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. The oldest Mesopotamian records of a lunar eclipse were made
   (a) about 40 years ago.
   (b) about 400 years ago.
   (c) about 4,000 years ago.
   (d) about 40,000 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 slowest 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 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.

6. 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) Aristarchus.
   (b) Aristotle.
   (c) Copernicus.
   (d) Kepler.
   (e) Galileo.

7. 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.

8. 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.]

9. 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.
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. Brahe lived about
   (a) 2300 years ago.
   (b) 2000 years ago.
   (c) 400 years ago.
   (d) 100 years ago.

12. Retrograde motion
   (a) refers to the apparent “backward” motion of planets at certain times.
   (b) is needed so that satellites can land on planets.
   (c) is an apparent vibration of solar prominences.
   (d) refers to a type of “earthquake” that occurs on some neutron stars.

13. In the Renaissance, Nicolaus Copernicus reintroduced the ancient
   (a) Big Bang model.
   (b) cosmic superstring model.
   (c) geocentric model.
   (d) heliocentric model.
   (e) superconducting supercollider model.

14. 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.

15. 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.
16. 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.

17. 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

18. 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.]

19. 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.]

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

(a) diffraction grating.
(b) interferometer.
(c) mirror.
(d) lens.
21. 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.]

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

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

23. 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.]

24. Which of the following types of electromagnetic radiation has the longest wavelength?

(a) Red light.
(b) Blue light.
(c) Coors light.
(d) Radio waves.
(e) Ultraviolet light.

25. Which of the following types of electromagnetic radiation has the shortest wavelength?

(a) Red light.
(b) Blue light.
(c) Miller light.
(d) Radio waves.
(e) Ultraviolet light.
26. The objective element for a reflecting 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. 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) 1/16
   (b) 1/4
   (c) 4 times
   (d) 16 times
   (e) [None of the above.]

29. When optical telescopes were first used to observe the heavens, it was noticed that planets appear as disks but stars appear as points. One can conclude from this observation that
   (a) stars are brighter than planets.
   (b) planets are brighter than stars.
   (c) stars are farther away than planets.
   (d) planets are farther away than stars.

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. 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. If the net force acting on an object triples in magnitude, but acts in the same direction, then
   (a) the acceleration of the object doubles.
   (b) the acceleration of the object triples.
   (c) the acceleration of the object increases by a factor of nine.
   (d) [None of the others.]
36. 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.
37. 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

38. Object A has twice the mass of Object B. The gravitational force that Object A exerts on Object B is ______ the gravitational force that Object B exerts on Object A.

(a) 1/4  
(b) 1/2  
(c) equal to  
(d) 2 times  
(e) 4 times

39. 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.

40. Light is

(a) a nuclear radiation wave.  
(b) a hydrodynamic wave.  
(c) an electromagnetic wave.  
(d) a charged sound wave.

41. 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.]

42. The colour of visible light depends on the light’s

(a) coherence.  
(b) intensity.  
(c) polarization.  
(d) wavelength.  
(e) [None of the others.]
43. The hottest stars are
   (a) red.
   (b) orange.
   (c) yellow.
   (d) green.
   (e) [None of the above.]

44. 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.]

45. 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.]

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 “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.
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.]