Name _____ Date _____

Basics of Radio Astronomy

Final Quiz

1. The radio frequency static Karl Jansky observed in 1931 with his rudimentary radio frequency antenna peaked 4 minutes _____ each day, confirming for him that the source could not be the sun. *earlier*

2. Radio frequency radiation induces a weak _____ in a radio telescope antenna. *current*

3. Electromagnetic radiation travels through space at approximately _____ km per second. *300,000 (299,792)*

4. The frequency of electromagnetic waves is given in units called _____. *Hertz*

5. Wavelength of electromagnetic energy is given in _____ or some decimal fraction thereof. *meters*

6. As electromagnetic radiation spreads out from a source, the area it covers is proportional to the _____ of the distance the radiation has traveled. *square*

7. The property that primarily determines the effects of electromagnetic energy, and therefore how we categorize it, is its _____. *wavelength (or frequency)*

8. Electromagnetic radiation in the frequency range just higher than x-rays is called _____ _____. *gamma rays*

9. The radio range includes the _____ (longest/shortest) wavelengths in the electromagnetic spectrum. *longest*

10. The range of electromagnetic radiation with wavelengths slightly shorter than visible light is called _____. *ultraviolet*

11. The range of electromagnetic radiation with wavelengths slightly longer than visible light is called _____. *Infrared*

12. The GAVRT is currently capable of receiving radio waves in the _____ and _____ bands. *S, X*

13. Electromagnetic waves include both a(n) _____ and a(n) _____ vector at right angles to each other and to the direction of wave propagation. *electric, magnetic*

14. The direction of the electric vector describes an electromagnetic wave's _____. *polarization*

15. The most important property of objects in determining the frequency of the radiation they emit is _____. *temperature*

16. In the case of thermal radiation, the higher the temperature of an emitting object, the _____ energy is contained in its radiation. *more*

17. An object that absorbs and re-emits all the energy that hits it is called a(n) _____. *blackbody*

18. Wien's Law states that the peak amount of energy is emitted at _____ wavelengths for higher temperatures. *shorter*

19. _____ _____ is defined as the energy received per unit area per unit of frequency bandwidth. *Flux density*

20. A plot of a brightness spectrum shows the brightness of radiation from a source plotted against the discrete _____ comprising that radiation. *wavelengths (or frequencies)*

21. Emissions due to temperature of an object, ionization of a gas, and line emissions from atoms are all examples of _____ radiation. *thermal*

22. Neutral hydrogen emits radiation at a characteristic wavelength of _____ cm . *21.11 (or 21)*

23. A region of interstellar space containing neutral hydrogen gas is called a(n) _____ region, while a region containing ionized hydrogen is called a(n) _____ region. *H I, H II*

24. Synchrotron radiation is produced when charged particles spiral about within _____ field lines. *magnetic*

25. Unlike thermal radiation, the intensity of non-thermal radiation often _____ with frequency. *decreases*

26. A dense molecular cloud that greatly amplifies and focuses radiation passing through it is called a _____. *maser*

27. The wavelengths of radiation that we can observe from the ground are limited by Earth's _____. *atmosphere*

28. Radiation that has passed through a cloud of gas produces a spectrum with a characteristic set of dark _____ _____. *absorption lines*

29. Complex organic molecules have been detected in space using the discipline of _____ _____. *molecular spectroscopy*

30. The angle at which an electromagnetic wave is _____ from a surface equals the angle at which it impinged on that surface. *reflected*

31. The ratio of the speed of electromagnetic energy in a vacuum to its speed in a given medium is that medium's _____ ____ _____. *index of refraction*

32. Extraterrestrial objects seen near the horizon are actually (lower or higher) _____ than they appear. *lower*

33. _____ is caused by electromagnetic waves from a source becoming out of phase as they pass through a dynamic medium such as Earth's atmosphere. *Scintillation*

34. _____ _____ is the effect produced when electromagnetic waves become circularly polarized in opposite directions as they pass through magnetic lines of force moving in the same direction as the waves. *Faraday rotation*

35. Gravitational lensing is caused by the _____ of space around large masses. *warping*

36. Doppler effect causes the frequency of waves from a receding object to appear (lower or higher) _____. *lower*

37. _____ _____ is the apparent faster-than-light motion of a discrete source within a quasar. *Superluminal velocity*

38. Occultations provide astronomers good opportunities to study any existing _____ of the occulting object. *atmosphere*

39. A source of radiation whose direction can be identified is said to be a _____ source. *discrete*

40. The origin of cosmic background radiation is believed to be _____ _____ _____. *the big bang*

41. Cepheid variable stars with longer regular periods are more _____ than those with shorter regular periods. *luminous*

42. The activity of the sun varies over about a(n) _____-year cycle. *11*

43. Sunspots are (cooler or hotter) _____ than the surrounding surface of the sun. *cooler*

44. The aurora that sometime appears in Earth's upper atmosphere are associated with solar _____. *flares (*or *wind)*

45. A _____ is a rapidly spinning neutron star. *pulsar*

46. The predominant mechanism producing radiation from a radio galaxy is _____ _____. *synchrotron radiation*

47. The most distant objects so far discovered are _____. *quasars*

48. The radio energy from most planets in the solar system is (thermal or non-thermal) _____ radiation. *thermal*

49. On Jupiter, a compass needle would point _____. *south*

50. The _____ is the region around a planet where the planet's magnetic field dominates the interplanetary field carried by the solar wind. *magnetosphere*

51. Surrounding Jupiter at approximately the orbit of Io is a strongly radiating _____ _____. *plasma torus*

52. Radio telescopes are best placed in (high or low) _____ locations. *low*

53. The great circle around Earth that is at every point the same distance from the north and south poles is called _____. *the equator*

54. Great circles that pass through Earth's north and south poles are called _____. *meridians*

55. In Earth's coordinate system, the north-south component of a location is called _____ . *latitude*

56. In Earth's coordinate system, longitude is measured from the _____ _____ . *prime meridian*

57. A solar day is about 4 minutes (longer or shorter) _____ than a sidereal day. *longer*

58. The Earth's axis precesses around a complete circle having a 23.5 degree radius relative to a fixed point in space over a period of about _____ _____. *26,000 years*

59. A diagram that shows a 360º silhouette of the horizon as viewed from a particular location is called a(n) _____ _____. *horizon mask*

60. In all astronomical coordinate systems and in general usage, _____ is directly overhead and _____ is directly below the observer. *zenith, nadir*

61. In the horizon system of coordinates, the horizontal component of an object's coordinates is given by the _____. *azimuth*

62. In the horizon system of coordinates, the vertical component of an object's coordinates is given by the _____. *elevation*

63. In the equatorial coordinate system, an object's east-west component is given as its _____ _____. *right ascension*

64. In the equatorial coordinate system, an object's north-south component is given as its _____. *declination*

65. _____ is a date of reference used in sky almanacs to take into account slight variations in the celestial coordinates of objects due to the precession of Earth's axis. *epoch*

66. The _____ is the plane formed by the orbit of Earth around the sun. *ecliptic*

67. The reference in the _____ coordinate system is a plane through the sun parallel to the mean plane of the Milky Way galaxy. *galactic*

68. In the Milky Way galaxy alone, the number of planetary systems could be on the order of _____. *billions*

69. The diameter of our galaxy is around _____ light years. *100,000*

70. Astronomers estimate the age of the Universe to be on the order of 15 _____ years. *billion*