

ASTR/ATOC 3720: Homework Assignment #4

Due: Thur. March 20, in class

1. Calculate the escape velocities **and** the most probable speeds of hydrogen atoms at the top (exobase) of Venus and Jupiter's atmospheres. assuming that the mass of a hydrogen atom is 1.67×10^{-27} kg and Newton's Universal Gravitational Constant is $6.67 \times 10^{-11} \frac{m^3}{kg \cdot sec^2}$. Use planetary masses and radii from the tables in the back of NSS. Assume that the height of the exobases for the two planets is 500 km above the radii of the planets given in the tables in NSS, and also assume that the temperature at the exobase of Venus is 300 K and of Jupiter is 1000 K.
2. The Moon most likely formed after the Earth as the result of a huge collision; therefore, the Moon started with almost no volatiles in its bulk composition. and has no appreciable magnetic field. What do you think the dominant source processes for atmospheric gases on the Moon currently are? Given this, what do you think the atmosphere of the Moon would consist of primarily?
3. Why does the atmosphere of Venus have such a smaller fraction of N_2 in it than the atmosphere of Earth (3.5% for Venus, 78% for Earth, by number).
4. Using the saturation vapor pressure vs. temperature diagram for H_2O as shown in class to demonstrate your answer, explain why oceans of liquid water on Mars are or were unlikely.