Cosmology – 30.01 **Prof. Micha Tomkiewicz**
Fall 2006 **Midterm Exam:**

My Name_____

A. Answer all of the following multiple choice questions (50%):

1. One (or more) of the basic assumptions that astronomers make about the universe is (are) that the universe

a. both will expand forever and follows physical laws that can be mathematically described

b. both will expand forever and must have formed from the top down

c. must have formed from the top down.

d. will expand forever.

e. follows physical laws that can be mathematically described.

2. The planets differ in composition in part because

a. none of these choices

b. the outer parts of the solar nebula were cooler than the inner parts.

c. collisions damp out non-circular orbits.

d. the Sun was an integral part of the solar nebula.

e. meteorites formed at a cooler temperature than the Earth.

3. The Doppler effect:

a. is the change in observed wavelength from a wave source that is approaching or receding from us .

b. causes a prism to form a spectrum.

c. causes the speed of light to be finite.

d. determines the resolving power of a telescope.

e. was used by Roemer to measure the velocity of light.

4. The Stefan-Boltzmann law is

a. the wavelength at which the most energy per unit time is emitted is proportional to the Kelvin temperature

b. water boils at 373 degrees Kelvin

c. some radiation is emitted at all wavelengths

d. change in length proportional to speed

e. the total energy emitted per unit area per unit time is proportional to the fourth power of the temperature in degrees Kelvin

5. Energy stored in fossil fuels originally came from

a. the proto-solar nebula.

b. a supernova.

c. the Earth.

d. OPEC.

e. the Sun.

6. White light:

a. is a special spectral line.

is produced with a prism.

c. consists of all colors.

d. is at the center of the spectrum.

e. none of these choices

7. An example of conservation of angular momentum is

a. none of these choices

b. what happens when you stand on a skateboard and throw a ball.

c. a car going through a 90-degree turn at high speed.

figure skaters speeding up their spin when they pull in their arms.

e. figure skaters slowing down their spin when they pull in their arms

8. All of the planets' orbits lie roughly in the same plane since

a. the faster spin of a contracting cloud will cause the cloud to flatten to a disk.

b. no explanation was given.

c. angular momentum is conserved.

d. there were varying temperatures within the solar nebula.

e. gas pressure is exerted.

B. Answer two out of the three questions (50%):

1. Suppose you hit a baseball or kick a soccer ball. What happened to the kinetic energy that you put into the ball? What was the source of energy that let you move the ball? Can you trace it all the way back to the Sun? How many times is the energy transformed?

2. The Sun is made mostly of hydrogen gas. Suppose your teacher gives you a flask of such gas at room temperature. Of course, it is not giving off light as the sun does. What are the main differences between it and the gas in the Sun?

3. On the average, Mars is about 1.5 times further from the sun than the earth is. Approximately how long is the Martian year?