1. **If the Earth's spin axis was not tilted with respect to the Earth's orbital plane (around the Sun) which of the following would be true, which false?:**

   T The number of daylight hours in a day would not change through the year.
   F The length of a day would increase from 24 hours to 365 days
   F The change of seasons would become more pronounced in the Northern Hemisphere.
   F There would be no change in the pattern of the seasons compared to the real situation

   } see lecture notes

2. **Suppose you identified in a distant galaxy the Hydrogen emission line corresponding to an electron dropping from the second excited level to the first excited level. The "rest" wavelength of this photon is $= 6365\text{Å}$ yet in the galaxy spectrum you measure it at 5365Å.**

   (a) Is this galaxy moving toward___or away___from the Earth?

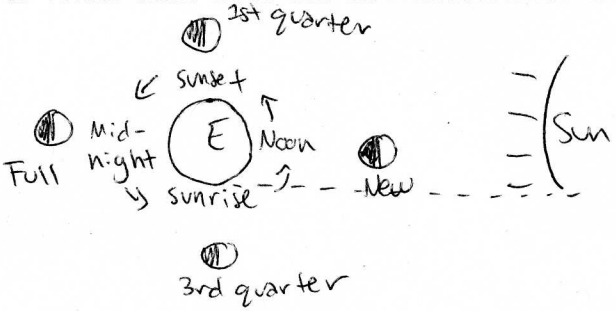
   (b) What is the relative speed between the Earth and the Galaxy?

) since $\lambda_{obs} < \lambda_{rest} \Rightarrow$ galaxy is moving toward

) $\frac{|v|}{c} = \frac{|\lambda_{obs} - \lambda_{rest}|}{\lambda_{rest}} \Rightarrow |v| = 3\times10^{10}\frac{cm}{s} \cdot \frac{6365\text{Å} - 5365\text{Å}}{6365\text{Å}} = 3\times10^{10}\frac{cm}{s} \cdot 0.157$

$\Rightarrow \boxed{|v| = 4.71\times10^{9}\ cm/s}$

3. **What time does the new moon rise? Draw a picture to demonstrate your answer.**



By looking @ the horizon line (- - - -) we see that the first time the new moon appears is at | sunrise |

4. **Given the speed of light $c = 186,000$ miles/second, how many miles is a "light-minute"?**

1 ly = c · t w/t = 1 year

) $1\,Lm = c \cdot (1\text{ minute}) = \frac{186,000\text{ miles}}{\text{second}} \cdot 1\text{ minute} \cdot \frac{60\text{ seconds}}{1\text{ minute}}$

$\Rightarrow \boxed{1\,Lm = 11,160,000\text{ miles}}$

5. **Suppose you lived on the Moon where there is essentially no atmosphere. Label the following statements as (T)rue or (F)alse:**

F The Sun would appear redder (compared to as seen from the Earth) during the day.
T The color of the sky (looking away from the Sun during the day) would be black.
F At sunset, the Sun would appear redder than it does at noon.
F The "green flash" would be a "red flash"

} see lecture notes

6. **You measure the spectrum of a solid green sphere of aluminum and the highest intensity is at a wavelength of 2×10^{-4}cm. What is the temperature of this sphere?**

Since $\lambda_{green} \approx 510\,nm \ll \lambda_{obs}$ we can ignore the fact that the sphere is green & treat it as a blackbody

$$\Rightarrow T = \frac{2.9 \times 10^6\,nm\,K}{\lambda_{peak}} = \frac{2.9 \times 10^{-3}\,m\,K}{2 \times 10^{-4} \cdot 10^{-2}\,m} = \boxed{1450^oK = T}$$

7. **What color does a red apple appear to be when illuminated with white light?**

Since a red apple will absorb all but the red wavelength of light & reflect the red
$\Rightarrow$ Apple will appear red

8. **What is the frequency of light with a wavelength of 20cm?**

$$\nu = \frac{c}{\lambda} = \frac{3 \times 10^{10}\,cm/s}{20\,cm} \Rightarrow \boxed{\nu = 1.5 \times 10^9\,s^{-1} = 1.5 \times 10^9\,Hz}$$

9. **What is $10^3 \times 10^5 \times 10^{-6}$?**

$$10^3 \times 10^5 \times 10^{-6} = 10^{(3+5-6)} = \boxed{10^2}$$