$\frac{2200 \text{ km/s}}{1 \cdot 10^{-12}} \cdot \frac{7{,}92 \cdot 10^{6}}{10^{-12}} = 7{,}92 \cdot 10^{18}$

$KE_{a} = \frac{3}{2} k_B T \qquad KE_{d} = \frac{5}{2} k_B T \qquad KE = KE_{trans} + KE_{rot}$

$KE = \frac{3}{2} \cdot 294 \cdot 1{,}38 \cdot 10^{-23} = 6{,}1e{-21}\ J \cdot \frac{5}{3}$

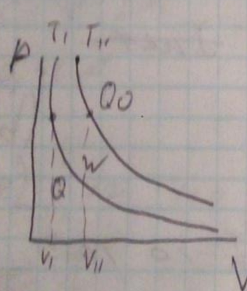
$KE_{trans} = \frac{3}{2} k_B T = 0{,}61 \cdot 10^{-20}\ J$

$\frac{1}{2} m v^2 = 0{,}61 \cdot 10^{-20} \qquad \frac{1}{2}(16\, m_p) v^2 = 0{,}61 \cdot 10^{-20}$

$v^2 = \frac{0{,}61 \cdot 10^{-20}}{8(1{,}7 \cdot 10^{-27})} = 448529$

$U = MCT$

$20 \cdot 20 = 400\ W \qquad 4185 \cdot 20 \cdot 20 = 1{,}6 \cdot 10^{6}$



$\epsilon = \frac{T_h - T_c}{T_h}$

S - entropy (disorder) $\Delta S = \frac{Q}{T}$

2 kg of ice at 0°C. Let it melt

$Q = m\, C_p \Delta T \qquad Q = m L$

C_p - specific heat capacity

L - latent heat fusion, vaporization

$Q = 2kg \cdot (334 \cdot 10^3\ J/kg) = 668 \cdot 10^3\ J$

$\Delta S = \frac{Q}{T} = \frac{668 \cdot 10^3 J}{273K} = 2{,}45 \cdot 10^3\ J/°K$

rot

2 kg water heats to 20° C

$Q = 2(4180) \cdot 20 = 1{,}6 \cdot 10^5 = 167 \cdot 10^3 J$

$\Delta S = \frac{167 \cdot 10^3}{\cancel{9.10}\ 285°K} = 590 = 0{,}59 \cdot 10^3\ J$

Tavg

$F = \frac{+mMG}{r^2}$ $\quad PE = \frac{-mMG}{r}$ $\quad T^2 = \frac{4\pi^2}{MG} r^3$

$F_e = \frac{qQk_e}{r^2}$ $\quad E = \frac{Qk_e}{r^2}$ $\quad PE = \frac{qQk_e}{r}$ $\quad V = \frac{Qk_E}{r}$

$F = q\cancel{Q}E$ $\quad PE = qV$ $\quad E = \frac{-\Delta V}{\Delta x}$