

ASTR121 Homework #2 – (Hamilton)  
due Thursday Feb. 13 (15 Points)

This problem is from Chapter 5.

40. The wavelength of  $H_{\beta}$  in the spectrum of the star Megrez in the Big Dipper (part of the constellation Ursa Major, the Great Bear) is 486.112 nm. Laboratory measurements demonstrate that the normal wavelength of this spectral line is 486.133 nm. Is the star coming toward us or moving away from us? At what speed?

Finishing reading Chapter 6. These problems are from that chapter.

29. Show by means of a diagram why the image formed by a simple refracting telescope is upside down.

32. (a) Compare the light-gathering power of the Keck I 10.0-m telescope with that of the Hubble Space Telescope (HST), which has a 2.4-m objective mirror. (b) What advantages does Keck I have over HST? What advantages does HST have over Keck I?

33. Suppose your Newtonian reflector has an objective mirror 20 cm (8 in.) in diameter with a focal length of 2 m. What magnification do you get with eyepieces whose focal lengths are (a) 9 mm, (b) 20 mm, and (c) 55 mm? (d) What is the telescope's diffraction-limited angular resolution when used with orange light of wavelength 600 nm? (e) Would it be possible to achieve this angular resolution if you took the telescope to the summit of Mauna Kea? Why or why not?

41. To search for ionized oxygen gas surrounding our Milky Way Galaxy, astronomers aimed the ultraviolet telescope of the FUSE spacecraft at a distant galaxy far beyond the Milky Way. They then looked for an ultraviolet spectral line of ionized oxygen in that galaxy's spectrum. Were they looking for an emission line or an absorption line? Explain.

42. A sufficiently thick interstellar cloud of cool gas can absorb low-energy X rays but is transparent to high-energy X rays and gamma rays. Explain why both part b and part d of Figure 6-32 reveal the presence of cool gas in the Milky Way. Could you infer the presence of this gas from the visible-light image in Figure 6-32a? Explain.