

## 22.8: Problems

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1. The gravitational potential energies available to a molecule near the surface of the earth are  $\epsilon(h) = mgh$ . Each height,  $h$ , corresponds to a unique energy, so we can infer that the degeneracy of  $\epsilon(h)$  is unity. Derive the probability density function for the distribution of molecules in the earth's atmosphere. (See Problem 19 in [Chapter 3](#).)
  2. The value of the molecular partition function approximates the number of quantum states that are available to the molecule and whose energy is less than  $kT$ . How many such quantum states are available to a molecule of molecular weight 40 that is confined in a volume of  $10^{-6} \text{ m}^3$  at 300 K?
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