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.

1. The average distance from the Sun to Mercury is about
   (a) * 0.39 AU.
   (b) 39 AU.
   (c) 39,000 AU.
   (d) 3,900,000 AU.

2. As observed from above the North Pole, the Earth spins
   (a) clockwise.
   (b) * counter-clockwise.
   (c) from North to South.
   (d) from South to North.

3. The Earth takes _______ to spin on its axis through one complete rotation.
   (a) 1 hour
   (b) * 1 day
   (c) 1 week
   (d) 1 month
   (e) [None of the above.]

4. The distance from the Earth to the Moon is about
   (a) 6,400 km.
   (b) 6,400 AU.
   (c) 6,400 light-years.
   (d) 6,400 parsecs.
   (e) * [None of the above.]
5. Short-period comets originate in the 
   (a) asteroid belt. 
   (b) comet belt. 
   (c) * Kuiper belt. 
   (d) van Allen belt. 
   (e) [None of the above.]

6. The diameter of the Sun is about _______ times the diameter of the Earth. 
   (a) 10 
   (b) * 100 
   (c) 1,000 
   (d) 10,000 

7. The distance between our Sun and the star closest to our Sun is about 
   (a) 4 AU. 
   (b) 4 billion km. 
   (c) * 4 light years. 
   (d) 4 galactic units. 
   (e) [None of the above.] 

8. When observing the Milky Way from Earth, we see more stars when we look 
   (a) * within the plane containing its disk. 
   (b) out of the plane containing its disk. 
   (c) [There is no difference.] 

9. The diameter of the Milky Way is about 
   (a) 1,000 km. 
   (b) 100,000 km. 
   (c) 1,000 light-years. 
   (d) * 100,000 light-years. 

10. Within the Milky Way galaxy, the Sun is located 
    (a) in the bulge. 
    (b) in the core. 
    (c) in the halo. 
    (d) * in the disk. 
    (e) [None of the above.]
11. The local group is a cluster of
   (a) constellations that contains our solar system.
   (b) * galaxies that contains the Milky Way.
   (c) planets that contains the Earth.
   (d) stars that contains our solar system.
   (e) [None of the above.]

12. The universe is believed to have an age of about
   (a) 14 thousand years.
   (b) 14 million years.
   (c) * 14 billion years.
   (d) 14 trillion years.

13. Galaxy clusters form even larger structures, called galaxy
    (a) gigaclusters.
    (b) hyperclusters.
    (c) megaclusters.
    (d) * superclusters.
    (e) [None of the above.]

14. Among the most distant objects visible in the universe are
    (a) homotopy groups.
    (b) pulsars.
    (c) * quasars.
    (d) tensors.
    (e) [All of the above.]

15. The most common type of atom in the universe is
    (a) carbon.
    (b) nitrogen.
    (c) oxygen.
    (d) silicon.
    (e) * [None of the above.]
16. If the entire history of the universe were compressed into a year, with the Big Bang occurring on 1 January and the present moment being midnight on 31 December, then the Milky Way was formed in
   (a) January.
   (b) * May.
   (c) August.
   (d) December.

17. Among the planets Earth, Mars, Saturn, and Venus, the one closest to the Sun is
   (a) Earth.
   (b) Mars.
   (c) Saturn.
   (d) * Venus.

18. Among the planets Earth, Jupiter, Mercury, and Uranus, the one farthest from the Sun is
   (a) Earth.
   (b) Jupiter.
   (c) Mercury.
   (d) * Uranus.

19. A constellation is
   (a) a collection of galaxies that are close together in space.
   (b) a collection of galaxies that appear close together in the sky.
   (c) a collection of stars that are close together in space.
   (d) * a collection of stars that appear close together in the sky.

20. The number of galaxies visible from Earth is
   (a) fewer than 10.
   (b) between 10 and 100.
   (c) between 100 and 1,000.
   (d) between 1,000 and 10,000.
   (e) * [None of the above.]

21. In their daily motions, stars rise in the _______ and set in the _______.
   (a) * east, west
   (b) west, east
   (c) north, south
   (d) south, north
22. A chemical element is defined by the number of _______ in its atoms.
   (a) electrons.
   (b) * protons.
   (c) neutrons.
   (d) quarks.

23. A star rose tonight at 11:00 pm. At the same viewing location, yesterday it rose at about
   (a) 11:50 pm.
   (b) 10:10 pm.
   (c) * 11:04 pm.
   (d) 10:56 pm.

24. The bright star close to the north celestial pole is called
   (a) Beverwijk.
   (b) Nordstrom.
   (c) Nordstellen.
   (d) Stellaluna.
   (e) * [None of the above.]

25. The Earth’s North Pole is tipped most closely towards the Sun on
   (a) the vernal equinox, which occurs on about March 20th.
   (b) * the summer solstice, which occurs on about June 21st.
   (c) the autumnal equinox, which occurs on about September 22nd.
   (d) the winter solstice, which occurs on about December 21st.

26. The names of constellations in English are typically derived from
   (a) Arabic.
   (b) Farsi.
   (c) Hindi.
   (d) * Greek or Latin.

27. At the equinoxes, the Sun rises in St. Catharines
   (a) * directly in the east.
   (b) a little north of east.
   (c) a little south of east.
   (d) directly in the west.
28. At summer solstices, the number of hours between sunrise and sunset in St. Catharines is
   (a) less than 12.
   (b) exactly 12.
   (c) * more than 12.

29. In St. Catharines, after the summer solstice and before fall equinox, the Sun rises a little farther _______ each day.
   (a) north of east
   (b) * south of east
   (c) east of north
   (d) east of south

30. In St. Catharines, after the spring equinox and before the summer solstice, the Sun sets a little farther _______ each day.
   (a) * north of west
   (b) south of west
   (c) west of north
   (d) west of south

31. A new moon occurs when
   (a) * the Moon lies approximately between the Earth and the Sun.
   (b) the Earth lies approximately between the Moon and the Sun.
   (c) the Sun lies approximately between the Earth and the Moon.
   (d) the Sun, Earth, and Moon form an approximate right angle.

32. The phase of the Moon is first quarter when
   (a) the Moon lies approximately between the Earth and the Sun.
   (b) the Earth lies approximately between the Moon and the Sun.
   (c) the Sun lies approximately between the Earth and the Moon.
   (d) * the Sun, Earth, and Moon form an approximate right angle.

33. The full moon rises at about
   (a) noon.
   (b) * sunset.
   (c) midnight.
   (d) sunrise.
34. The first-quarter moon rises at about
   (a) * noon.
   (b) sunset.
   (c) midnight.
   (d) sunrise.

35. The Earth’s rotation axis precesses, and goes through one complete cycle in about
   (a) 26 days.
   (b) 26 years.
   (c) * 26,000 years.
   (d) 26,000,000 years.

36. When the Moon’s phase is waxing crescent it sets
   (a) between sunrise and mid-day.
   (b) between mid-day and sunset.
   (c) * between sunset and the middle of the night.
   (d) between the middle of the night and sunrise.

37. When the Moon’s phase is waning gibbous it sets
   (a) * between sunrise and mid-day.
   (b) between mid-day and sunset.
   (c) between sunset and the middle of the night.
   (d) between the middle of the night and sunrise.

38. When the Moon’s phase is waning gibbous it rises
   (a) between sunrise and mid-day.
   (b) between mid-day and sunset.
   (c) * between sunset and the middle of the night.
   (d) between the middle of the night and sunrise.

39. When the Moon’s phase is waxing crescent it rises
   (a) * between sunrise and mid-day.
   (b) between mid-day and sunset.
   (c) between sunset and the middle of the night.
   (d) between the middle of the night and sunrise.

40. The third-quarter moon sets at about
   (a) sunrise.
   (b) * mid-day.
   (c) sunset.
   (d) the middle of the night.
41. The first-quarter moon rises at about
   (a) sunrise.
   (b) * mid-day.
   (c) sunset.
   (d) the middle of the night.

42. All stars are circumpolar as observed from
   (a) the equator.
   (b) the tropic of cancer.
   (c) * the north pole.

43. The Earth lies directly between the Sun and the Moon
   (a) during a solar eclipse.
   (b) * during a lunar eclipse.
   (c) every day at high noon.
   (d) [None of the above.]

44. The Moon lies directly between the Sun and the Earth
   (a) * during a solar eclipse.
   (b) during a lunar eclipse.
   (c) every day at high noon.
   (d) [None of the above.]

45. A sidereal day is about _______ than a solar day.
   (a) 4 minutes longer
   (b) * 4 minutes shorter
   (c) 50 minutes longer
   (d) 50 minutes shorter

46. The day of the year that has the longest period of daylight is
   (a) the vernal (spring) equinox.
   (b) * the summer solstice.
   (c) the autumnal equinox.
   (d) the winter solstice.
47. As seen from Earth, the apparent angular size of the Sun is ________ the apparent angular size of the Moon.

   (a) larger than
   (b) * about the same as
   (c) smaller than

48. An annular eclipse

   (a) occurs every year (annually).
   (b) occurs due to the position of the back (anterior) part of the Moon.
   (c) * does not block a ring-shaped (annulus) outside part of the Sun.
   (d) [None of the above.]

49. The Moon is still visible during a lunar eclipse because

   (a) some of the Sun's light reflected from Mars illuminates the Moon.
   (b) * the Earth's atmosphere preferentially refracts red light from the Sun that illuminates the Moon.
   (c) the Earth's magnetic field bends the path of red photons that illuminates the Moon.
   (d) [None of the above.]

50. At a particular location on the Earth, the period of totality during a total solar eclipse cannot last longer than about

   (a) 30 seconds.
   (b) 45 seconds.
   (c) 2 minutes.
   (d) * 7 minutes.