Astrophysics Quiz Dec 2nd

$\sigma_T = 6.652 \times 10^{-29}$ m^2, $m_p = 1.67 \times 10^{-27}$ kg

A. If the Force exerted by radiation pressure on a hydrogen atom, is

$$F_{rad} = L\sigma_T / 4\pi r^2 c$$

Derive an expression for the maximum luminosity of an accretion powered neutron star or black hole.

B. Calculate the energy gained by a neutron star X-ray pulsar, if its pulse period is observed to decrease from 75 seconds to 73 seconds over a period of one week.

C. Compare this result with the maximum accretion-powered luminosity for a 1.4 M_{sun} neutron star, and compute the maximum spin-up rate for a neutron star.

D. What is the name of this maximum luminosity condition, and how does it depend on the composition of the infalling gas?