ASTR 138 Fall 2017 Exam 2 – 10/19/2017

Wien's Law: $\lambda_{max} = C / T$, where C = 2,900 in units of (micrometers*Kelvins degrees)
Newton's Universal Law of Gravitation: Force of Gravity = $G M_1 M_2 / R^2$

1) An observer vacations in Cuba on the 21˚ north latitude line and goes star gazing. How many degrees above the horizon is the north star?
   a) It is not visible; it is below the horizon
   b) 23.5˚
   c) 69˚
   d) 0˚
   e) **21˚**
2) An observer is located in São Paulo, Brazil, at -23.5˚ (south) latitude. Can the observer see the north celestial pole?
   a) Yes
   b) No
   c) Sometimes
3) The same Brazilian observer plants a vertical pole and watches the shadow cast by the sun over the course of a year. When does the pole cast no shadow at noon?
   a) Never. It always casts a shadow.
   b) Twice yearly, on the equinoxes
   c) Twice yearly, between the equinoxes and the Dec 21 solstice
   d) Twice yearly, between the equinoxes and the June 21 solstice
   e) Once yearly, near December 21
4) Which person sees the most circumpolar stars?
   a) The Venezuelan (10˚ N. latitude)
   b) The Costa Rican (20˚ N. latitude)
   c) The Texan (32˚ N. latitude)
   d) The Alaskan (58˚ N. latitude)
5) As viewed from the north, planets orbit
   a) clockwise
   b) counterclockwise
6) Direct motion (sometimes called prograde motion) for a planet is
   a) west-to-east
   b) east-to-west
   c) south-to-north
   d) none of the above
7) Solar eclipses (sun's disk is blocked) occur during lunar phase
   a) new
   b) first quarter
   c) full
   d) last quarter
8) How much time elapses between a star's rising time and setting time?
   a) Less than 12 hours
   b) 12 hours
   c) More than 12 hours
   d) It depends on the star
9) On the celestial sphere, the zero of the *right ascension* coordinate is located at
   a) the celestial equator
   b) the vernal equinox

c) the celestial north pole
d) the celestial south pole

10) An atom goes from a highly-excited state to a less-excited state.
a) A photon is absorbed by the atom.
b) A photon is emitted by the atom.
c) No photons are involved in this process.

11) On January 1, a careful observer notes the exact compass point on the horizon where the sun rises. A few days later, the sun rises
a) at an azimuth further north
b) at the same place
c) at an azimuth further south

12) On July 17, a careful observer notes the exact point on the horizon where the star Altair rises. On July 24, Altair rises at
a) an azimuth further north
b) the same place
c) an azimuth further south

13) If the earth's orbit were exactly circular instead of elliptical, would the heat and cold of the seasons be different?
a) the seasons would be more intense (greater hot-to-cold swings)
b) the seasons would remain about the same as they are now
c) the seasons would be less intense

14) If the earth's axial tilt was changed from 23.5˚ to 33.5˚,
a) the seasons would be more intense
b) the seasons would remain about the same as they are now
c) the seasons would be less intense

15) Keeping Kepler's first law, that orbits are ellipses with the sun at one focus, in mind, what is at the center of the orbit of Halley's comet?
a) the sun
b) the earth
c) no object
d) Mercury

16) An X-ray telescope should probably be placed
a) underground
b) on the ground
c) in space

17) A visible light telescope should probably be placed
a) underground
b) on the ground
c) in space

18) What sort of light has the shortest wavelength?
a) Radio waves
b) Infrared light
c) X rays
d) Visible light
e) Microwaves

19) Which wavelength regime contains potentially ionizing photons?
a) Microwave
b) Infrared
c) Visible
d) Ultraviolet
e) Radio

20) What sort of light travels the fastest?
   a) a laser beam
   b) a radio wave
   c) both travel the same speed.
21) What coordinates are useful for locating geographical locations, such as cities, on earth?
   a) right ascension and declination
   b) x and y
   c) longitude and latitude
   d) azimuth and altitude
22) What item in this list is not part of "local" coordinates?
   a) meridian
   b) N, S, E, and W compass points
   c) zenith
   d) north celestial pole
   e) nadir
23) What is the ecliptic?
   a) the plane of the earth and the moon
   b) the plane of the earth and the sun
   c) the plane of the earth's equator
   d) the average plane of the solar system
24) What is the obliquity of the earth, also known less precisely as its "tilt?"
   a) 0˚
   b) 15˚
   c) 23 ½ ˚
   d) 45˚
   e) 66 ½ ˚
25) The obliquity of the earth is the angle between which two planes?
   a) celestial equator, moon's orbit
   b) prime meridian, celestial equator
   c) azimuth, altitude
   d) ecliptic, celestial equator
26) During a crescent moon, what causes the dark portion?
   a) Sunlight does not strike that portion
   b) The earth casts a shadow on the moon
   c) The dark portion does not exist. Only the crescent physically exists.
27) Spring tides occur during lunar phase
   a) first quarter
   b) full ----------(other acceptable answer is: new)
   c) last quarter
28) When is a new moon on the meridian (high in the sky, exactly south)?
   a) noon
   b) 6 pm
   c) midnight
   d) 6 am
29) When is a third quarter moon on the meridian?
   a) noon
   b) 6 pm
   c) midnight
   d) 6 am
30) About how long does it take the earth to orbit the sun once?
   a) 1 day

b) 29 days
c) 365 days
d) 26,000 days

31) At about what wavelength does the red supergiant star Betelgeuse, at 2900 Kelvin, emit most of its light?
a) 2900 Kelvin
b) 0.1 micrometer
c) 1 micrometer
d) 10 micrometer
e) 100 micrometer

32) At about what wavelength does the earth, at roughly 290 Kelvin, emit most of its light?
a) 290 Kelvin
b) 0.1 micrometer
c) 1 micrometer
d) 10 micrometer
e) 100 micrometer

33) Earth emits most of its thermal radiation in the
a) Ultraviolet
b) Visible
c) Infrared
d) Radio

34) Molecules of water and carbon dioxide are important for the greenhouse effect on earth. What sort of spectrum do these molecules exhibit?
a) thermal
b) blackbody
c) line
d) Doppler

35) An atom with one or more electrons removed is termed
a) excited
b) ionized
c) neutral
d) auroral

36) A blue light photon _____ a red light photon.
a) is less energetic than
b) is more energetic than
c) has the same amount of energy as

37) The star Alpha Centauri has a spectrum that looks almost exactly like the sun's. If it is indeed a twin of the sun, why is it about a hundred billion times fainter in terms of luminous flux?
a) It must be small
b) It must be distant
c) It must be cool
d) It must be located behind an absorbing cloud of gas

38) Chronologically first, this Renaissance thinker published a fairly detailed sun-centered cosmology that was influential for later scientists. He was a Polish cleric. He was
a) Kepler
b) Galileo
c) Tycho
d) Copernicus
e) Newton

39) This Danish gentleman was the most able naked-eye observer of his day. His catalog of planet positions was used by another to find the true shape of planetary orbits. He was

a) Kepler
b) Galileo
c) Tycho
d) Copernicus
e) Newton

40) This Italian scholar ground his own lenses and constructed the first telescope for astronomical use. He also made contributions to basic physics. He was
a) Kepler
b) Galileo
c) Tycho
d) Copernicus
e) Newton

41) If all the water vapor were somehow removed from the earth's atmosphere (this is a thought experiment), the average earth temperature at ground level would
a) decrease
b) stay the same
c) increase

42) Which gas is the most effective "greenhouse gas" in the earth's atmosphere as it exists now, averaged over time and area?
a) nitrogen
b) ozone
c) carbon dioxide
d) water vapor
e) methane

43) Does Mercury have a greenhouse effect?
a) yes
b) no

44) Which layer of earth's interior gets the "most liquid" award?
a) inner core
b) outer core
c) mantle
d) crust

45) Most earthquakes are associated with
a) mid-continent areas
b) mid-ocean areas
c) plate boundaries

46) The flattened, rotating disk of cold, dusty gas that gave rise to the solar system 4.5 billion years ago is called the
a) condensation theory
b) planetesimal
c) solar nebula
d) T-Tauri phase

47) As the planets were forming, long ago, and between Mars and Jupiter there is a region where the average temperature went from above the freezing point of water on the sunward side, and below the freezing point of water on the outside. This radius is often called
a) the T-Tauri phase
b) the frost line
c) the bifurcation radius
d) planetary migration

48) The ages of rocks taken from the lunar highlands have typical ages of
a) 50 to 100 million years ago

b) 1.5 to 2 billion years ago
c) 3.0 to 3.6 billion years ago
d) 4.0 to 4.2 billion years ago

49) The heavy bombardment phase of solar system formation appears to have been over by age
a) 4 billion years ago
b) 3 billion years ago
c) 2 billion years ago
d) 1 billion years ago

50) Heavily cratered terrain generally indicates
a) a geologically young surface
b) a geologically ancient surface
c) many volcanos

51) Neap tides occur at
a) new moon
b) first quarter moon --------- (other acceptable phase is: last quarter)
c) full moon

52) How many tidal bulges does the moon raise on the earth's oceans?
a) zero
b) one
c) two
d) three
e) four

53) Over the course of two orbits around the sun, Mercury spins on its axis
a) once
b) twice
c) three times
d) 88 times

54) The favored theory for the formation of the moon is usually called
a) the capture hypothesis
b) the fission hypothesis
c) the giant collision hypothesis
d) the co-creation hypothesis

55) There are now two competing theories for giant planet formation. They are “2-stage condensation” and
a) equilibrium condensation theory
b) gravitational instability
c) the fission hypothesis