MULTIPLE CHOICE

1. Radio telescope dishes are made as large as possible so they are (have):

   a. better resolution   b. easier to steer   c. economical   d. easer to access

2. A 4-m Cassegrain telescope has a hole of 55 cm in diameter. What percentage of the total area will remain for gathering or collecting light.

   a. 98 %   b. 99 %   c. 2 %   d. 100 %

3. What is the main limitation to the resolving power of a particular telescope on the surface of the Earth?

   a. Light pollution   b. Seeing   c. Ozone layer   d. Color of the sky

4. A refracting telescope, compared with a reflecting telescope

   a. is free of chromatic aberration   b. requires aluminizing
   c. can not be used for photography   d. has an objective supported only from its rim

5. Why might some stars appear double in blue light, though they could not be resolved in red light?

   a. The wavelength of blue light is longer than that of the red
   b. The energy of blue light is less than that of the red
   c. The wavelength of blue light is shorter than that of the red
   d. The blue light is usually reflected, but the red light is usually refracted

6. Which one of the following criteria is not important in choosing a site for an optical observatory?

   a. Near Major Cities   b. Good Seeing   c. Dry Climate   d. Many Clear Nights

7. The planets, which do not have moons, are:

   a. Mercury and Venus   b. Venus and Pluto   c. Venus, Pluto, and Mercury   d. Mercury and Pluto

8. Standard time is based on the

   a. mean solar day   b. sidereal month   c. solar eclipse   d. mean lunar month

9. Radio telescopes are always reflecting telescopes because

   a. radio waves are not refracted like light waves   b. radio lenses would be impossibly large
   c. radio waves are not reflected like light waves   d. you can't see radio waves

10. Celestial objects that are so far away to appear as mere points of light no matter how much they are magnified are

   a. zodiacs   b. stars   c. asterisms   d. outer planets

11. The primary element in a refracting telescope is a:

   a. lens   b. correcting plate   c. mirror   d. CCD

12. In a telescope, the use of a longer focal length eyepiece decreases the magnification but increases the

   a. number of colors   b. number of observers   c. size of the objective   d. field of view

13. The instant of the Sun's highest declination is the

   a. vernal equinox   b. autumnal equinox   c. summer solstice   d. winter solstice
14. The average density of Mars is

a. 5.4 g/cm^3 b. 3.9 g/cm^3 c. 3.4 g/cm^3 d. the same as that of Earth

15. Dark, cool regions on the photosphere are called

 a. solar corona   b. solar wind   c. sunspots   d. terminators

16. The first lens the light encounters in a refracting telescope is called the:

 a. image   b. objective   c. prism   d. eyepiece

17. The Sun travels the full length of the ecliptic once in about

 a. 26000 years   b. 24 hours   c. 365 days   d. 354 days

18. One physical characteristic of Mercury that is approximately similar to that of the Earth is the:

 a. size   b. density   c. atmosphere   d. mass

19. Today, astronomical images are usually produced and recorded using

 a. prisms   b. photosphere   c. CCDs   d. photographic plates

20. One of the reasons that observatories are not built on the surface of the Moon is the:

 a. transparency   b. cost   c. seeing   d. light pollution

21. The second lens, which is used to examine and magnify the image produced by the first lens, is in called the:

 a. objective   b. primary   c. eyepiece   d. aperture

22. At what altitude is a star that is setting?

 a. $180°$ b. $90°$ c. $-90°$ d. $0°$

23. What is the ratio of the light gathering power of a 3.4-m reflecting telescope to the HST (2.4 m) telescope ?

 a. 2.0   b. 4.0   c. 8.2   d. 1.4

24. What should be the smallest separation between two stars so the 5-m Palomar telescope will be able to resolve them in green light of 500 nm wavelength?

 a. 0.02 arc second   b. 0.01 arc second   c. 0.10 arc second   d. 0.05 arc second

25. The planet that has the rotational period approximately similar to that of the Earth is:

 a. the Moon   b. Venus   c. Mercury   d. Mars

26. The astronomical basis of the Lunar-Hejriah calendar is the:

 a. 27 days months   b. 30 days months   c. synodic (lunar) months   d. tropical (solar) year

27. The astronomical basis of the Julian or Gregorian calendars is the:

 a. 30 days months   b. 27 days months   c. synodic (lunar) months   d. tropical (solar) year

28. A curved piece of glass or other material that brings all the light of a given wavelength passing through it to a focus is called a:

 a. prism   b. mirror   c. lens   d. diffraction grating

29. Which one of the following physical properties is common between Jupiter and Saturn?

a. Rotational Period   b. Revolution Period   c. Density   d. Diameter

30. The sidereal rotation period of the Moon is about:

a. 27 times that of the Earth   b. 28 of that of the Earth
c. 29 of that of the Earth   d. 30 times that of the Earth

31. The number of days in the month of Zul-Hejjah in the leap years of the Lunar-Hejriah calendar is:

a. 27 days   b. 28 days   c. 29 days   d. 30 days

32. Because the Earth's axis of rotation is tilted to its orbit, the Earth has

a. an atmosphere   b. a magnetic field   c. clouds   d. seasons

33. When the side of the Moon facing the Earth is one half dark it is called a

a. crescent moon   b. full moon   c. new moon   d. quarter moon

34. The nearest planet to the Earth is:

a. the Moon   b. Mercury   c. Mars   d. Venus

35. The mass of the Sun is approximately one thousand times that of:

a. the Moon   b. the Earth   c. Saturn   d. Jupiter

36. The location on the surface of the Earth that is midway between the North Pole and the South Pole is:

a. on the horizon   b. on the equator   c. at Greenwich   d. near the Polaris

37. Compared with the Earth, Mercury has a mass that is

a. about the same   b. ½ as much   c. ¼ as much   d. much less

38. The number of days in the month of February in the simple years of the Gregorian calendar is:

a. 27 days   b. 28 days   c. 29 days   d. 30 days

39. The tilt of the celestial equator to the ecliptic is about:

a. 23½ °   b. 23^h 54^m c. 45 °   d. 67½ °

40. The winter solstice occurs during the month of

a. March   b. June   c. September   d. December

41. In an equatorial mounting of a telescope, one axis points directly at the north celestial pole,
this axis is called the

a. meridian   b. zenith   c. polar axis   d. azimuth

42. In the horizon system, the coordinate that is measured in angular units parallel to the horizon is the

a. altitude   b. azimuth   c. declination   d. right ascension

43. The rotational period of Uranus is approximately equal to that of:

a. Mars   b. Jupiter   c. Saturn   d. Neptune

44. If Dhahran, Saudi Arabia has coordinates of about 50 ° E and 26 ° N and Brasilia, Brazil has coordinate of about 48 ° W and 16 ° S, then Dhahran is to the _ _ _ _ _ _ _ of Brasilia.

    a. west   b. south   c. east   d. south and east

45. The summer solstice in the northern hemisphere occurs during the month of

    a. March   b. June   c. September   d. December

46. The star β Cygnus, in general, should be

    a. brighter than α Cygnus   b. a large star in Cygnus
    c. fainter than α Cygnus   d. a small star in Cygnus

47. The sky has been divided, by the International Astronomical Union, into 88 distinct areas called

    a. asterisms   b. groups   c. constellations   d. zodiacs

48. What is the celestial analogue of latitude?

    a. Zenith   b. Azimuth   c. Declination   d. Ecliptic

49. The visible disk (surface) of the Sun is called:

    a. photosphere   b. solar wind   c. solar corona   d. sun spots

50. Longitude is measured in degrees of angle relative to the

    a. equator   b. north pole   c. vernal equinox   d. prime meridian

51. Magnetic storms on the Earth are caused by the:

    a. solar corona   b. solar wind   c. photosphere   d. sun spots

52. For any location on the Earth there is a point directly overhead in the sky called the

    a. autumnal equinox   b. vernal equinox   c. meridian   d. zenith

53. Relative to a sidereal day, a solar day is

    a. four minutes longer   b. four minutes shorter   c. the same length   d. 24 minutes longer

54. If you were standing at the North Pole the stars would

    a. move parallel to the horizon   b. move perpendicular to the horizon
    c. move at an oblique angle to the horizon   d. be invisible

55. In general, when a telescope is mounted in such a way so it can only move along the horizon and up-down, the mounting system is called:

    a. Cassegrain   b. conventional   c. alt-azimuth   d. equatorial

TRUE/FALSE

56. Electronic devices are more sensitive to faint signals than photographic films.   (   )

57. The sidereal day is based on the apparent movement of the Sun
    while the solar day is based on the stars.   (   )

58. Refracting telescopes are more suitable in studying UV radiation than reflecting telescopes.   (   )

59. A 20-meter radio telescope studying 3-millimeter waves has poorer resolution than
    a 100-meter radio telescope studying 1-centimeter waves.   (   )

60. Since x-rays have such high energies and will pass right through a mirror it is not
    possible to use optical telescopes to study x-ray.   (   )

61. The resolution of any single radio telescope is far better than any single optical telescope.   (   )

62. The full moon is the best time to observe lunar surface features.   (   )

63. The main purpose of building observatories on high mountains is to be able
    to do observations in all types of the electromagnetic waves.   (   )

64. The apparent speed of the Sun changes during the year.   (   )

65. In general, at some latitudes, some stars never rise while others never set.   (   )

66. Declination is measured from celestial equator in degrees.   (   )

67. The eyepieces of refracting and reflecting telescopes can only be held from their rims.   (   )

68. It is not possible to make a large telescope from several small mirrors instead
    of a single large one.   (   )

69. A synodic month is shorter than a sidereal month.   (   )

70. The stars are likely to be twinkling less than the planets.   (   )

71. Today, all major observatories are built at remote sites chosen for the quality
    of their observing conditions.   (   )

Formulas and Constants (PHYS 215, term: 002)

Planet	Radius (km)	Mass (kg)	Ave. Distance From the Sun	Period of Revolution	Period of Rotation	Eccentricity (e)
Mercury	02439	33×10^{22}	057909000 km	00088 days	1408 hrs.	0.206
Venus	06052	49×10^{23}	0108209000 km	00225 days	5832 hrs.	0.007
Earth	06378	60×10^{23}	0150000000 km	365.25 days	0024 hrs.	0.017
Mars	03397	64×10^{22}	0227939000 km	00687 days	0025 hrs.	0.093
Jupiter	71492	19×10^{26}	0778298000 km	04337 days	0010 hrs.	0.048
Saturn	60268	57×10^{25}	1429394000 km	10760 days	0011 hrs.	0.056
Uranus	25559	87×10^{24}	2875039000 km	30700 days	0017 hrs.	0.046
Neptune	24764	10×10^{25}	4504450000 km	60200 days	0016 hrs.	0.010
Pluto	0 1151	11×10^{21}	5915799000 km	90780 days	0153 hrs.	0.248

1 hr.	= 60 min	1 min.	= 60 sec
1 day	= 24 hrs	1 week	= 7 days
1 year	= 365.25 days	1 km	= 1000 m
1 a.u.	= 1.5×10^{11} m	1 m	= 100 cm
1 ly	= 9.46×10^{15} m	1 cm	= 10 mm
1 pc	= 3.09×10^{16} m	c	= 3.0×10^{8} m/s
G	= 6.67×10^{-11} m^3/kg-s^2	$r_{moon-earth}$	= 384403 km
M_{sun}	= 2.0×10^{30} kg	R_{sun}	= 7.0×10^{5} km
M_{earth}	= 6.0×10^{24} kg	R_{earth}	= 6378 km
M_{moon}	= 7.4×10^{22} kg	R_{moon}	= 1738 km

If the value of the a wavelength (λ) is not mentioned in the problem then use the following:
λ (violet) = 400 nm , λ (indigo) = 450 nm , λ (blue) = 500 nm , λ (green) = 550 nm
λ (yellow) = 600 nm , λ (orange) = 650 nm , λ (red) = 700 nm

$\theta = \lambda / 500 \times D$
Mag $= f_o / f_e$
$C = \lambda \times f$

$$P^2 = [4\pi^2 / G M] a^3$$
$$P^2_1 / P^2_2 = a^3_1 / a^3_2$$
(Kepler's 3rd Law)

$$\Delta\lambda / \lambda_o = v / c \qquad \text{(Doppler effect [shift])}$$
$$V = (4/3) \pi R^3 \qquad \text{(volume of a sphere)}$$
$$A = 4 \pi R^2 \qquad \text{(surface area of a sphere)}$$
$$C = 2 \pi R \qquad \text{(Circumference of a circle)}$$
$$a = \pi R^2 \qquad \text{(Area of a circle)}$$

Equation of an ellipse: $\mathbf{r = a (1 - e^2) / (1 + e\ cos\ (\theta))}$

or $\mathbf{x^2 / a^2 + y^2 / b^2 = 1}$

where: **e** is the eccentricity

f$_1$ & **f$_2$** are the locations of the two foci

a & **b** are the semi major axis and semi minor axis, respectively