Review 1

These questions provide a review of the material we have been discussing in class as well as a few exercises to test your understanding of the ideas covered. (All answers should be short: sometimes only a word or number, at most a few sentences.)

Chapter 1

1. How is astronomy done, that is, what type of discipline is Astronomy? What branch of science is concerned with the rules governing matter and energy that guides astronomers?

2. Why is Astronomy done?

3. What does it mean when you say the Moon subtends and angle of $\frac{1}{2}$ degree?

4. If the Moon subtends an angle of $\frac{1}{2}$ degree and is about 400,000 Km from Earth, how do you calculate its diameter? Hint: we did this in class two different ways.

5. How would you define in words what an astronomical unit, light year, and parsec are? Which of these is largest? Which smallest?

6. How fast does light travel in free space?

7. If it takes two minutes (120 seconds) for a space probe to send a message back to Earth, how far away is the probe?

8. How many arcminutes are in a degree? How many arcseconds are in a degree?

9. Remembering powers of ten: What is 3785000000000 expressed in scientific notation? What is 0.0000000000067 expressed in scientific notation?

10. How long does it take to travel to the outer planets, say Saturn, that is does it take a space probe a matter of days, months, or years to get there?
Chapter 2

11. What is a constellation? How many do we have? Are all stars members of constellations?

12. In the course of one night a star rises in the east and sets in the west. Why?

13. From season to season the stars visible at zenith at midnight changes along the southern horizon (but not at the north celestial pole). Why?

14. How much earlier does a star along the southern horizon rise each night? Why? Vega rises at 10:00 pm tonight. What time does it rise tomorrow night? And day after tomorrow?

15. What are the following: the celestial equator, the celestial north and south poles.

16. What is the ecliptic? Is the ecliptic the same thing as the celestial equator?

17. Why do we have seasons on Earth?

18. On the vernal equinox, what does the Sun cross? Does the Sun cross it from below to above or above to below? On the autumnal equinox?

19. On what day or days is the length of the day light hours the same as the night hours for everyone on Earth?

20. Where is the Sun at zenith on the day of the Summer Solstice in the Northern Hemisphere?

21. How is the Arctic and Antarctic Circle defined? On the day of the Summer Solstice in the Northern Hemisphere, where does the sun never rise?

22. Today is the Winter Solstice (in the Northern Hemisphere) and the Sun is at zenith. Where do you live?
23. What is precession?

24. Precession of the Earth’s spin axis results in a shift of the vernal equinox. Why?

25. What is meant by the declination of a celestial object?

26. What is meant by the right ascension of an object?

27. What are the units of declination and right ascension? How many hours of right ascension are there? What direction is zero hours right ascension?

28. What type of time does a wrist watch tell you?

29. Why do we not use apparent solar time?

30. Astronomers use a different day. What is it called? Is it longer or shorter than a mean solar day?

31. When is it zero hours sidereal time?

32. When is it noon (12 hours) sidereal time?

33. If the mean solar time is noon and the sidereal time is noon (12 hours), about what day of the year is it? (See your handout for this.)

34. What is a tropical year? What is a Sidereal Year? Which one do we base our calendar upon? Why is the tropical year shorter than the sidereal year?

35. It is 6 hours sidereal time. What is the right ascension of the celestial objects directly overhead?

Chapter 3

36. Why does the Moon exhibit phases?
37. What are the phases of the Moon?

38. Just after a new moon, what time of day will you see a crescent moon?

39. Just before a new moon, what time of day will you see a crescent moon?

40. Where is the Moon when the phase is new?

41. When the Sun and Moon are separated by 12 hours right ascension, what is the phase of the Moon? Zero hours?

42. The Moon is at first quarter. How much of the Moon is illuminated by the Sun. (Be careful!) Of that how much of the illuminated side is visible from Earth?

43. Suppose an astronaut is visiting the Moon, does the Earth rise and set from his point of view? Does the Sun?

44. Does the Moon always keep the same side pointing toward the Earth?

45. Does the Moon spin on its axis?

46. What is the line of nodes?

47. What conditions are required for a total solar eclipse? Lunar?

48. Why is there not a solar and lunar eclipse each month?

49. What is Eratosthenes famous for?

50. What is a saros? What is an eclipse series?

51. What is Aristarchus noted for?

Chapter 4

52. What is meant by retrograde motion of a planet?
53. What is meant by direct or prograde motion?

54. What does the word planet mean?

55. What does geocentric mean? What does heliocentric mean?

56. What is Ptolemy know for?

57. What is an epicycle? A deferent?

58. What was Copernicus’s model of the planetary system, heliocentric or geocentric? Was it different than Ptolemy’s? Did Copernicus use epicycles?

59. What is meant when we say a planet is at opposition? Opposition is the best time to view which planets?

60. What is meant when we say a planet is at conjunction? Which planets can attain conjunction? Is it a good time to view these planets from Earth?

61. What is inferior conjunction? Superior conjunction? Which planets attain these positions?

62. Tycho Brahe is famous for charting the planets’ positions even though he did not have a telescope. Why was this data important?

63. What is Kepler’s first law?

64. What is Kepler’s second law? What does it mean in regard to the planet’s speed while orbiting? When does the planet travel fastest?

65. What is perihelion? Aphelion?

66. What is Kepler’s third law? What do the symbols mean? What does it mean as far as the length of time required for a planet to orbit as you move farther from the Sun, that is, is the length of the year increase or decrease as you increase the semi-major axis?
67. Who was the first astronomer to use a telescope? Name some things he saw?

68. State the law of gravity as expounded by Newton. What do all the symbols mean?

69. What are Newton’s three laws? What do they mean?

70. What is Edmund Halley famous for, that is, he used Newton’s laws to do what?

71. Who was the first person to measure the speed of light? How fast does light travel in free space? Do x-rays travel at the same speed as radio waves in free space?

72. When light is characterized as a wave, what do you mean by wave velocity, wavelength, and frequency? What is the relationship between wave velocity, wavelength, and frequency?

73. What is the wavelength range of visible light?

74. How does violet light differ from red light?

75. If a radio wave is 3 meters in wavelength, what is the frequency of this wave?

76. What is a blackbody?

77. What are the two radiation laws for a blackbody?

78. If a particular star is cooler than our Sun, will the peak blackbody emission wavelength from that star be at a longer or shorter wavelength than that form the Sun? (Hint: use Wien’s Law)
79. If a blackbody doubles its temperature, what happens to its total radiated energy flux, that is, by what factor does it increase? (Hint: use Stephan’s Law)

80. How is the energy of a photon related to its wavelength? Do shorter wavelength photons have higher or lower energy than long wavelength photons?

81. What is diffraction?

82. What is interference?

83. What type of spectrum does a hot dense source yield?

84. What type of spectrum does a hot transparent gas produce? What type of spectrum does a cool gas in front of a light source give? If the gases are the same, how are the two spectra related?

85. The study of line spectra and continuous spectra is called spectroscopy. Why is it extremely important in astronomy?

86. Who was the first person to explain line spectra in terms of being caused by the structure of the atom?

87. Briefly describe the Bohr atom?

88. What is the Doppler Effect?

89. When a source moves away from the viewer, is its light red or blue shifted?

90. When a source moves toward a viewer, is its light red or blue shifted?

91. Why is the Doppler Effect of significance to astronomers?