

class 36 T6 B.16, M.2, R.3

B.16 → from class of DS  $\frac{N}{V} = 8\pi \cdot 2.404 \left(\frac{kT}{hc}\right)^3$

RT=295;  $N = (L)^3 \cdot 8\pi \cdot 2.404 \left(\frac{k \cdot 295}{hc}\right)^3$   $\frac{hc}{kT}$  units:  $\frac{E \cdot T}{E} = L$

↳  $5.2 \times 10^{11}$  photons

$T = 2.73 \rightarrow 4.14 \times 10^5$

M.2  $T = 2 \times 273 \rightarrow v_p = \left(\frac{2kT}{m}\right)^{1/2} = 520.3$

$T = 50 \times 273 = 546.3$

$E = -42 \text{ eV} = \frac{1}{2}mv^2 \rightarrow v = \left(\frac{2 \times 42 \text{ eV}}{m}\right)^{1/2} = 2122 \text{ m/s}$   
convert to J  
18 x 1.66 x 10<sup>-27</sup>

$u_2 = \infty$

$u_1 = \begin{cases} 2122/520.3 = 4.078 \rightarrow 2.8 \times 10^{-7} \\ 2122/546.3 = 3.884 \rightarrow 1.2 \times 10^{-6} \end{cases}$

MBoltz app

R.3

avg E =  $\frac{\text{total energy}}{N} = \frac{\frac{1}{2} \sigma T^4}{8\pi \cdot 2.404 \left(\frac{kT}{hc}\right)^3} = \frac{8\pi^5}{15} \left(\frac{kT}{hc}\right)^3 (kT)$

=  $\frac{\pi^4/15}{2.404} (kT) = \frac{1.02 \times 10^{-22} \text{ J}}{6.4 \times 10^{-4} \text{ eV}}$   
2.70 T=273

estimate surface area = 1m<sup>2</sup>;  $\frac{1}{2}$  blocked by earth

$\frac{\text{energy flux} = \sigma A T^4}{\text{energy/photon}} = \frac{\sigma \cdot \frac{1}{2} (2.73)^4}{1.4 \times 10^{-22} \text{ J}} = 1.6 \times 10^{16} \frac{\text{phot}}{\text{sec}}$

avg E =  $h f = \frac{hc}{\lambda}$   
1.4 x 10<sup>-22} J</sup> λ ← 2mm  
1.5 x 10<sup>11} Hz</sup>