Homework 2 for Introduction of Fusion Energy

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Question 1

Lawson Lawson Q
ł1/5ŁαłŁ. :

$$n\tau_E \geq \frac{3T}{\frac{1}{20}\langle\sigma v\rangle E_{DT} - \frac{S_B}{n^2}} \tag{1}$$

,$\eta = \frac{1}{3}$,$Z_{eff} = 1$,$n\tau = 1.5 * 10^20 m^{-3}s$,$T = 20.6729keV$,$\langle\sigma v\rangle$.

$$Z_{eff} = \sum_i Z_i^2 \frac{n_i}{n_e}$$

i $Z_{eff} = 1$.
LawsonŁ(łLawson,Lawson1/5łŁ,.

$$Q = \frac{\eta(\frac{1}{4}n^2\langle\sigma v\rangle E_f + \frac{3nT}{\tau_E} + S_B)}{\frac{3nT}{\tau_E} + S_B} \tag{2}$$

,

$$Q = \frac{\frac{17.591.1T^2}{10^{24}12} + \frac{T}{1.510^{20}} + \frac{1.625\sqrt{T}}{3\ 10^{38}}}{\frac{3T}{1.510^{20}} + \frac{1.625\sqrt{T}}{10^{38}}} \tag{3}$$

Q2.

Question 2

D-DD-D
$\langle\sigma v\rangle$ J.Rand McNally, Jr., K.E. Rother, R.D. Sharp, Fusion Reactivity Graphs and Tables for Charge and Particle Reactions, Oak Ridge National Laboratory, ORNL/TM-6914, Oak Ridge, TN(1979).
$Q_{dd,t}Q_{dd,h}$ł,Q 3.65 MeV,łŁ,:

$$\frac{3T}{\frac{1}{20}3.65 * 1000\langle\sigma v\rangle_{dd} - 1.625 * 10^{38} * 6.24151 * 10^{15}\sqrt{1000T}} \tag{4}$$

,DD , 1-1000 keV Ł,$n\tau < 0$.,$n\tau \geq 3.28692 * 10^{22}$.ł, DT ,$n\tau \geq 1.57133 * 10^{20}$,.
DD ,. 6 ł D , 43.2 MeV;ł D 14.4 MeV.$n\tau \geq 2.20731 * 10^{22}$, 60%.

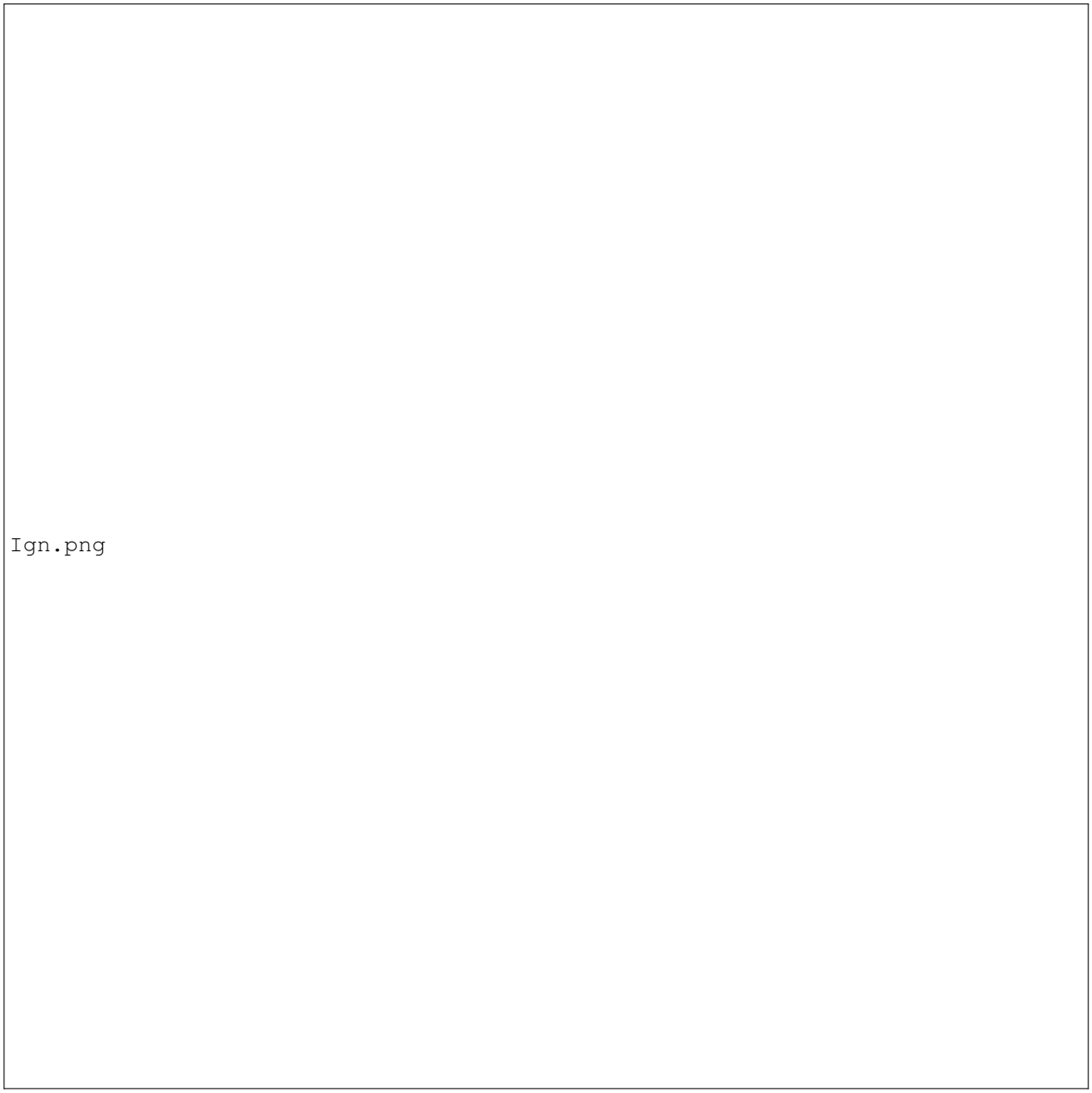

Figure 1: Ignition Condition