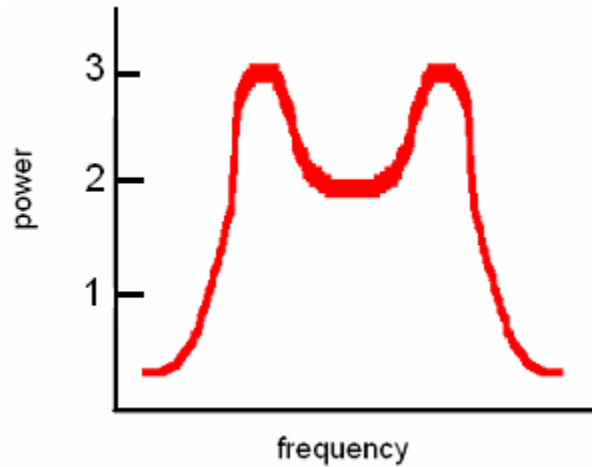


# Ionosphere as Plasma

1. From the graph on the “At what altitude are most of the ions?” slide, at what altitude is the production of ions the greatest? In what layer of the ionosphere is this?
2. In which layer of the ionosphere is the electron concentration the greatest?
3. What is the name of the change in wavelength of a photon as it is reflected off an electron?
4. A radio wave reflects off a region of plasma. If the frequency of the radio wave was  $2.50 \times 10^8$  Hz, what is the density of electrons in the plasma?
5. Light travels at  $3.00 \times 10^8$  m/s. A signal is fired directly up, bounces off a layer of the ionosphere and returns. If the entire trip took a total of 0.002 seconds, how high up was the layer of the ionosphere off which the signal reflected?
6. What is the temperature of a helium ion (mass =  $6.70 \times 10^{-27}$  kg) if its velocity is 1,800 m/s.

7. In the following diagram, what is the ratio of the power returned by the electrons to the power returned by the ions? This is the same as the ratio of electron temperature to the ion temperature.



If the ions have a temperature of 400 K, what is the temperature of the electrons?

8. Draw two power v. frequency graphs for a signal reflected off a portion of the ionosphere. Make the first graph for a dense region with hot ions but relatively cool electrons. Draw the second graph for a sparse region with hot ions and even hotter electrons.