Our Dynamic Universe

Redshift

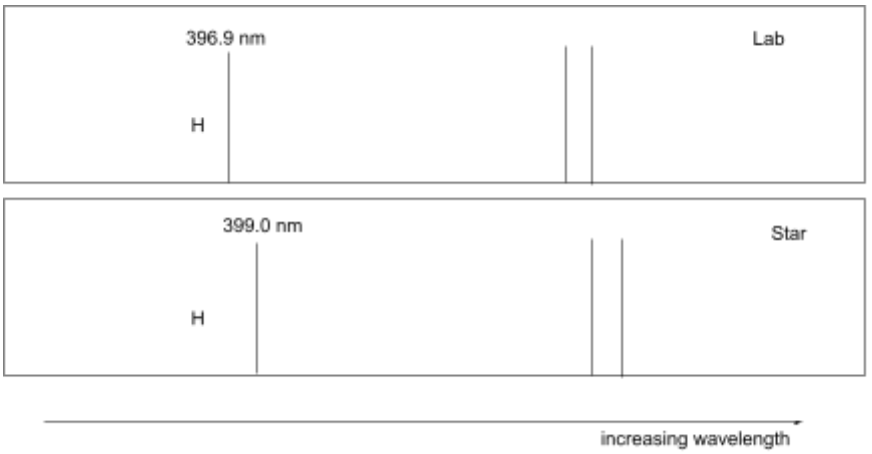
1) An astrophysicist measures the Calcium Potassium absorption spectral line`s wavelength to be 3934×10^{-10} m in the laboratory.
The light from a star in a galaxy gives the same absorption line a wavelength of 3965×10^{-10} m

   a) State whether the galaxy is moving towards or away from the Earth.
   b) Calculate the redshift ratio for this galaxy [0.00788]
   c) Determine the speed of the galaxy. [2.364×10^{6} m s^{-1}]

2) In the laboratory the wavelength of an absorption line in the spectra is 393.4 nm. When the same absorption line is viewed from light coming from a distant galaxy the wavelength is 394.0 nm.

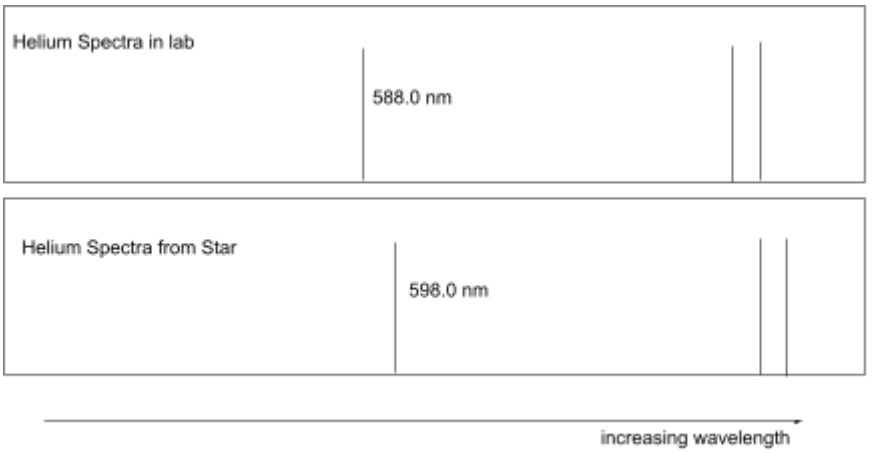
   a) State whether the galaxy is moving away or approaching the Earth.
   b) Calculate the redshift ratio for this galaxy. [0.00153]
   c) Determine the speed of the galaxy [459,000 m s^{-1}]

3) An astrophysicist measures the absorption line spectra wavelength for a hydrogen gas and compares it to the same line from the light of a distant galaxy.
The computer print out is shown below.



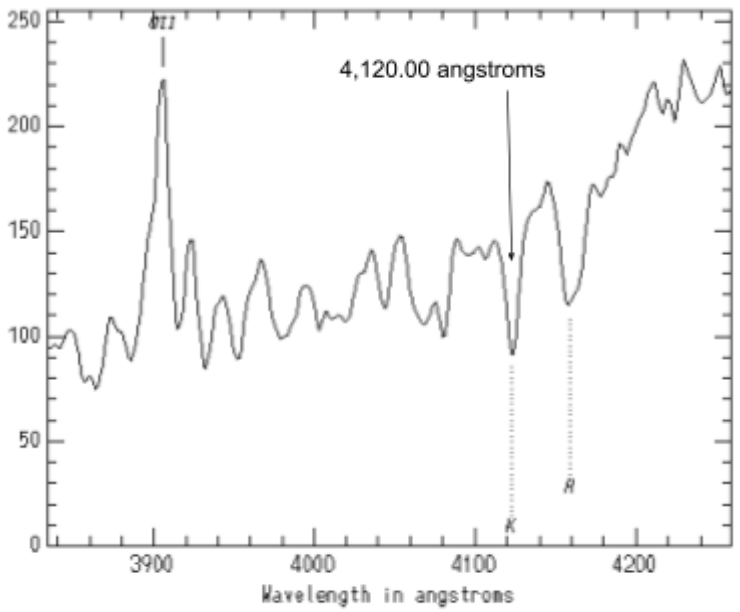
   a) State what is meant by the spectral lines being redshifted.
   b) Calculate the redshift ratio for this galaxy. [0.00529]
   c) Determine the speed of this galaxy. [1.587×10^{6} m s^{-1}]

4) An astrophysicist compares the spectral lines measured in the laboratory to those measured on a distant galaxy`s star..



a) Calculate the redshift ratio for the star. [0.017]
b) Determine the speed the galaxy is moving away from us. [5.1 x 10^6 ms^{-1}]

5) An astrophysicist takes a measurement of the spectral lines from a calcium -K source in the laboratory. Measurements are made of the calcium - K lines on a distant galaxy which is measured to have a recessional velocity of 20.0 x 10^3 m s^{-1}.



a) Determine the redshift of this star. [66.7 x 10^{-6}]
b) Calculate the observed wavelength of the calcium - K line on the star.
[4120.27 angstroms]