

BROCK UNIVERSITY

Test 2: Fall 2018

Course: ASTR 1P01, Section 2

Examination date: 3 November 2018

Time of Examination: 13:00 – 13:50

Number of pages: 10

Number of students: 1351

Time limit: 50 min

Instructor: S. D'Agostino

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

You may use your question page for rough work (for example, to draw diagrams or write notes), but DO NOT WRITE YOUR ANSWERS ON YOUR QUESTION PAGE. If you wish, you may discreetly circle your answers on your question page.

1. The constellations of the zodiac are based on patterns observed and recorded by the ancient
 - (a) Babylonians.
 - (b) Druids.
 - (c) Egyptians.
 - (d) Mayans.
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 fastest when it is
 - (a) closest to the Sun.
 - (b) farthest from the Sun.
 - (c) at an equinox point.
 - (d) at a Lagrange point.

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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 NHL 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 this was not observed.
- (a) a slight wobble in the Sun's apparent motion.
 - (b) neutrino oscillation.
 - (c) stellar precession.
 - (d) stellar parallax.
8. Aristarchus determined the relative sizes of the Earth and the Moon by
- (a) timing a lunar eclipse and using geometry.
 - (b) timing a solar eclipse and using geometry.
 - (c) measuring the Earth-Moon distance and using geometry.
 - (d) measuring the Earth-Sun and Earth-Moon distances and using geometry.
 - (e) [None of the above.]
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. Ptolemy 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 tidal 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. Renaissance astronomers were able to determine the distance of Venus from the Sun by measuring the planet's
 - (a) albedo.
 - (b) angular momentum.
 - (c) maximum altitude.
 - (d) total energy.

15. The greatest naked-eye observer in the history of astronomy was
- (a) Tycho Brahe.
 - (b) Trifidus Nebularus.
 - (c) Isaac Newton.
 - (d) Uther Pendragon.
 - (e) Lago Titicaca.
16. After 8 long years of calculations, _____ determined that the orbit of Mars is an ellipse.
- (a) Aristotle
 - (b) Brahe
 - (c) Copernicus
 - (d) Newton
 - (e) [None of the others.]
17. The eccentricity of an ellipse is a measure of its
- (a) size.
 - (b) angular size.
 - (c) deviation from a circle.
 - (d) mass.
18. Most planets in the solar system have orbital eccentricities that are
- (a) 0.1 or less.
 - (b) between 1 and 10.
 - (c) between 10 and 100.
 - (d) between 100 and 1000.
19. Ancient Greek astronomers explained retrograde planetary motion using
- (a) bicycles.
 - (b) epicycles.
 - (c) exocycles.
 - (d) horocycles.
 - (e) kaleidocycles.
20. 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. This is a statement of
- (a) Newton's second law of motion.
 - (b) Kepler's second law of planetary motion.
 - (c) Stefan's second law of areas.
 - (d) Boltzmann's second law of thermodynamics.

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. The astronomer _____ provided convincing evidence for the Sun-centred model of the solar system with his observation of the phases of Venus.
- (a) Aristarchus
 - (b) Aristotle
 - (c) Brahe
 - (d) Galileo
 - (e) Newton
23. The famous library of Alexandria, Egypt, was destroyed and all of its contents were burned shortly after the murder of the director of its observatory, Hypatia, about
- (a) 100 years ago.
 - (b) 500 years ago.
 - (c) 1000 years ago.
 - (d) 2000 years ago.
24. Craters and "seas" on the Moon were seen through a telescope and described by
- (a) Brahe.
 - (b) Copernicus.
 - (c) Galileo.
 - (d) Kepler.
 - (e) Newton.
25. Aristotle hypothesized that the Earth is the only body about which other heavenly bodies revolve. This was decisively disproved by _____, who observed _____.
- (a) Aristarchus / moons revolving about Mercury
 - (b) Galileo / moons revolving about Jupiter
 - (c) Herschel / moons revolving about Neptune
 - (d) Kepler / comets revolving about Venus

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. Object A and Object B have the same angular size, but the diameter of Object A is actually 4 times the diameter of Object B. Therefore, Object A is _____ as far away as Object B.
- (a) 1/4
 - (b) 1/2
 - (c) 2 times
 - (d) 4 times
 - (e) [None of the above.]
29. Stars are much farther away from us than planets. This means that, when observed in an optical telescope,
- (a) planets appear as points and stars appear as diamonds.
 - (b) planets appear as hyperboloids and stars appear as cones.
 - (c) planets appear as disks and stars appear as points.
 - (d) planets appear in colour and stars appear colourless (white).
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 most 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. According to Newton's laws of motion, for an object moving in a circle at a constant speed, the direction of motion of the object
- (a) changes continuously because of a net force acting on the object directed towards the centre of the circle.
 - (b) changes continuously because of a net force acting on the object in the direction of the object's motion.
 - (c) changes continuously, but the net force acting on the object is zero.
 - (d) does not change.
33. It is possible to determine the mass of a planet from the _____ of one of its satellites.
- (a) mass and diameter
 - (b) orbital period and diameter
 - (c) orbital period and orbital radius
 - (d) mass and volume
34. A comet moves in deep space, far from any other object, at a constant speed in a straight line. According to Newton's first law of motion, the net force acting on the comet is
- (a) zero.
 - (b) not zero, and is in the direction of the comet's motion.
 - (c) not zero, and is in the direction opposite to the comet's motion.
 - (d) not zero, and is in a direction perpendicular to the comet's motion.
35. Equal non-zero net forces act on Objects A and B. The mass of Object A is twice the mass of Object B. The acceleration of Object A is _____ the acceleration of Object B.
- (a) 1/4
 - (b) 1/2
 - (c) equal to
 - (d) 2 times
 - (e) 4 times

36. Object A has twice the mass of Object B. Both objects are dropped from the same height near the surface of the Earth. If air resistance is negligible, the acceleration of Object A is _____ the acceleration of Object B.
- (a) 1/4
 - (b) 1/2
 - (c) equal to
 - (d) 2 times
 - (e) 4 times
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. One of Newton's great advances was to realize that the pull of Earth's gravity
- (a) extends only up to a few hundred kilometres above the Earth's surface.
 - (b) extends only up to the top of Earth's atmosphere.
 - (c) extends as far as the Moon, but no farther.
 - (d) extends as far as the Moon and beyond.
39. Light is
- (a) a nuclear radiation wave.
 - (b) a hydrodynamic wave.
 - (c) an electromagnetic wave.
 - (d) a charged sound wave.
40. For visible light photons, the energy of each photon is greater for photons of
- (a) longer wavelength.
 - (b) shorter wavelength.
 - (c) [The energy of a photon is not related to its wavelength.]
41. When an atom is excited, it typically returns to its "ground state" by
- (a) emitting a photon.
 - (b) emitting an electron.
 - (c) emitting a neutron.
 - (d) emitting a proton.

42. The wavelengths of visible light range from about
- (a) 400 nm to 700 nm.
 - (b) 400 mm to 700 mm.
 - (c) 400 cm to 700 cm.
 - (d) 400 m to 700 m.
43. Radio waves from outer space
- (a) can easily pass through the Earth's atmosphere.
 - (b) cannot easily pass through the Earth's atmosphere.
 - (c) [No radio waves are produced in outer space.]
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. Most ultraviolet light from outer space that is directed towards Earth
- (a) reaches the Earth's surface.
 - (b) is blocked by the ozone layer in the atmosphere.
 - (c) is blocked by water vapour in the atmosphere.
 - (d) is blocked by carbon dioxide gas in the atmosphere.
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. The Hubble space telescope has an objective mirror with a diameter of
- (a) 2.4 cm.
 - (b) 2.4 m.
 - (c) 2.4 km.
 - (d) 2.4 nm.
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.