$$\left\langle \frac{1}{2} m v^2 \right\rangle = \frac{3}{2} k_B T$$

**5.8**

$$\sqrt{\langle v^2 \rangle} \simeq \sqrt{\frac{3 k_B T}{m}} \simeq 1.2 \times 10^4 \frac{m}{s} = \bar{v}$$

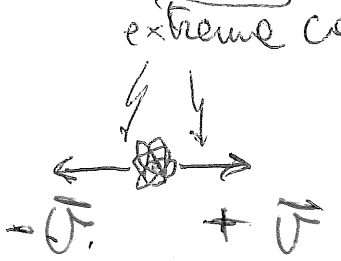
Earth $\left( \frac{\bar{v}}{c} \sim 4 \times 10^{-5} \right)$

$\oplus$ $\sim \sqrt{\frac{3 k_B T}{m c^2}}$.

(you can look up the whole distribution in e.g. Wikipedia).

SUN

extreme case




$$\frac{\lambda}{\lambda_0} = \frac{v_0}{v} = \sqrt{\frac{1 \pm \bar{v}/c}{1 \mp \bar{v}/c}} \simeq 1 \pm \frac{\bar{v}}{c}$$

$$\lambda \simeq \lambda_0 \left( 1 \pm 4 \times 10^{-5} \right)$$

∴ There is a broadening due to thermal effects: