

## Constellations

Why aren't the same constellations visible at night all year long?  
 Why are there different constellations visible during different seasons?  
 What does this have to do with the orbit of the earth around the sun?  
 From Chicago, how do stars appear to move across the sky?  
 Be able to identify on a star chart and describe where in the sky (northern sky or southern sky) you can find the following constellations and their brightest stars:

Fall

Summer Triangle – Cygnus (Deneb), Lyra (Vega), Aquila (Altair)  
 Cassiopeia, Ursa Major, Ursa Minor

Winter

Orion (Betelgeuse, Rigel), Canis Major (Sirius), Canis Minor (Procyon), Gemini (Pollux, Castor), Auriga (Capella), Taurus (Aldebaran)

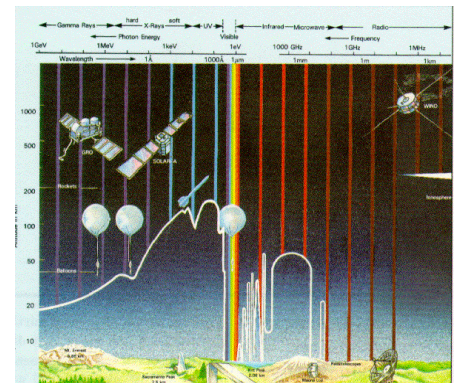
## Telescopes

Explain the basic differences between a refracting telescope and a reflecting telescope.  
 Can you explain the difference between the objective lens or mirror and the eyepiece in a telescope?  
 Can you explain the difference in the following terms  
     Focal length & aperture  
     Focal ratio & magnification  
 Could you trace light rays as they move through the following telescopes?  
     Reflecting, refracting, catadioptric  
 What is the difference between a Galilean telescope and a Newtonian telescope?  
 Can you explain resolution? Focus? Chromatic aberration?  
 Who was the first person to record the use of a telescope on the sky? What did he discover?  
 Who invented the refracting telescope? Why?  
 Can you calculate magnification if given a telescope's and eye piece's focal lengths?  
 Would you be able to pick adequate eye pieces to use with a particular telescope  
 Can you explain what MEM is and the 20x rule?  
 Can you explain how a ccd camera takes a telescope picture and how that picture is unique – what information is embedded in the pixels?  
 Can you use an image processing program to manipulate a telescope ccd image? (ImageJ or MicroObservatory Image)

## Light

Explain what light is. Can you use the following terms correctly to explain the electromagnetic spectrum?  
     Magnetic & electric fields; energy; frequency; wavelength; photon  
 Can you name the different types of electromagnetic energy in order from most energetic to least energetic?  
 Can you explain why ionizing radiation (ultraviolet, x-ray, gamma) is dangerous?  
 Can you explain what a light year is?  
 Can you describe how the following people contributed to the knowledge of the electromagnetic spectrum?  
     a. Isaac Newton              b. William Herschel              c. Johann Ritter  
     d. Thomas Young            e. Hans Christian Orsted          f. Michael Faraday  
     g. James Clerk Maxwell      h. Henrich Hertz                  i. Wilhelm Roentgen  
     j. Ernest Rutherford & Paul Villard

Can you describe the atmospheric window? (which types of light get through our atmosphere?)  
 Can you explain the following terms in terms of how light interacts with matter? Reflection; transmission; absorption; emission  
 Can you draw a picture that shows what those terms mean in the previous questions?  
 Can you describe why an astronomer may want to take an image of an object with infrared light and also visible light? What would be the use of looking at something with both kinds of light?

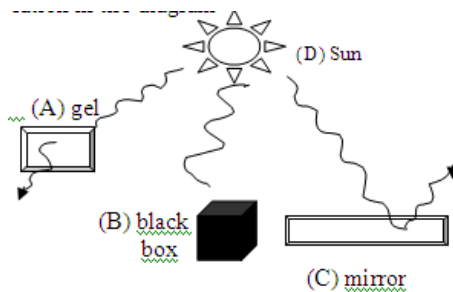


Apollo

Can you identify which Apollo mission was the first to land on the moon?  
 Can you give the date of that 1<sup>st</sup> moon landing and who was the first man to step on the moon?  
 Can you explain the problem Apollo 13 had that changed its mission objective?  
 Can you explain how the moon gravity was used as a slingshot in Apollo 13's rescue?  
 Explain what a spinoff is and give an example of one.

Filters

Can you explain how a filter interacts with light? Can you identify which part of the picture shows reflection, transmission, absorption, and transmission.



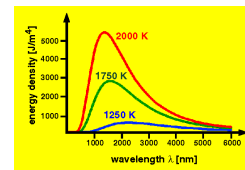
Can you describe why an astronomer may want to take an image of an object with infrared light and also visible light? What would be the use of looking at something with both kinds of light?

Can you define the following terms?

- |                    |             |               |
|--------------------|-------------|---------------|
| a. Equinox         | d. meridian | g. orbit      |
| b. Summer Solstice | e. zenith   | h. revolution |
| c. Ecliptic        | f. horizon  | i. rotation   |
| d.                 |             |               |

Blackbodies

Can you explain what a blackbody curve diagram is showing?  
 Can you identify the peak wavelength in a spectral curve?  
 Can you explain the relationship of color & temp in stars?  
 Can you use Wein's Law to calculate a star's temperature if given its peak wavelength or its peak wavelength if given its temperature?



Spectra

Can you identify the 3 types of spectra – what they are and what causes them at the atomic level?  
 Can you explain Kirchoff's 3 laws of spectra?  
 Can you explain the obafgkm classification of spectra?  
 Can you describe the basic types of substances (neutral elements, ion, molecules) present in stars of different temperatures (cooler, hot, hotter) and why they are there or not according to present theory?  
 Can you describe the contributions of the following people to the understanding of spectra?

- Isaac Newton
- William Wollaston & solar spectra
- Joseph von Fraunhofer & solar spectrum lines
- Robert Bunsen & Gustav Kirchoff
- Sir William Huggins & stars
- Norman Lockyer & helium
- Annie Jump Cannon & classification of spectra