

**BROCK UNIVERSITY**

Test 2: May 2017

Course: ASTR 1P01

Examination date: 27 May 2017

Time of Examination: 13:00 – 13:50

Number of pages: 10

Number of students: 596

Time limit: 2 hours

Instructor: S. D'Agostino

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**Answer all questions on the scantron sheet provided. No aids permitted except for a non-programmable calculator (this regulation does not preclude special arrangements being made for students with disabilities). Translation dictionaries (e.g., English-French) or other dictionaries (thesaurus, definitions, technical) are not allowed. Use or possession of unauthorized materials or electronic devices will result in a charge of academic misconduct under the University's Academic Integrity Policy.**

**Each question is worth 1 mark. Total number of marks: 50.**

**Return both the exam script and your scantron sheet when you leave the exam room.**

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

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1. There is significant evidence that Stonehenge was used for astronomical observations. Building of Stonehenge began
  - (a) about 50,000 years ago.
  - (b) about 5,000 years ago.
  - (c) about 500 years ago.
  - (d) about 50 years ago.
2. Eratosthenes determined the size of the Earth by measuring the angles of shadows on the summer solstice and using geometry. He did this
  - (a) about 2200 years ago.
  - (b) about 1500 years ago.
  - (c) about 800 years ago.
  - (d) about 200 years ago.
3. 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.

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 a solstice point.
  - (d) at a Lagrange point.
  
5. The observation that the intervals of time between the first-quarter and third-quarter phases of the Moon are very nearly equal implies that our distance from the Sun is much greater than our distance from the Moon. The first known person to make this argument was
  - (a) Aristotle.
  - (b) Brahe.
  - (c) Kepler.
  - (d) Galileo.
  - (e) [None of the others.]
  
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. Ancient astronomers did not observe stellar parallax. This supported the ancient argument that
  - (a) the Sun is at the centre of the solar system and planets orbit around the Sun.
  - (b) the Sun emits neutrinos at an enormous rate.
  - (c) the Sun is much farther from the Earth than the Moon is.
  - (d) the Sun produces light using nuclear fusion.
  - (e) [None of the others.]
  
8. The observation that the Milky Way consists of an enormous number of individual stars was first made
  - (a) in the 1400s.
  - (b) in the 1600s.
  - (c) in the 1800s.
  - (d) in the 1900s.
  - (e) within the past 15 years.

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9. The Crab nebula is the remnant of a supernova explosion that was observed
- (a) by Babylonian astronomers about 10,000 years ago.
  - (b) by Aztec astronomers about 5,000 years ago.
  - (c) by Chinese astronomers about 1000 years ago.
  - (d) by indigenous North American astronomers about 500 years ago.
10. A major scientist who lived soon after Galileo died and built on Galileo's work was
- (a) Aristarchus.
  - (b) Brahe.
  - (c) Copernicus.
  - (d) Newton.
  - (e) [More than one of the above.]
11. Copernicus lived about
- (a) 2300 years ago.
  - (b) 2000 years ago.
  - (c) 500 years ago.
  - (d) 100 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
- (a) Newton's first law of motion.
  - (b) Newton's second law of motion.
  - (c) Newton's third law of motion.
  - (d) Newton's law of gravity.
14. One of Kepler'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) observe stellar parallax.
  - (e) determine that planets move around the Sun in elliptical orbits.

15. 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
16. The Earth is much more massive than the Moon. The gravitational force that the Earth exerts on the Moon is \_\_\_\_\_ the gravitational force that the Moon exerts on the Earth.
- (a) greater than
  - (b) equal to
  - (c) less than
  - (d) [Only the Earth exerts a gravitational force on the Moon; the Moon responds to this force, but does not exert a force on the Earth.]
17. A planet normally appears to move towards the east with respect to the stars because
- (a) of the rotation of the Earth on its axis.
  - (b) of the Earth's orbital motion around the Sun.
  - (c) of the rotation of the planet on its axis.
  - (d) of 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) elliptical horocycles.
  - (b) epicycles.
  - (c) hypocycloids.
  - (d) stellar parallax.
  - (e) zodiacal cycles.

20. The mass of a planet can be deduced from \_\_\_\_\_ of one of its satellites by using Newton's formulation of Kepler's third law.
- (a) the mass and the orbital radius
  - (b) the orbital period and the orbital radius
  - (c) the mass and the orbital period
  - (d) [None of the others.]
21. 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.]
22. According to Newton's laws of motion, the net force exerted on an object moving in a circle at a constant speed is
- (a) zero.
  - (b) directly towards the centre of the circle.
  - (c) directly away from the centre of the circle.
  - (d) along the path of the object's motion.
23. Which of the following types of electromagnetic radiation has the longest wavelength?
- (a) Red light.
  - (b) Blue light.
  - (c) Coors light.
  - (d) X-rays.
  - (e) Microwaves.
24. Which of the following types of electromagnetic radiation has the shortest wavelength?
- (a) Red light.
  - (b) Blue light.
  - (c) Miller light.
  - (d) X-rays.
  - (e) Microwaves.
25. The objective element for a reflecting optical telescope is a
- (a) diffraction grating.
  - (b) interferometer.
  - (c) mirror.
  - (d) lens.

26. The objective element for a refracting optical telescope is a
- (a) diffraction grating.
  - (b) interferometer.
  - (c) mirror.
  - (d) lens.
27. Among the important observations by Galileo that persuaded scientists to discard the geocentric model of the solar system and adopt the heliocentric model were
- (a) the phases of Venus
  - (b) the moons of Neptune
  - (c) the retrograde motion of Jupiter
  - (d) [All of the above.]
  - (e) [None of the above.]
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 \_\_\_\_\_ 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) craters and mountains on the Moon
  - (b) comets
  - (c) moons of Jupiter
  - (d) asteroids
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. A photon of which of the following type of electromagnetic radiation carries the most energy?
- (a) Red light.
  - (b) Blue light.
  - (c) Coors light.
  - (d) X-rays.
  - (e) Microwaves.
33. A photon of which of the following type of electromagnetic radiation carries the least energy?
- (a) Red light.
  - (b) Blue light.
  - (c) Miller light.
  - (d) X-rays.
  - (e) Microwaves.
34. 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.
35. If the net force acting on an object doubles in magnitude, but acts in the same direction, then
- (a) the speed of the object certainly doubles.
  - (b) the velocity of the object certainly doubles.
  - (c) the acceleration of the object certainly doubles.
  - (d) [None of the others.]
36. Your weight 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.

37. If the distance between two bodies is decreased by a factor of 2, 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.
38. When an atom absorbs a photon of electromagnetic radiation, it makes a transition into
- (a) a lower-energy state.
  - (b) a higher-energy state.
  - (c) a higher-wavelength state.
  - (d) a lower-wavelength state.
39. 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.
40. 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.
41. The colour of visible light depends on the light's
- (a) coherence.
  - (b) intensity.
  - (c) polarization.
  - (d) wavelength.
  - (e) [None of the others.]
42. For glowing objects, such as the Sun or a star, the wavelength of peak intensity is
- (a) shorter for cooler objects.
  - (b) longer for cooler objects.
  - (c) shorter for more smaller objects.
  - (d) longer for more larger objects.

43. The hottest stars are
- (a) red.
  - (b) orange.
  - (c) yellow.
  - (d) green.
  - (e) [None of the above.]
44. 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.
45. 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.
46. If the light-gathering power of Telescope A is 4 times as great as the light-gathering power of Telescope B, then the diameter of the objective lens of Telescope A is \_\_\_\_\_ the diameter of the objective lens of Telescope B.
- (a) 2 times
  - (b) 4 times
  - (c) 8 times
  - (d) 16 times
47. The leader of the "Hubble Space Telescope Key Project on the Extragalactic Distance Scale" was led by astronomer
- (a) Margaret Atwood.
  - (b) Wendy Freedman.
  - (c) Mavis Gallant.
  - (d) Edwin Hubble.
  - (e) Mary Wollstonecraft.

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48. One can change the light-gathering power of an optical telescope by
- (a) using a different eye piece.
  - (b) making the telescope's tube longer.
  - (c) making the telescope's tube shorter.
  - (d) [All of the above.]
  - (e) [None of the above.]
49. The best site on Earth for an optical telescope is a place where the air is
- (a) dry and dense.
  - (b) dry and not very dense.
  - (c) moist and dense.
  - (d) moist and not very dense.
50. Most X-rays from space that reach the top of the Earth's atmosphere are
- (a) blocked by the Earth's atmosphere.
  - (b) pass through the Earth's atmosphere and reach the ground.
  - (c) [There are no X-rays from space.]