First Name:_____   **Last Name:**_____   **Mark:**_____

Student ID:_____   **Computing ID:** _____   **Date:**_____

Phys 100 Assignment #9

Due Wednesday March 28, 2007, 9AM.

1. The spiral galaxy in the Andromeda constellation is about $2*10^{19}$ km away from us. How many light years is this?

2. A silver coin sits on the bottom of a swimming pool that is 4 m deep. A beam of light reflected from the coin emerges from the pool making an angle of 20° with respect to the water's surface and enters the eye of an observer. Draw a ray from the coin to the eye of the observer. Extend this ray, which goes from the water-air interface to the eye, straight until it intercepts with the vertical line drawn through the coin. What is the apparent depth of the swimming pool to this observer?

3. The density of the atmosphere decreases with height, as does the index of refraction. Explain how one can see the sun after it has been set. Why does the setting sun appear to be flattened?

4. A glass surface (n=1.5) has a layer of water (n=1.33) on it. Light in the glass is incident on the glass-water interface. Find the critical angle for total internal reflection. Draw the ray diagram showing total internal reflection including the angle you calculated.