

1. a) Determine the present mean mantle concentrations of the heat-producing elements if the present value for the mean mantle heat production is  $6.2 * 10^{-12}$  W/kg and  $C_o^k/C_o^u = 6 * 10^4$  and  $C_o^{th}/C_o^u = 4$ . (Problem 4-3, Turcotte and Schubert)  
  
b) Determine the rates of heat production for the rocks listed in Table 4-3. (Problem 4-4, Turcotte and Schubert)  
  
c) Why are the concentrations in the undepleted mantle of radiogenic elements important to convection in the mantle?
2. a) Estimate the values of the Rayleigh numbers for the mantles of Mercury, Venus, Mars, and the Moon. Assume heat is generated internally at the same rate it is produced in the earth. Use the same values for  $m$ ,  $k$ ,  $\kappa$ , and  $a_v$  as used above for the Earth's mantle. Obtain appropriate values of  $r_0$ ,  $g$ , and  $b$  from the discussion of Chapter 1. (Problem 6-27, Turcotte and Schubert)  
  
b) Use the variables in Rayleigh number to explain what properties are important in convection and physically why they are important.