

Homework Questions

- Derive the reaction rate formula for a single narrow resonance from the general reaction rate formula using the Breit Wigner function for the resonance cross section!
- Calculate the Gamow window for the $^{14}\text{N}(p,\gamma)^{15}\text{O}$ reaction for temperatures of 0.01 to 0.1 GK.
- Calculate the reaction rate for $^{14}\text{N}(p,\gamma)^{15}\text{O}$ for the resonant contribution: $E_r^{\text{cm}}=0.259$ MeV, $\omega\gamma=13$ meV and non resonant component : $S=1.61$ keV-b
- Compare the reaction rate with the one of $^{12}\text{C}(p,\gamma)^{13}\text{N}$ and plot the ratio at a function of temperature!
- Determine the ground state spins of ^1H , ^4He , ^{16}O , ^{19}F , ^{20}Ne
- Determine the reaction rate for $^{16}\text{O}(\alpha,\gamma)^{20}\text{Ne}$ at a temperature of 1.0 GK from the NACRE compilation; what is the rate for the inverse photo-disintegration process.