Summary of lecture 10

- The chemical potential of an ideal classical gas is modified if the particles in the gas have spin:

$$\mu = kT \ln \frac{n}{(2s+1)n_Q}$$

- Its actual value also depends upon the zero of the energy scale:

$$\mu = E_0 + kT \ln \frac{n}{n_Q}$$

- And if internal degrees of freedom exist, they too must be included:

$$\mu = kT \ln \frac{n}{Z_{int} n_Q}$$

- The quantum effects due to the identical particle nature of the gas are only important when the de Broglie wavelength of the particles is of the same order as the spacing between gas particles:

$$n > n_Q \equiv \left(\frac{mkT}{2\pi\hbar^2}\right)^{3/2}$$

- In this "high density and/or low temperature" regime it is not a good approximation to assume that particles occupy energy levels independently of each other.