

ASTRO 342 – FALL 2006

Problem Set #5 - DUE Fri., Nov. 13
Last regular problem set!

Do the following problems from the text –

Ch. 10: prob.: 1.

Extra Credit: Ch. 10: prob. 13

Ch. 7: probs.: 5, 21, 22 (note: this last problem should refer to prob. 21, not prob. 10).

And one more from de Pater and Lissauer –

dPL 10.14 A comet's perihelion distance is 1 au, and its aphelion distance is 15 au. In the following we make a very crude calculation of the average rate of shrinkage of the comet.

a) Calculate the comet's orbital period.

b) Calculate how many meters of ice the comet will lose each time it orbits the Sun. (Hint: In order to simplify the calculations, you may assume: 1) that ice sublimates off the comet's surface during 1/10 of its orbital period, 2) that the average cometary distance over that period is 1.5 au, and 3) that the density of the cometary ice is 1.0 g/cm^3 . Also you need to know that the gas production rate, Q (molecules per second), for water molecules is adequately approximated by,

$$Q \approx \frac{1.2 \times 10^{18} \pi R^2}{r_{AU}^2}$$

where R is the radius of the comet in cm, and r_{AU} is the distance of the comet from the Sun in AU.