Physics 555 Fall 2007 -- Numbers to memorize

You are expected to be able to calculate numerical answers, without being given any of these basic numbers.

You do not have to memorize this exact list, as long as the numbers you do memorize allow you to do equivalent calculations. For example, knowing that $a_B = 0.529 \times 10^{-10}$ m and/or $e^2/2a_B = 13.6$ eV allows you to do a lot of calculations, and may bail you out if you forget some of $\hbar$, e, and m_e.

$k_B = 1.38 \times 10^{-23}$ J/K [= R/N_A, in case you remember R=8.31 J/mole K]

$N_A = 6.02 \times 10^{23}$ molecules/mole

$\hbar = 1.054 \times 10^{-34}$ Js

$e = 1.602 \times 10^{-19}$ C ; 1.602×10^{-19} J = 1 eV

$m_e = 0.911 \times 10^{-30}$ kg

1 amu = 1.66×10^{-27} kg = $1/(N_A \times 10^3$ g/kg)

$\mu_B = 0.927 \times 10^{-23}$ J/T (the Bohr Magneton)

In addition to fundamental constants, of course, you do have to know a few other numbers. Ones that come to mind are

0°C=273.15 K

1 atm = 10^5 Pa (actually 1.013×10^5 Pa, and 1 "Pascal" is 1 N/m^2.)

Plus, please remember that 1 cm^{-1} is the energy of a photon with λ = 1 cm , and c = 3×10^8 m/s enables you to convert to real units, instead of remembering that 1 cm^{-1} = 0.124 meV or 8.06 cm^{-1} = 1 meV

You probably have your own list of things you keep in your head, like 22.4 liters per mole at STP, which would enable you to find how many pascals pressure is one atmosphere from the ideal gas formula, if you remember what "STP" is.