. B) 6000 K. C) 270 K. D) 15 million K.
- 26) A photon is A) a lump of light. B) a micro-meteorite. C) a part of an atom. D) an oriental, foldout bed.
- 27) Mercury contains a large proportion of iron because A) iron floats on mercury. B) iron condenses to a solid at high temperatures. C) iron is magnetic and was attracted to the Sun. D) Mercury is the outermost planet.
- 28) In our Solar System, which of the following planets is not a member of the Terrestrial group? A) Mercury. B) Jupiter. C) Mars. D) Venus.
- 29) During the solar cycle, the positions at which sunspots form move A) towards the convective zone. B) towards the equator. C) towards the west. D) towards the poles.
- 30) The center of the Earth is A) solid uranium. B) a liquid rock core. C) the mantle. D) an iron core.
- 31) The temperature of an object measures A) the luminosity of internal dimensions. B) the kinetic energy of individual atoms. C) the mass of individual molecules. D) the brightness of electromagnetic waves.
- 32) A key feature of the protoplanetary disk when the Solar System formed was the “frost line”, beyond which A) ice could condense. B) rocks could evaporate. C) dust could sublimate. D) hydrogen could ionize.
- 33) The volume of an object is A) the density of the object. B) the mass of the object. C) the amount of space taken up by the object. D) the amount of matter in the object.
- 34) All of following are the results of tidal friction at the present time *except* A) the month is getting longer. B) the Moon rotates once during each orbit around the Earth. C) the Moon is moving closer to the Earth. D) the day is getting longer.
- 35) The light from planets consists of A) reflected infrared light only. B) reflected infrared sunlight and thermal visible radiation. C) thermal X-ray emission. D) reflected visible sunlight and thermal infrared radiation.
- 36) The most physically useful temperature scale is the A) the angular or arc-degree scale. B) absolute or Kelvin scale. C) the internal or Fahrenheit scale. D) the relative or Celsius scale.

- 37) In astronomy, the term “seeing” refers to the fact that A) the Earth’s atmosphere blocks ultraviolet light from reaching the Earth’s surface. B) motions in the air blur the images of stars. C) optical telescopes cannot be built with high magnifications because of structural limitations. D) is “believing”.
- 38) The Sun’s energy is produced by A) magnetic forces in the convective zone. B) magnetic forces in its core. C) nuclear forces in the convective zone. D) nuclear reactions in its core.
- 39) Space missions to the inner (Mercury) or outer (Saturn and beyond) Solar System have been accomplished with the aid of A) nuclear powered rockets. B) rockets launched from the lunar surface. C) gravitational assists from closer planets. D) liquid helium rockets.
- 40) Light is A) a result of gravitation. B) a form of matter. C) a substance containing no energy. D) waves of electricity and magnetism.
- 41) All of the following are *required* to produce dynamo magnetic fields *except* A) convection. B) solid iron cores. C) electrically conducting material. D) rotation.
- 42) A place which has particularly large tides is A) Lake Superior. B) the Bay of Fundy. C) the Dead Sea. D) the Greek Island of Rhodes.
- 43) On your way to class, you got a speeding ticket. The officer determined your speed using a radar gun and which wave effect of light? A) refraction. B) reflection. C) diffraction. D) the Doppler effect.
- 44) The escape velocity from a planet is A) the speed a satellite must move to orbit the planet. B) the speed that heavy atoms in the atmosphere move. C) the speed a satellite must move to orbit the planet synchronously. D) the speed a satellite must move to completely leave the planet and its gravitational pull.
- 45) All of the following are reasons astronomers build telescopes *except* A) to produce clearer images. B) to observe the interior of the Earth and study the mantle. C) to collect more light. D) to observe the Universe in non-visible light which our eyes can’t see.
- 46) The mathematical theory of electricity and magnetism and correct explanation of the nature of light was developed by A) James Clerk Maxwell. B) James T. Kirk. C) Sir Isaac Newton. D) Carl Sagan.
- 47) The Terrestrial planets, as compared to the Jovian planets, share all of these properties *except* A) they rotate faster. B) they are smaller. C) they all have solid surfaces. D) they are all denser.
- 48) Fishers claim that fishing is best during a very high (spring) tide. The Moon was new on April 6. The next good fishing period will be about A) April 28. B) May 5. C) April 12. D) April 20.
- 49) During transits of exoplanets, astronomers have detected A) ring systems. B) intelligent life. C) their atmospheres. D) multiple moon systems.

- 50) The University of Virginia is a partner in what is, arguably, the world's biggest visible light telescope. This telescope is A) the Large Binocular Telescope. B) the Giant Segmented Mirror Telescope. C) the Hubble Space Telescope. D) the McCormick Observatory Refractor.
- 51) The study of exoplanets indicates that, after they form, jovian planets can A) break into multiple terrestrial planets. B) migrate into the inner planetary system. C) accrete their parent star. D) explode by thermonuclear detonations.
- 52) Normal high tides occur about A) twice a day. B) once a day. C) once a week. D) twice a week.
- 53) The wavelength of light is A) the height of waves of light. B) the number of times wave peaks go by. C) the distance between peaks on light waves. D) the speed of light.
- 54) The Sun's surface rotates with a period of about one A) hour. B) month. C) day. D) week.
- 55) The most probable theory for the formation of the Solar System is A) the condensation of a nebula of uranium gas into the Sun and planets. B) a gas and dust cloud condensed to form the Sun and planets at about the same time. C) a capture theory in which the Sun, after formation, captured objects moving through space to form the planets. D) an encounter, in which a passing star ripped off material from the Sun to form the planets.
- 56) Heat is A) the inertia of an object. B) the luminosity of a star. C) the result of convection. D) the kinetic energy of atoms in motion.
- 57) Which of the following wave effects is *not* electromagnetic in nature? A) radio waves. B) seismic waves. C) gamma rays. D) microwaves.
- 58) Which planet or planetary group occupies the next orbital position beyond Saturn? A) Neptune. B) the asteroid belt. C) Uranus. D) Jupiter.
- 59) Continental drift explains all of the following *except* A) the extinction of the dinosaurs. B) the existence of mountain ridges. C) sea floor spreading. D) the occurrence of earthquakes along fault lines around plate boundaries.
- 60) A satellite (moon) orbits a planet with an orbital period of 3 (Earth) days. If the satellite rotates synchronously, its rotation period (in Earth days) is A) 9 days. B) 30 days. C) 2 days. D) 3 days.
- 61) The age of the Solar System is about A) 4.6 billion years. B) 26 million years. C) 26 billion years. D) 4.6 million years.
- 62) When you increase the temperature of an object, all of the following occur *except* A) the velocity of atoms increases. B) the wavelength of thermal radiation increases. C) the amount of heat the object has increases. D) the amount of thermal radiation increases.
- 63) When a rotating nebula collapses, it A) will rotate faster and become a disk. B) will lose all its magnetic field. C) will undergo nuclear fission at its center. D) will heat up and bounce back.

- 64) The magnetic field of the Sun reverses itself every A) 11 months. B) 11 days. C) 11 years. D) 11 million years.
- 65) Reflecting telescopes collect light with A) prisms. B) refractors. C) mirrors. D) lenses.
- 66) The Doppler shift causes A) bands of light and dark colored gases on Mercury. B) the wavelength of light to increase when something moves away from us. C) the period of rotation of a planet to become equal to the period of the orbit. D) hot fluid to rise and cold fluid to fall.
- 67) As one moves inward toward the center of the Sun, A) the temperature and density both decrease. B) the temperature increases and density decreases. C) the temperature decreases and density increases. D) the temperature and density both increase.
- 68) Which of the following substances has the highest density? A) air. B) wood. C) lead. D) water.
- 69) The number of exoplanets currently known is about A) 24. B) 24. C) 240. D) 24,000.
- 70) To give images of the same sharpness (spatial resolution), which kind of telescope must be largest? A) radio. B) infrared. C) X-ray. D) optical.
- 71) The temperature at the center of the Sun is about A) 1500 K. B) 15 million K. C) 6000 K. D) 60 million K.
- 72) The average density of the Earth is about A) 0.1 grams per cubic centimeter. B) 5.5 grams per cubic centimeter. C) 3.1 grams per cubic centimeter. D) 1.0 grams per cubic centimeter.
- 73) The outer gas in the Sun's atmosphere, at a temperature of about 1 million K, is called the A) corona. B) chromosphere. C) convective zone. D) photosphere.
- 74) The largest of the Terrestrial planets is A) Earth. B) Mars. C) Jupiter. D) Venus.
- 75) The term "exoplanets" refers to A) planets in the exterior of the Solar System. B) planets around stars other than the Sun. C) exotic plants found on Venus. D) former planets, such as Pluto and Ceres.
- 76) Which of the following types of electromagnetic radiation can generally penetrate the Earth's atmosphere and reach the Earth from outer space? A) X-ray radiation. B) UV radiation. C) visible light. D) gamma-ray radiation.
- 77) The granulation of the Sun (grainy appearance of its surface) is due to A) convection. B) prominences. C) solar flares. D) plagues.
- 78) To leave the gravitational pull of the Earth and move elsewhere in the Solar System, a space probe must have at least A) the orbital velocity. B) the escape velocity. C) the perigee velocity. D) permission of the U.S. President.
- 79) The Earth's magnetic field A) is due to the solar wind. B) reverses its direction every 100,000 years or so. C) is a permanent magnet. D) is due to low pressure systems.

- 80) All of the following are true of the nebular theory of formation of Solar System *except* A) it says that the Sun formed through the collapse of an interstellar cloud. B) it requires that the Solar System have formed from a Pre-Solar Nebula about 100,000 AU in size. C) it predicts that the formation of planetary systems is a relatively normal and common event. D) it states that the Solar System formed when another star collided with the Sun.
- 81) The Sun is able to keep from being crushed by gravity because the force of gravity is opposed by A) anti-gravity. B) gas pressure. C) magnetic forces. D) nuclear radioactivity.
- 82) The idea of artificial satellites orbiting around the Earth was first proposed by A) Newton. B) Plato. C) Einstein. D) Ptolemy.
- 83) Giant explosions which occur in the atmosphere of the Sun are called solar A) granules. B) neutrinos. C) flares. D) fusions.
- 84) One very surprising discovery among exoplanets are A) planets that are both jovian and terrestrial. B) “hot Jupiters”. C) multiple terrestrial planet systems. D) “cold Mercurys”.
- 85) All of the planets (without exception) A) have solid surfaces. B) revolve around the Sun in the same direction. C) have thick atmospheres. D) have satellites or moons orbiting around them.
- 86) All of the following are true of the mass of an object *except* A) it determines the magnetic field of the object. B) it can be measured in the units of grams. C) it determines how much inertia the object has. D) it measures the amount of matter in the object.
- 87) Continental drift is due to A) atmospheric convection. B) prevailing winds. C) the solar wind. D) convective motions in the Earth’s mantle.
- 88) The number of sunspots increases and decreases with a period of A) 11 million years. B) 11 days. C) 11 months. D) 11 years.
- 89) Plate tectonics is the study of A) table manners. B) the Moon’s tidal influence. C) continental drift. D) solar activity.
- 90) Choose the correct sequence of electromagnetic radiations, in order of *increasing* wavelengths A) UV, visible, IR, radio. B) visible, UV, IR, radio. C) radio, IR, visible, UV. D) UV, visible, radio, IR.
- 91) The higher the frequency of light, A) the shorter the wavelength. B) the longer the wavelength. C) the faster the speed of light. D) the slower the speed of light.
- 92) The last solar maximum was in 2001. The next solar maximum should be in A) 2008. B) 3001. C) 2023. D) 2012.
- 93) In the simple theory of planetary temperatures, the temperature of a planet decreases when A) the albedo (reflectivity) decreases. B) the mass of the planet increases. C) the density of the planet decreases. D) the distance from the Sun increases.