HW 5 A2020 Out 3/2/2010 Due 03/18/2010

1. (4 pts) Describe the process of cosmic recycling. A.) Start with a Hydrogen atom. Describe in detail the journey of the hydrogen atom from a diffuse cloud, into a star, and then back into the interstellar medium. B.) will that hydrogen atom always end up back in the interstellar medium? C.) will that hydrogen atom always remain a hydrogen atom?

2. (3 pts) Associate the following emission mechanisms (i.e. ways of producing electromagnetic radiation) with the following objects:

emission mechanism	**object**
Synchrotron radiation	ionized hydrogen in a planetary nebula.
Brehmstrahlung radiation	clouds of atomic (not ionized) hydrogen
21 cm line	ionized gas moving through magnetic field in a supernova remnant

3. (3 pts) What is the Schwarzchild radius of a black hole? Calculate the Schwarzchild radius for the following (you need to do this on a separate piece of paper)

radius (cm) = 2 G M/c^2 = 2 x 6.67x10^{-8} Mass (gm)/(3 x 10^{10} cm/s)^2

a a human being (90000 gm)
b the Earth (5.9 x 10^{27} gm)
c the Sun (2 x 10^{33} gm)
d the Galaxy (4 x 10^{44} gm)

4. (2 pts extra credit) If our Sun was suddenly and mysteriously turned into a black hole with the *exact* same mass of the Sun- what would happen to the orbits of the planets?

5. (2 pts extra credit) What holds the Milky Way galaxy together?

6. (2 pts extra credit) Which of the following are supported against gravity (or in the case of a balloon, against the elasticity of the balloon itself) by thermal pressure (pressure caused by molecules or atoms moving and bouncing around), and which are supported by degeneracy pressure from electrons or neutrons?

    a. a balloon.
    b. the Sun
    c. a white dwarf
    d. a neutron star
    e. a car
    f. the Earth's atmosphere