

PHY2201 Summary Sheet 5

Maxwell velocity distribution:

$$p(v_x) = \frac{1}{\sqrt{2\pi}} \cdot \sqrt{\frac{m}{k_B T}} \cdot \exp\left(-\frac{mv_x^2}{2k_B T}\right) \quad \text{ditto } v_y, v_z$$

Maxwell speed distribution:

$$p(v) = \sqrt{\frac{2}{\pi}} \cdot \left(\frac{m}{k_B T}\right)^{3/2} \cdot v^2 \cdot \exp\left(-\frac{mv^2}{2k_B T}\right)$$

Maxwell-Boltzmann energy distribution:

$$p(\epsilon) = \frac{2}{\sqrt{\pi}} \cdot \left(\frac{1}{k_B T}\right)^{3/2} \cdot \epsilon^{1/2} \cdot \exp\left(-\frac{\epsilon}{k_B T}\right)$$

Normalisation factor, ensures  
 $\int_0^{+\infty} p(\epsilon) d\epsilon = 1$

'Density-of-states' factor.  
 Describes how many distinct 'microstates' lie in the infinitesimal energy range  $\epsilon \rightarrow \epsilon + d\epsilon$

'Boltzmann factor' i.e. the Boltzmann energy distribution

You should understand how these distributions are related to each other e.g. how to derive the speed distribution, given the velocity distribution.