PHYSICS 113
Practice Test #2
SOLUTIONS

Multiple Choice

1. b
2. b
3. a
4. b
5. b
6. d
7. b
8. c
9. e
10. b
11. e
12. b
13. c
14. a
15. c (this type of question will NOT be on the test)
16. a (this type of question will NOT be on the test)
17. e (this type of question will NOT be on the test)
18. b (this type of question will NOT be on the test)
19. e (this type of question will NOT be on the test)

SHORT ANSWERS

1. Solar Max refers to the times when the number of sunspots on the sun is at a maximum. During these times, the strong solar wind and numerous solar storms produce charged particles that interact with the Earth's magnetic field and cause communications disruptions, blackouts and aurorae. The Maunder Minimum occurred over a period of time of about 70 years in the late 1600's when there were **very few** sunspots. The Earth experienced a mini ice-age during that period.

2. The photospheric layer has a temperature of between ~ 4000K - 10000K and extends about 1000km above the top of the convection (granulation) zone. The chromospheric layer has a temperature of between ~ 7000K - 15000K and extends about 2000km above the photospheric zone. The corona has a temperature of more than one million Kelvin and extends many thousands of kilometres above the chromosphere. To see a sketch, look at Figures 6.1 or 6.5 in the text or look at the slides in the lecture handouts.

3. The Earth produces energy by nuclear fusion in its core. In the pp (proton-proton) chain, four hydrogen nuclei (i.e., protons) are fused to form a helium nucleus (also known as an alpha particle) and energy is released in the form of gamma ray photons. In the inner 75% of the sun, the heat is transported outwards by radiation and in the outer 25% (just below the photosphere) it is transported by convection.

4. H I regions are interstellar gas clouds composed mostly of atomic (neutral) hydrogen while H II regions are interstellar gas clouds composed mostly of ionized hydrogen. The reason that the hydrogen is ionized is that there are some nearby O and/or B type stars (hot stars) that cause the hydrogen gas in the nebula to fluoresce. For this reason, we refer to H II regions as the Emission Nebulae. H I regions are obviuosly cooler than H II regions.

5. Protostars are formed as result of the fragmentation of gas inside a giant molecular (interstellar) cloud. As a result of a nearby supernova explosion, shock waves can fragment a gas cloud into successively smaller pieces (hierarchical fragmentation). Each fragment can then collapse under its own gravity leading to the formation of a protostar. Protostars are much larger in radius than main sequence stars (but are still spherical) and continue to collapse until equilibrium is achieved.

6. This type of question (i.e., the evolution of stars off the MS) will **NOT** be on the test.

7. Star A and star B have the same intrinsic brightness but star A is 100 times as bright as star B. Star A has an apparent magnitude of +1 and star B has an apparent magnitude of +6; the difference in their magnitudes is 5 which corresponds to a factor of 100 in brightness). We also know that star A has a parallax angle of 0.1 arcseconds. Since star A is at a distance of 10 parsecs ($d = 1/\theta = 1/0.1$ = 10 parsecs) and appears 100 times brighter, it must be 10 times closer. Remember that the brightness that an object appears to have depends on r^2 (where r is the distance). Thus if two objects have the same intrinsic brightness and one appears 100 times as bright, the brighter star must be 10 times closer. Since star A is at a distance 10 parsecs, star B must be at the distance of 100 parsecs.