Stars, Galaxies & the Universe (29:50)
Professor C.C. Lang
Exam #1 - Fall 2010
Wednesday, September 22nd

FORM B - SOLUTIONS

Questions 1-6 are True/False questions (worth 4 pts each):

1. The Sun is a Red Giant star.
(a) True
(b) False

2. The H-R diagram shows the relationship between temperature and luminosity for stars.
(a) True
(b) False

3. The Sun has NO effect on the tides; they occur only because of the Moon.
(a) True
(b) False

4. The reason astronomers use large diameter telescopes (such as the Keck Observatory on Mauna Kea) is to make more magnified images of astronomical objects.
(a) True
(b) False

5. Wien's Law relates the motion of an object to its peak temperature.
(a) True
(b) False

6. It takes the Moon approximately two weeks to go from New Moon to Full Moon.
(a) True
(b) False

7. At what time is the full moon overhead (near the zenith)?
(a) noon
(b) never – the full moon only is seen near the horizon
(c) midnight
(d) sunrise
(e) sunset

8. Why is the Hubble Space Telescope able to make such sharp, high quality images?

(a) it is in orbit around the Earth and therefore above the distorting effects of the atmosphere

(b) it operates at the shortest wavelengths possible (gamma rays)

(c) it has the biggest diameter of any optical telescope (much bigger than those on the ground)

(d) it is in orbit around the Earth and therefore much closer to the most distant stars and galaxies

(e) it is in orbit around the Earth and therefore not subject to the gravity distortions which exist on Earth

9. The distance of the nearest star (beyond the Sun) is approximately

(a) 1 light year

(b) 1 AU (astronomical unit)

(c) 400,000 AU

(d) 4 parsecs

(e) 4 light years

10. On an H-R diagram, where would you find stars that are cool and luminous?

(a) upper right

(b) lower right

(c) upper left

(d) lower left

(e) on the main sequence

11. *Apparent magnitude* is the same as

(a) absolute magnitude

(b) luminosity

(c) flux (brightness)

(d) parallax

(e) the absolute magnitude, but only for the Sun

12. The bright lines observed from the spectrum tubes we showed in class are due to

(a) the cool gas layers of gas absorbing energy from the hot gas.

(b) primarily the elements nitrogen, oxygen and neon.

(c) emission of photons when electrons are moving down in their energy levels back to the ground state.

(d) a continuous spectrum.

(e) absorption of photons when electrons are moving to the ground state.

13. Which of the following objects is located overhead in the summer and early fall here in Iowa?

(a) Orion
(b) Taurus
(c) The Pleiades
(d) The Summer Triangle
(e) Comet Hartley

14. A lunar eclipse occurs when the moon is in what phase of its cycle?

(a) New Moon
(b) First Quarter
(c) Third Quarter
(d) Full Moon
(e) It can occur during any of the phases.

15. Which of the following best describes the relationship between energy and electromagnetic waves (or photons)?

(a) all photons carry the same amount of energy
(b) photons with longer wavelengths carry greater amounts of energy
(c) photons with shorter wavelengths carry greater amounts of energy
(d) the amount of energy a photon carries depends on the medium it is moving through
(e) it is impossible to determine how much energy a photon carries

16. For an observer in Iowa, the North Celestial Pole (Polaris) is located

(a) directly overhead.
(b) due South.
(c) close to the horizon.
(d) at a latitude of 50 degrees.
(e) at an altitude of approximately 40 degrees.

17. The parallax measured for a star that is **half as distant** as the nearest star, α Centauri, will be

(a) impossible to observe.
(b) twice the value for α Centauri.
(c) half the value for α Centauri.
(d) 2 arcminutes
(e) 2 degrees.

18. On the celestial sphere, which of the following is located 90° from the north celestial pole?

(a) the ecliptic plane
(b) the prime meridian
(c) the celestial horizon
(d) the celestial equator
(e) the zenith

19. If a cool star is receding from Earth (moving ***away***), which of the following would best describe its spectral lines?

(a) A continuous spectrum.
(b) A dark line spectrum with the spectral lines redshifted.
(c) A bright line spectrum with the spectral lines redshifted
(d) A bright line spectrum with the spectral lines blueshifted.
(e) A dark line spectrum with the lines blueshifted.

20. Which of the following is NOT a visible light (optical) telescope?

(a) Hubble Space Telescope
(b) A refractor
(c) A reflector
(d) The Keck Observatory on Mauna Kea
(e) The Very Long Baseline Array

21. Seasonal variations on the surface of the Earth occur because

(a) the Earth's axis of spin is titled with respect to the plane in which it orbits the Sun
(b) the Earth's distance from the Sun varies periodically over its orbital path
(c) clouds alternately form and decay away in our atmosphere in a periodic way
(d) volcanoes periodically cloud out the atmospheres of planets because of tidal interactions
(e) the Sun rises and sets due East and West only twice a year

22. Tonight is the autumnal equinox. This day is significant because the Sun

(a) is the most Northerly in our sky
(b) is farthest from the Earth
(c) is closest to the Earth
(d) rises due East and sets due West
(e) is the most Southerly in our sky

23. If a planet identical to the Earth were discovered at 4 AU (between the Earth and Jupiter), how would the gravitational pull by the Sun on that planet compare to what we experience on Earth from the Sun?

(a) the gravitational force would be ¼ of what the Earth experiences
(b) it would not change – gravitational force does not depend on distance
(c) the gravitational force would be 4x that of what the Earth experiences
(d) the gravitational force would be 1/16th of what the Earth experiences
(e) the gravitational force would be 2x that of what the Earth experiences

24. Which types of electromagnetic radiation get trapped in the *uppermost* layers of the Earths's atmosphere?

(a) x-ray, gamma rays and radio waves
(b) ultraviolet, visible and infrared
(c) ultraviolet, x-rays and gamma rays
(d) microwave and x-rays
(e) infrared and microwave

25. A spectrum (a plot of intensity versus wavelength) – is made for two stars. Star A has its peak intensity at a wavelength of 700 nanometers and Star B has its peak intensity at a wavelength of 350 nanometers. Which of the following is true?

(a) Star A is half as hot as Star B.
(b) Star B is cooler than Star A by a factor of 2.
(c) Star A is four times as hot as Star B.
(c) The two stars have the same temperature.
(d) There is not enough information to determine which star is hotter.