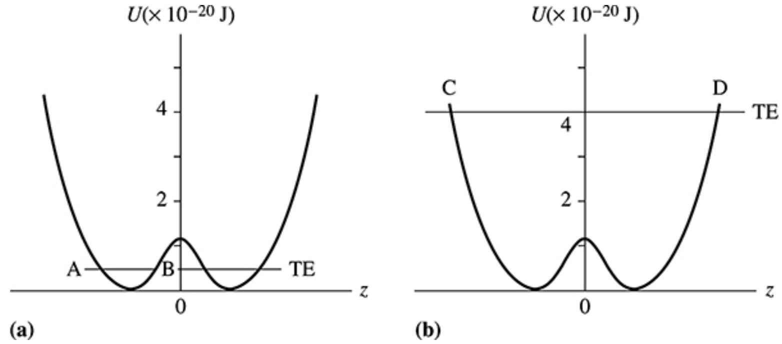
10.60. Model: We will use the conservation of mechanical energy.

Visualize:



The potential energy (U) of the nitrogen atom as a function of z exhibits a double-minimum behavior; the two minima correspond to the nitrogen atom's position on both sides of the plane containing the three hydrogens.

Solve: (a) At room temperature, the total energy line is below the "hill" in the center of the potential energy curve. That is, the nitrogen atom does not have sufficient energy to pass from one side of the molecule to the other. There's a stable equilibrium position on either side of the hydrogen-atom plane at the points where $U = 0.$ Since $E > 0,$ the nitrogen atom will be on one side of the plane and will make small vibrations back and forth along the z-axis—that is, toward and away from the hydrogen-atom plane. In the figure above, the atom oscillates between points A and B.

(b) The total energy line is now well above the "hill," and the turning points of the nitrogen atom's motion (where the total energy line crosses the potential curve) are at points C and D. In other words, the atom oscillates from one side of the H_3 plane to the other. It slows down a little as it passes through the plane of hydrogen atoms, but it has sufficient energy to get through.