

BROCK UNIVERSITY

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Test 2: November 2016
Course: ASTR 1P01, Section 2
Examination date: 5 November 2016
Time of Examination: 13:00 – 13:50

Number of pages: 10
Number of students: 1274
Time limit: 50 min
Instructor: S. D'Agostino

Answer all questions on the scantron sheet provided. No aids permitted except for a non-programmable calculator. Each question is worth 1 mark. Total number of marks: 50.

DO NOT WRITE YOUR ANSWERS ON YOUR QUESTION PAGE. DOING SO WILL RESULT IN AN ASSIGNED GRADE OF ZERO.

1. There is significant evidence that ancient people used astronomical observations to determine
 - (a) which inane television celebrities to sacrifice.
 - (b) the best times of the year for cave painting.
 - (c) when to plant crops.
 - (d) when to begin interstellar journeys.
2. Eratosthenes determined the size of the Earth about 2200 years ago by
 - (a) sending a team of surveyors on a round-the-world trip.
 - (b) measuring the angles of shadows on the summer solstice and using geometry.
 - (c) measuring the size of the Earth's shadow on the Moon during a lunar eclipse and using geometry.
 - (d) measuring time delays in GPS signals from two different locations on Earth.
3. As first argued by Aristarchus, the observation that the intervals of time between the first-quarter and third-quarter phases of the Moon are very nearly equal implies that
 - (a) our distance from the Moon is much greater than our distance from the Sun.
 - (b) Kepler's third law of planetary motion is valid.
 - (c) our distance from the Sun is much greater than our distance from the Moon.
 - (d) Newton's second law of motion is valid.
4. The motion of a planet moving along an elliptical orbit is slowest when it is
 - (a) closest to the Sun.
 - (b) farthest from the Sun.
 - (c) at an equinox point.
 - (d) at a Lagrange point.

5. Aristarchus argued that the Sun is much larger than the Moon based on his observation that
 - (a) it takes longer for the Sun to rotate once on its axis than the Moon.
 - (b) the time between sunrise and sunset is longer than the time between moonrise and moonset.
 - (c) the Sun is named after a more important mythological god.
 - (d) the Sun and the Moon have the same angular size and the Sun is much farther away than the Moon.

6. Ancient Inuit people in Canada's Arctic used astronomical observations for
 - (a) deciding when to begin their annual migration to watch the NBA playoffs.
 - (b) navigation and weather forecasting.
 - (c) deciding when to plant crops.
 - (d) forecasting plankton migration routes.

7. Aristotle countered the Sun-centred solar system hypothesis of Aristarchus by arguing that the Earth does not move. If the Earth did move, argued Aristotle, then we should observe _____, and at that time it was not observed.
 - (a) a slight wobble in the Sun's apparent motion.
 - (b) neutrino oscillation.
 - (c) stellar precession.
 - (d) stellar parallax.

8. The first person to observe that the Milky Way consisted of an enormous number of individual stars was
 - (a) Aristarchus.
 - (b) Aristotle.
 - (c) Brahe.
 - (d) Copernicus.
 - (e) Galileo.

9. The apparent motions of the planets are close to the ecliptic because
 - (a) planets are visible only when the ecliptic and the celestial equator coincide.
 - (b) the planes of the orbits of the planets are close to the plane of Earth's orbit.
 - (c) only motions close to the zodiac are visible from Earth.
 - (d) a planet is visible only when the Sun, the Earth, and the planet are aligned.

10. Newton lived about
 - (a) 2300 years ago.
 - (b) 600 years ago.
 - (c) 300 years ago.
 - (d) 100 years ago.
11. Aristotle lived about
 - (a) 2300 years ago.
 - (b) 1800 years ago.
 - (c) 500 years ago.
 - (d) 300 years ago.
12. Tides in the Earth's oceans were explained by
 - (a) Copernicus, using his heliocentric model of the solar system.
 - (b) Galileo, using his law of inertia.
 - (c) Kepler, using his first and third laws of planetary motion.
 - (d) Newton, using his law of gravity and his laws of motion.
13. The operation of a rocket in space is an example of Newton's third law of motion, because
 - (a) the force that the exhaust gases exert on the rocket is equal and opposite to the force that the rocket exerts on the exhaust gases.
 - (b) the force that the rocket exerts on the fabric of spacetime is equal and opposite to the force that the fabric of spacetime exerts on the rocket's exhaust gases.
 - (c) the force of the rocket's motion is equal and opposite to the force of the motion of the exhaust gases.
 - (d) the force of the rocket's velocity is equal and opposite to the force of the velocity of the exhaust gases.
14. The prevailing medieval view was that the realm of the stars was eternal and unchanging. However, in 1572 Brahe observed _____, which helped to shatter this hypothesis, and helped humans to advance their understanding of the heavens.
 - (a) retrograde motions of planets
 - (b) features on the Moon
 - (c) the rings of Saturn
 - (d) a supernova, and he determined that it was farther away than the Moon
 - (e) stellar parallax

15. One of Copernicus's great advances was to
- (a) measure the relative size of each planet.
 - (b) precisely measure the relative brightness of each planet.
 - (c) determine the composition of the atmosphere of each planet.
 - (d) explain the retrograde motions of planets more simply.
16. Ancient astronomers believed that planetary orbits are circles, because circles are the most perfect geometric shape. Using painstaking and lengthy calculations, based on careful observations of his predecessor _____, the astronomer _____ determined that planetary orbits are ellipses.
- (a) Galileo, Newton
 - (b) Brahe, Kepler
 - (c) Copernicus, Hubble
 - (d) Aristotle, Ptolemy
17. A planet normally appears to move towards the east with respect to the stars because of
- (a) the rotation of the Earth on its axis.
 - (b) the Earth's orbital motion around the Sun.
 - (c) the rotation of the planet on its axis.
 - (d) the planet's orbital motion around the Sun.
18. Occasionally a planet appears to move towards the west with respect to the stars (retrograde motion) because
- (a) the Earth and the other planets travel along different orbits at different speeds.
 - (b) planets sometimes travel through dense clouds of gas and dust that cause them to reverse direction temporarily.
 - (c) of precession of planetary orbits.
 - (d) of instabilities in the interplanetary glutino flux.
19. One of the main problems of ancient astronomy was an understanding of planetary motion. The simple geocentric model, with circular orbits, was modified by Ptolemy by his inclusion of
- (a) stellar parallax.
 - (b) the Kuiper belt.
 - (c) epicycles.
 - (d) asteroids.
 - (e) comets.

20. Kepler's second law of planetary motion states that
- (a) the orbital speed of a planet varies so that an imaginary line joining the planet to the Sun sweeps over equal areas in equal times.
 - (b) the force exerted by the Sun on a planet is inversely proportional to the distance between them.
 - (c) the force exerted by the Sun on a planet is proportional to the mass of the planet and the acceleration of the planet.
 - (d) each planet's average kinetic energy is equal to its average potential energy.
21. As described by Kepler's third law of planetary motion,
- (a) planets closer to the Sun have shorter periods.
 - (b) planets closer to the Sun have longer periods.
 - (c) the period of a planet does not depend on its distance from the Sun.
 - (d) the period of a planet is related to its distance from the Sun, but not in a way described here.
22. Radio waves from space
- (a) can be detected by radio telescopes on the surface of the Earth.
 - (b) are blocked by the Earth's atmosphere, and so can only be observed by radio telescopes orbiting the Earth.
 - (c) [No radio waves come to the Earth from space.]
23. Who determined that gravity is responsible for keeping the Moon in its orbit around the Earth?
- (a) Copernicus.
 - (b) Galileo
 - (c) Kepler.
 - (d) Newton.
24. Observations by _____ provided decisive evidence for the heliocentric model of the solar system.
- (a) Brahe of the motions of the planets
 - (b) Galileo of the phases of Venus
 - (c) Huygens of the rings of Saturn
 - (d) Kepler of the orbit of Mars
 - (e) Newton of falling apples

25. Infrared light was discovered by _____ in the 1800s.
- (a) Aristarchus
 - (b) Galileo
 - (c) Herschel
 - (d) Kepler
26. The two main kinds of optical telescopes are
- (a) diffractors and deflectors.
 - (b) focal and confocal.
 - (c) photonic and wavelike.
 - (d) refractors and reflectors.
27. Among Newton's great advances are his discoveries of
- (a) laws of motion, law of gravity, and applications of them to explain many kinds of motion in the solar system.
 - (b) quantum mechanics, and applications to explaining light and colour.
 - (c) curved spacetime, and applications to explaining black holes.
 - (d) quasars, and the subatomic particles emitted by them, quasalinos.
28. Observations during a total solar eclipse show that the angular sizes of the Sun and Moon are nearly equal. Therefore, if the Sun is about 400 times farther from us than the Moon, the diameter of the Sun must be about _____ the diameter of the Moon.
- (a) 1/400th of
 - (b) 1/20th of
 - (c) the same as
 - (d) 20 times
 - (e) 400 times
29. The prevailing medieval view was that all objects in the solar system orbit the Earth. Observation of moons of Jupiter in the early 1600s by _____ suggested that objects in the solar system could orbit other objects, not just Earth, and so helped humans to advance their simplistic views of the heavens.
- (a) Copernicus
 - (b) Galileo
 - (c) Kepler
 - (d) Newton

30. After the fall of Constantinople in 1453, many scholars travelled to _____, bringing with them the collective wisdom of centuries of _____ thought, and thereby contributed to the Renaissance.
- (a) North America / European
 - (b) South America / African
 - (c) Asia / North American
 - (d) Europe / Middle Eastern and Asian
31. The three important powers of an optical telescope are its
- (a) diffraction power, interference power, and adaptive power.
 - (b) length, mass, and time.
 - (c) optical power, fringing power, and dodecahedral power.
 - (d) light-gathering power, resolving power, and magnifying power.
32. An atom becomes excited when
- (a) its favourite celebrity appears on *Dancing with the Stars*.
 - (b) one of its chemical bonds is broken.
 - (c) one of its electrons “jumps” to a higher energy level.
 - (d) it undergoes de-ionization.
33. It is possible to determine the mass of a planet from the orbital data (the period and the orbital radius) of one of its satellites.
- (a) True.
 - (b) False.
34. There are no X-ray telescopes on Earth because
- (a) no X-rays are emitted from astronomical objects.
 - (b) astronomers can't afford to construct an X-ray telescope.
 - (c) X-rays from space are almost completely blocked by Earth's atmosphere.
 - (d) X-ray telescopes are beyond our current level of technology.
35. A spectrograph
- (a) is a toy popular in the 1970s used to make spiral patterns.
 - (b) is a graph used to plot the intensity of light received from various stars.
 - (c) is a device used to separate visible light into its separate colours.
 - (d) is a device used to record very faint astronomical images.

36. Which of the following was a valid argument against the heliocentric model proposed by some ancient Greek astronomers?
- (a) The Earth would lose its Moon if it were revolving around the Sun.
 - (b) The heliocentric model contradicted the ideas of Aristotle.
 - (c) Things would fall off the Earth if it were moving.
 - (d) Stellar parallax was not observed.
37. Concerning Newton's laws of gravity, Newton's laws of motion, and Kepler's laws of planetary motion,
- (a) Kepler used his laws to explain Newton's laws of gravity.
 - (b) Kepler used his laws to explain Newton's laws of motion.
 - (c) Newton used his laws to explain Kepler's laws.
 - (d) [The laws are all independent.]
38. If the net force acting on an object doubles in magnitude, but acts in the same direction, then
- (a) the speed of the object doubles.
 - (b) the velocity of the object doubles.
 - (c) the acceleration of the object doubles.
 - (d) [None of the others.]
39. Your mass is
- (a) the same on Earth as it is on the Moon.
 - (b) greater on Earth than it is on the Moon.
 - (c) less on Earth than it is on the Moon.
 - (d) [It depends on your state of motion in each location.]
40. If the distance between two bodies is increased by a factor of 4, the force of gravity each exerts on the other is
- (a) decreased by a factor of 4.
 - (b) increased by a factor of 4.
 - (c) decreased by a factor of 16.
 - (d) increased by a factor of 16.
41. When an atom is excited, it typically returns to its "ground state" by
- (a) emitting a photon of electromagnetic radiation.
 - (b) emitting an electron.
 - (c) emitting a neutron.
 - (d) emitting a proton.

42. Geosynchronous satellites are ideal for communications networks because
- (a) they always remain above the same point on Earth.
 - (b) they are much closer to the Moon than to the Earth, so they are always visible.
 - (c) they move around the Earth at extremely high speeds.
43. Astronauts in orbit around the Earth float in their spacecraft because
- (a) they are beyond the reach of gravity.
 - (b) they are far enough away from Earth that gravity is negligible.
 - (c) they are in free fall.
44. Visible light has a variety of wavelengths, and each wavelength is related to the light's
- (a) intensity.
 - (b) polarization.
 - (c) colour.
 - (d) [This is incorrect; all visible light has the same wavelength.]
45. The strength of the gravitational force exerted by the Earth on the Moon is _____ the strength of the gravitational force exerted by the Moon on the Earth.
- (a) greater than
 - (b) equal to
 - (c) less than
 - (d) [The Moon does not exert a gravitational force on the Earth.]
46. For glowing objects, such as the Sun or a star, the wavelength of peak intensity is
- (a) shorter for hotter objects.
 - (b) longer for hotter objects.
 - (c) shorter for larger objects.
 - (d) longer for larger objects.
47. The hottest stars are
- (a) red.
 - (b) orange.
 - (c) yellow.
 - (d) blue.
 - (e) purple.

48. One purpose of Stonehenge seems to have been
- (a) an arena for Druidic curling bonspiels.
 - (b) a golf course for top astronomers.
 - (c) a way of keeping track of the beginning of seasons and making other astronomical measurements.
 - (d) a quarry for producing marble for ancient Druidic sculptures.
49. One of Tycho Brahe's great advances was his observation of _____ , which he observed to be beyond the orbit of the Moon, thereby disputing the ancient belief that the heavens were perfect and unchanging.
- (a) a meteor.
 - (b) an asteroid.
 - (c) a supernova.
 - (d) a galaxy.
50. The nucleus of an atom contains the atom's
- (a) neutrons and electrons.
 - (b) protons and electrons.
 - (c) protons and neutrons.
 - (d) protons, neutrons, and electrons.