Clicker Questions (chapters 6-18)

1. Officially, how many planets are there in our solar system?
a. 8
b. 9
c. dozens

2. The Doppler formula is $v = (\Delta\lambda/\lambda) *$ 300,000 km/sec for light waves. A particular feature is seen at 5000 Angstroms in the laboratory, but we observe it at 5020 Å in the spectrum of a galaxy. What is $\Delta\lambda$?
a. +20 Å
b. −20 Å
c. 5000 Å
d. 5020 Å

3. To continue the previous example, what is the correct means of calculating the radial velocity of the galaxy?
a. v = (20/5000) * 300,000 km/sec away from us
b. v = (20/5000) * 300,000 km/sec towards us
c. v = (20/5020) * 300,000 km/sec away from us
d. v = (20/5020) * 300,000 km/sec towards us

4. An atom of the most common isotope of the most common element in the universe (hydrogen) consists of:
a. two neutrons, two protons and two electrons
b. two neutrons, one proton, and one electron
c. one neutron, one proton, and one electron
d. one proton and one electron

5. A spherical body that orbits a star but has not cleared out the doughnut-shaped volume around the star that it occupies is called a
a. red dwarf
b. white dwarf
c. dwarf planet
d. brown dwarf

6. The bomb that was dropped on Hiroshima on August 6, 1945, had the destructive power of 15.5 thousand tons of dynamite. If a 5 km diameter asteroid hits the Earth, what is its equivalent destructive power?
a. about the same as the Hiroshima bomb
b. about 65 “Hiroshimas” (1 Megaton of TNT)
c. about 3000 “Hiroshimas” (50 Megatons of TNT)
d. about 1 billion times the power of the Hiroshima bomb (15 million Megatons of TNT)

7. According to the web article "Which emits more carbon dioxide: volcanoes or human activities?" (climate.gov) how does the amount of CO_2 outgassed by volcanoes compare to the amount produced by human activities?
a. about 2 percent
b. 10 percent
c. 50 percent
d. volcanoes put out way more CO_2, so we don't really have to worry about car emissions and other such production of greenhouse gases

8. Which of the following is *not* a greenhouse gas?
a. ammonia
b. methane
c. carbon dioxide
d. nitrous oxide

9. At the present epoch what source of energy causes much of the outer core of the Earth to be hot, molten lava?
a. the pressure
b. the infrared emission of the Earth
c. radioactive decay of various unstable elements
d. tidal action of the Sun and Moon

10. A star is at a distance of 12 parsecs. What is its trigonometric parallax?
a. 12 arc seconds
b. 1.2 arc seconds
c. 0.12 arc seconds
d. 0.083 arc seconds

11. The trigonometric parallax of a star is 1/22 of an arc second. How far away is it?
a. 1/22 of a light-year
b. 1/22 of a parsec
c. 22 light-years
d. 22 parsecs

12. If the stars move sideways in random directions by a few tenths of an arc second per year, or a few arc seconds per year, what is one of the long term consequences of this?
a. they will all eventually escape the galaxy
b. they will all eventually be captured by the black hole at the center of the galaxy
c. their radial velocities are mostly zero
d. the constellations will change shape over tens or hundreds of thousands of years

13. Consider two stars of identical size and identical photospheric temperature. So they both give off the same amount of light each second. One star is at a distance of 25 parsecs and has an apparent magnitude of 5.0. The other one is at a distance of 50 parsecs and has an *apparent* magnitude of
a. 5.0 (e.g. the same)
b. fainter than 5.0 (e.g. 6.5)
c. brighter than 5.0 (e.g. 3.5)

14. The Sun's absolute visual magnitude is $M_V = +4.8$. That is to say, if it were at a distancd of 10 parsecs, it would have an apparent magnitude a little brighter than 5. How bright would the Sun be if it were at a distance of 100 pc? You will need $M_V = m_V + 5 - 5 \log (d_{pc})$.
a. apparent mag 4.8
b. apparent mag 9.8
c. apparent mag 14.8
d. apparent mag 104.8

15. The mass of Jupiteris about 1/1000 of the Sun's mass. How many Jupiters would we have to put together to make a star (an object with a core hot enough to fuse protons into helium nuclei)?
a. 8
b. 80
c. 320
d. 800

16. The H-R Diagram is a plot of
a. H vs. R
b. apparent magnitudes of stars vs. their spectral types
c. absolute magnitudes of stars vs. their masses
d. luminosities of stars in L_{sun} vs. their photospheric temperatures
e. masses of stars vs. the letters OBAFGKM

17. The most important parameter related to how long a star lasts as a main sequence star is
a. its initial composition
b. its mass
c. its rotation rate
d. the depth of its outer convection zone

18. What is the length of the main sequence lifetime of a star with a mass of 2 solar masses?
a. 0.2 billion years
b. 1.7 billions years
c. 20 billion years
d. 56 billion years

19. If we aim a radio telescope along the plane of the Milky Way galaxy and tune it to a wavelength of 21 cm we detect the presence of
a. molecular hydrogen
b. cold atomic hydrogen
c. ionized hydrogen
d. interstellar dust

20. What fraction of the mass of the interstellar medium is made up of interstellar dust?
a. 1 percent
b. 10 percent
c. 50 percent
d. 75 percent

21. The Orion Nebula is a star forming region visible to the unaided eye. How might we describe the gas?
a. hot solid, liquid, or dense gas
b. low density gas excited to emit
c. cooler gas between us and a source of continuous radiation
d. degenerate electron gas

B is the right answer to 21. So − the gas between the hot stars in the Orion Nebula shows an *emission line* spectrum.

22. What will be the final stage of the Sun's life?
a. neutron star
b. black hole
c. supernova
d. white dwarf

23. How long does a star of 4 solar masses last as a main sequence star?
a. the same amount of time as the Sun
b. 4 times as long as the Sun
c. 1/4 as long as the Sun
d. $4^{-2.5}$ times as long as the Sun

24. If a Cepheid variable star with a period of 30 days were at a distance of 10 parsecs, what would its apparent brightness be?
a. as bright as the Sun
b. a bit brighter than the planet Venus
c. just barely visible to the unaided eye
d. only visible in a medium size telescope

25. The final end state of a single star with less than 8 solar masses is
a. red giant star
b. white dwarf star
c. Type Ia supernova (exploding white dwarf)
d. Type II supernova (core collapse SN)

26. The final end state of a single star with more than 8 solar masses is
a. supergiant star
b. white dwarf star
c. Type Ia supernova (exploding white dwarf)
d. neutron star or black hole

27. What would happen to the orbit of the Earth if the Sun somehow became a black hole?
a. the Earth's orbit would be unchanged
b. the Earth would get sucked into the black hole
c. the Earth would be ejected from the solar system
d. we have no idea

28. Say a 10 solar mass star blows up at the end of its supergiant phase. It leaves behind a dense remnant having a mass of 2.0 solar masses. The remnant is
a. a black hole
b. a neutron star
c. a white dwarf star

29. Approximately how many stars are there in the Milky Way galaxy?
a. 200 thousand
b. 200 million
c. 200 billion
d. 200 trillion

30. Say you're outside at night on a clear, moonless night in west Texas. Approximately stars could you see with your unaided eye?
a. 50
b. 2000
c. 200,000
d. 200 million

31. Why are Cepheids so important?
a. we know their luminosities, so we can determine their distances
b. they produce pulsars
c. they are about to explode as supernovae
d. they generate most heavy elements

32. What type of star makes a Type II supernova?
a. a neutron star in a mass-transfer binary
b. a black hole
c. a pulsar
d. a single massive star

33. Approximately how far from the Sun are the nearest (other) stars?
a. several light-years
b. several thousand light-years
c. several hundred thousand light-years
d. several million light-years

34. As new generations of stars are formed the fraction of elements heavier than helium in the new stars
a. stays about the same
b. decreases
c. definitely increases

35. When was (or will be) the birth rate of stars from gas and dust a maximum in our galaxy?
a. 13 to 8 billion years ago
b. within the past couple billion years
c. a few billion years in the future

36. The Sun and most of the stars near it are moving
a. at all angles and velocities with respect to the plane of the Galaxy
b. on nearly circular orbits around the center of the Galaxy
c. inevitably toward the black hole at the center of the Galaxy

37. Most of the mass of the Galaxy is in what form?
a. main sequence stars
b. giant stars
c. white dwarfs
d. Dark Matter
e. black holes

38. In which type of galaxy are we *least* likely to find stars being formed at the present epoch?
a. spiral galaxy
b. barred spiral galaxy
c. elliptical galaxy
d. irregular galaxy

39. Let the Hubble constant be 72 km/sec/Mpc. Say there is a galaxy at a distance of 111 Megaparsecs. At what velocity is it receding from us?
a. 800 km/sec
b. 4000 km/sec
c. 8000 km/sec
d. 111 km/sec

40. Say a galaxy's radial velocity is 8000 km/sec. At what fraction of the speed of light is it receding from us?
a. 0.027
b. 0.27
c. 0.60
d. 0.80

41. Say a galaxy is receding from us at 2.7 percent the speed of light. In the lab we observethe hydrogen alpha line at 656.3 nm. At what wavelength would we observe this line in a spectrum of this galaxy?
a. 2.7 percent of 656.3 nm
b. 2.7 percent less than 656.3 nm
c. 2.7 percent more than 656.3 nm
d. it depends on the Hubble constant

42. The Milky Way galaxy
a. is expanding in according with Hubble's Law
b. is contracting because of the black hole in its center
c. is a gravitationally bound entity and is neither expanding nor contracting
d. goes through cycles of expansion and contraction

43. Hubble's Law states that
a. the universe will eventually reach a maximum size, then will recollapse
b. light intensity decreases as the square of the distance
c. red giants are distendedwith a hot white core, less than Chandrasekhar's limit, which is 1.4
d. distant galaxies are receding from us, with velocity of recession proportional to distance

44. What is the minimum distnace Hubble's law is useful for determining the distance to an astronomical object? (Hint: what is the size of the Milky Way galaxy and the distance to the Andromeda galaxy?)
a. 50 light-years
b. 5000 light-years
c. 500,000 light-years
d. 50 million light-years

45. The numerical value of the Hubble constant is most directly related to
a. the age of the universe
b. G, π, the speed of light, and other constants
c. the size of the Astronomical Unit
d. the mass of the Local Group of galaxies

46. Which of the following is getting bigger as a result of the expansion of the universe?
a. the size of the solar system
b. the size of the Milky Way galaxy
c. the distance between the Milky Way and a galaxy 100 megaparsecs away
d. all of the above

47. Which of the following is NOT an astronomical standard candle?
a. an A0 main sequence star
b. Cepheid variable with a period of 20 days
c. Type Ia supernova with a normal decline rate (when at maximum brightness)
d. white dwarf star of mass 0.6 solar masses

48. What distance method can give us the most accurate distance to the planet Venus?
a. main sequence fitting
b. parallax
c. relation between absolute magnitude and apparent magnitude
d. radar