BROCK UNIVERSITY

Test 2: Spring 2019
Course: ASTR 1P01, Section 1
Examination date: 25 May 2019
Time of Examination: 12:00 – 12:50

Number of pages: 10
Number of students: 566
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. Which of the following types of electromagnetic radiation has the shortest wavelength?
   (a) * Gamma rays.
   (b) Infrared light.
   (c) Radio waves.
   (d) Ultraviolet light.
   (e) X-rays.

2. The largest optical telescopes on Earth are currently
   (a) deflectors.
   (b) diffractors.
   (c) refractors.
   (d) * reflectors.

3. The most prolific telescope master builder of the early 20th century was
   (a) Christian Bale.
   (b) Wellington Gale.
   (c) * George Hale.
   (d) Mikhail Vale.
   (e) [None of the others.]

4. The mass of the Sun is greater than the mass of the Earth. Therefore, the gravitational force that the Sun exerts on the Earth is _____ the gravitational force that the Earth exerts on the Sun.
   (a) greater than
   (b) * equal to
   (c) less than

5. On the Moon, two objects (Object A and Object B) are dropped from the same height. The mass of Object A is greater than the mass of Object B. When they hit the Moon's surface, which object has the greater speed?
   (a) Object A has the greater speed.
   (b) Object B has the greater speed.
   (c) * Object A and Object B have the same speed.
   (d) [It depends on the height from which they are dropped.]

6. 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.

7. A photon of which of the following type of electromagnetic radiation carries the most energy?
   (a) Blue light.
   (b) Coors light.
   (c) Microwaves.
   (d) Red light.
   (e) * X-rays.

8. With a telescope that has Cassegrain focal arrangement, viewing is done from
   (a) inside the telescope.
   (b) * behind the objective.
   (c) the side of the telescope.

9. Which statement is correct?
   (a) * Kepler's laws can be derived using Newton's laws of motion and Newton's law of gravity.
   (b) Newton's laws of motion and Newton's law of gravity can be derived using Kepler's laws.
   (c) [Neither of the above statements is correct.]

10. 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 smaller objects.
   (d) longer for larger objects.

11. Which of the following types of electromagnetic radiation has the longest wavelength?
    (a) Blue light.
    (b) Green light.
    (c) Orange light.
    (d) * Red light.
    (e) Yellow light.

12. Object A exerts a gravitational force on Object B. If the mass of each object were to suddenly double, and everything else remained the same, then the gravitational force that Object A exerts on Object B would
    (a) decrease by a factor of 4.
    (b) decrease by a factor of 2.
    (c) remain the same.
    (d) increase by a factor of 2.
    (e) * increase by a factor of 4.

13. 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.

14. Light is
    (a) a nuclear radiation wave.
    (b) a hydrodynamic wave.
    (c) * an electromagnetic wave.
    (d) a charged sound wave.

15. 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.]

16. 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.

17. The Chandra X-ray observatory is located

    (a) at the bottom of the West Virginia Gold Mine.
    (b) at the top of Denali Mountain in Alaska.
    (c) within a Hawaiian volcano.
    (d) * in orbit around the Earth.
    (e) [None of the above.]

18. If the diameter of the objective lens of Telescope A is 4 times as great as that of Telescope B, then the light-gathering power of Telescope A is _____ that of Telescope B.

    (a) 2 times
    (b) 4 times
    (c) 8 times
    (d) * 16 times

19. The first recorded evidence that the Earth is round dates from

    (a) more than 2 million years ago.
    (b) * more than 2 thousand years ago.
    (c) about 500 years ago.
    (d) about 100 years ago.

20. 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.

21. 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.]

22. Seen from Earth, the angular size of the Moon is _____ the angular size of Jupiter.
    (a) * much greater than
    (b) about the same as
    (c) much less than

23. 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 a solstice point.
    (d) at a Lagrange point.

24. The first fairly accurate determination of the Earth's diameter was made
    (a) about 200 years ago.
    (b) * about 2000 years ago.
    (c) about 20,000 years ago.
    (d) about 200,000 years ago.

25. 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.

26. The intervals of time between the first-quarter and third-quarter phases of the Moon are nearly equal, which 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) * Aristarchus.
    (b) Aristotle.
    (c) Copernicus.
    (d) Kepler.
    (e) Galileo.

27. The best place on Earth for an optical telescopes is
    (a) deep in a valley, protected from ambient light.
    (b) in the centre of a large city, where WiFi connectivity is best.
    (c) in a tropical rain forest, far from inhabited regions.
    (d) deep in and underground mine.
    (e) * [None of the others.]

28. The typical wavelengths of visible light are about hundreds of

    (a) kilometres.
    (b) metres.
    (c) millimetres
    (d) micrometres.
    (e) * nanometres.

29. 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.

30. The first law of motion (if the net force acting on an object is zero, then the object's acceleration is also zero) was first clearly stated by

    (a) Aristotle.
    (b) * Galileo.
    (c) Newton.
    (d) Ptolemy.
    (e) [None one of the above.]

31. _____ devised a magnitude system for ranking stars according to their apparent brightness.

    (a) Aristarchus.
    (b) Brahe.
    (c) Copernicus.
    (d) Galileo.
    (e) * Hipparchus.

32. The colour of visible light depends on the light's

    (a) coherence.
    (b) intensity.
    (c) polarization.
    (d) * wavelength.
    (e) [None of the others.]

33. Astrology originated in

    (a) * Babylonia about 2500 years ago.
    (b) Egypt about 3000 years ago.
    (c) Persia about 4000 years ago.
    (d) Phoenicia about 5000 years ago.
    (e) Zoroastria about 6000 years ago.

34. The hottest stars are

    (a) green.
    (b) orange.
    (c) red.
    (d) yellow.
    (e) * [None of the above.]

35. The ancient Greek astronomer Aristotle presented arguments to support his hypothesis that the Earth is

    (a) flat.
    (b) crunchy on the outside and chewy on the inside.
    (c) * spherical.
    (d) hyperbolic.

36. X-rays from outer space

    (a) can easily pass through the Earth's atmosphere.
    (b) * cannot easily pass through the Earth's atmosphere.
    (c) [No X-rays are produced in outer space.]

37. The precession of the Earth's rotation axis was first noted by

    (a) Aristarchus.
    (b) Aristophanes.
    (c) Aristotle.
    (d) Asterix.
    (e) * [None of the others.]

38. Kepler lived about

    (a) 2300 years ago.
    (b) * 400 years ago.
    (c) 200 years ago.
    (d) 100 years ago.

39. Ptolemy's model of the solar system involving epicycles was an attempt to explain

    (a) the rotation of the Earth on its axis.
    (b) the Earth's orbital motion around the Sun.
    (c) * the apparent retrograde motion of planets.
    (d) tides.

40. The English word *planet* derives from

    (a) an Arabic word meaning desert lamp.
    (b) a Chinese word meaning dragon's gaze.
    (c) * a Greek word meaning wanderer.
    (d) a Latin word meaning swift traveller.
    (e) a Persian word meaning elephant's sway.

41. The heliocentric model

    (a) states that the Sun produces light by fusing hydrogen.
    (b) is a big improvement on the heliocastroneves model.
    (c) * states that the planets in the solar system orbit the Sun.
    (d) states that the planets in the solar system orbit the Earth.
    (e) [None of the others.]

42. According to Kepler's second law of planetary motion,

    (a) every action has an equal and opposite reaction.
    (b) * planets orbiting closer to the Sun move faster than planets orbiting farther from the Sun.
    (c) temperatures are higher in the inner solar system than in the outer solar system.
    (d) the force exerted by the Sun on a planet is inversely proportional to the distance between the two.
    (e) [All of the above.]

43. The objective element for a refracting optical telescope is a

    (a) diffraction grating.
    (b) interferometer.
    (c) mirror.
    (d) liquid crystal display.
    (e) * [None of the above.]

44. Kepler's first law states that planets travel around the Sun on orbits that are

    (a) circles.
    (b) * ellipses.
    (c) hyperbolas.
    (d) parabolas.
    (e) [None of the others.]

45. Sunspots were famously seen through a telescope and described by

    (a) Brahe
    (b) Copernicus.
    (c) * Galileo
    (d) Kepler.
    (e) Newton.

46. Newton made great advances in the _____ with his discoveries of laws of motion, a law of gravity, and applications of them to explain many kinds of motion in the solar system.

    (a) late 1400s and early 1500s
    (b) * late 1600s and early 1700s
    (c) late 1800s and early 1900s
    (d) [None of the above.]

47. The largest optical telescopes currently in use on Earth have mirrors or lenses that have diameters of about

    (a) 1 metre.
    (b) * 10 metres.
    (c) 100 metres.
    (d) 1000 metres.
    (e) [None of the above.]

48. A photon of which of the following type of electromagnetic radiation carries the least energy?

    (a) Blue light.
    (b) * Microwaves.
    (c) Miller light.
    (d) Red light.
    (e) X-rays.

49. 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.

50. Object A and Object B have the same mass, but the net force on Object A is twice as large as the net force on Object B. Therefore, the acceleration of Object A is _____ the acceleration of Object B.

    (a) 1/4 of
    (b) 1/2 of
    (c) * 2 times
    (d) 4 times
    (e) [None of the above.]