

Name:

ASTRONOMY 1102 - Section 1

Instructor: Juhan Frank

Fall 1999

Homework # 2 due Mon. Sep. 13

Scales, Matter, Energy & Radiation

1) Consulting your class notes and the textbook, write down the approximate scales (sizes: either the radius or the diameter), *using the units most appropriate for each case*, of the following:

- a) Sun, b) Solar System, c) distance to nearest star other than the sun
- d) Milky Way Galaxy, e) Local Group, f) Local Supercluster

2) How many protons, neutrons and electrons are present in a doubly ionized isotope of oxygen 18? Write down the corresponding symbol in the form ${}^n\text{O}_m^p$, where n is the atomic mass, m is the atomic number and p is the charge (with the appropriate sign) of the ion.

3) Describe all the energy conversions occurring as you throw up a baseball, from the moment your arm starts moving until the ball finally hits the ground.

4) Discuss briefly how the idealized scientific method proceeds.
Why is General Relativity a better theory than Newtonian Gravity?

5) What is the temperature of the freezing point of water in the Fahrenheit, Centigrade and Kelvin scales? What does the absolute zero in the Kelvin temperature scale correspond to physically?.

6) Give three examples in each type: material waves and electromagnetic waves.

7) The wavelength of a 100 kHz electromagnetic wave is 1 km. What is the wavelength of an electromagnetic wave with a frequency of 1 MHz?
What kind of electromagnetic waves are these?

8) A cloud of *relatively* cool N gas is placed near a very hot filament so that the radiation of the filament illuminates the cloud. What kind of spectrum do you see if you look

a) directly at the filament along a line of sight that does not go through the cloud?

b) at the filament through the cloud?

c) at the cloud from any direction that does not line up with the filament?