Formulas for Test 2

NMR resonance frequency: spin lattice relaxation time (T_1):	$f = gB$ $M_z = M_o(1 - e^{-t/T_1})$
Particle statistics: Distinguishable particles: Bosons: Fermions	$P_{Boltzman}(E) \propto \exp(-E/kT)$. $P_{Bose\text{-}Einstein}(E) \propto 1/(\exp(E/kT) - 1)$ $P_{Fermi\text{-}Dirac}(E) = 1/(\exp((E-E_F)/kT) + 1)$
LED:	$E_{gap} = hf = hc/\lambda$
Nuclear decay:	$dN/dt = -\lambda N$ $N = N_0\exp(-\lambda t)$, $R = R_0\exp(-\lambda t)$ $\tau = 1/\lambda$ $t_{1/2} = \tau \ln 2$
β^- decay: β^+ decay:	$n \rightarrow p + e^- + \bar{\nu}_e$ $p \rightarrow n + e^+ + \nu_e$
Coulomb barrier for fusion:	$U = kQ_1Q_2/D_0$
The Proton-Proton Chain:	$^1H + {}^1H \rightarrow {}^2H + e^+ +$ neutrino $^2H + {}^1H \rightarrow {}^3He +$ gamma-ray $^3He + {}^3He \rightarrow {}^4He + 2\ {}^1H$
Attenuation of radiation:	$N = N_0 \exp(-\mu_m x_m)$ $dN/dx_m = -\mu_m N$ $x_{m1/2} = \ln(2)/\mu_m$
Range of force carrier particle:	$R \sim \hbar/mc$