

Do the following problems and be prepared to discuss them in class.

1. Compute the *escape speeds* for particles at the surface of Earth and Titan.

a) $v_{\text{escape from Earth}} =$

b) $v_{\text{escape from Titan}} =$

Calculate the *most probable speeds* for a nitrogen molecule (N_2) in the lower atmospheres of Earth and Titan.

c) $v_{\text{m.p. for Earth}} =$

d) $v_{\text{m.p. for Titan}} =$

e) Explain why the ratios of escape-to-most-probable make sense for these two bodies.

2. Inspect Figure 8.1.

a) Qualitatively describe what the term “*most probable speed*” implies in terms of the curves displayed in Figure 8.1.

b) Quantify approximately the most probable speeds for the three curves in Figure 8.1.

3. Assume that atmospheric pressure falls with radius as

$$P(r) = P_0 e^{-r/H}$$

where H is the scale height. Read Chapter 8 to learn about scale height and compute H for Titan. Assume that Titan’s atmospheric composition, temperature, and gravity don’t appreciably change throughout its atmosphere.

$$H_{\text{Titan}} =$$

4. Create a plot with Coriolis acceleration on the y -axis and Earth latitude on the x -axis. The x -axis should span $0^\circ - 90^\circ$. Plot the Coriolis acceleration for four different wind speeds: 5, 10, 15, and 20 m/s.