

# Summary of lecture 19

As  $T$  falls so  $\mu$  rises in order to keep  $N$  fixed.

But since  $\mu \leq 0$  is necessary for a gas of bosons there must be a temperature  $T_c$  at which  $\mu = 0$ . What does this mean?

As  $T \rightarrow T_c$  and  $\mu \rightarrow 0$  there is an essential change of behaviour: the occupancy of the ground state starts to become significant.

We derived the number of particles in the lowest energy state for an ideal gas of bosons at temperatures below the critical temperature, i.e.

$$N_0 = N \left( 1 - \left( \frac{T}{T_c} \right)^{3/2} \right)$$

where the critical temperature is

$$T_c = 3.31 \frac{\hbar^2}{mk} n^{2/3}$$