

9.9) FIND  $v^*$  FOR  $N_2$  GAS IN AIR a) ON A COLD DAY,  $T = -15^\circ\text{C}$   
AND b) ON A HOT DAY,  $T = +35^\circ\text{C}$ .

$$m_{N_2} = 2(14.00)(1.66 \times 10^{-27}) = 4.65 \times 10^{-26} \text{ kg}$$

FROM T<sub>REX</sub> (9.15)

$$v^* = \sqrt{\frac{2kT}{m}}$$

$$v_{N_2, -15^\circ\text{C}}^* = \sqrt{\frac{2(1.38 \times 10^{-23})(-15+273)}{4.65 \times 10^{-26}}}$$

$$v_{N_2, \text{COLD}}^* = 391.4 \text{ m/s}$$

$$v_{N_2, +35^\circ\text{C}}^* = \sqrt{\frac{2(1.38 \times 10^{-23})(35+273)}{4.65 \times 10^{-26}}}$$

$$v_{N_2, \text{HOT}}^* = 427.7 \text{ m/s}$$

SO ON A HOT DAY, THE MOLECULES MOVE 36.2 m/s FASTER!