

**General Astronomy (29:61)**  
**Fall 2012**  
**Homework Set #8**  
**Assigned: November 9, 2012**  
**Due: November 16, 2012**

1. At aphelion, the surface temperature of Pluto is about 40K. Could Pluto retain an atmosphere of Argon gas? Show your work and quantitative arguments.
2. Let's keep talking about Pluto. Assume that it has an atmosphere of Argon, whether it could retain it or not. What would be the scale height of that atmosphere?
3. What is the mean density of the Moon? Based on that number, what can you say about the internal structure of the Moon?
4. Here's a neat one. In class, we calculated the mean density of the Earth, and from that number concluded that the Earth must have a core of iron. In your book, there is a diagram (Figure 9.1) showing the internal structure of the Earth and indicating the size of the core and mantle. Does all of this "pencil out"? In other words, is this diagram consistent with our calculation of the mean density for the Earth? In doing your calculation, assume all of the core is iron, and all of the mantle is rock. Obviously show your work.
5. A classic railroad locomotive was the Baldwin 4-8-4 "Northern". It was used to haul fast passenger trains in the 1920's and 1930's. The boiler pressure in this locomotive operated at pressures up to 250 pounds/square inch, i.e. 17 times atmospheric pressure. Assume all of that pressure was due to water vapor, and also assume that the vapor was at the boiling temperature of water, 100° C (*Achtung!* this temperature is not in Kelvin; you will have to convert it.). What is the mass density of water vapor in the locomotive boiler?
6. Problem 9.1 from the textbook
7. Problem 9.4 from the textbook