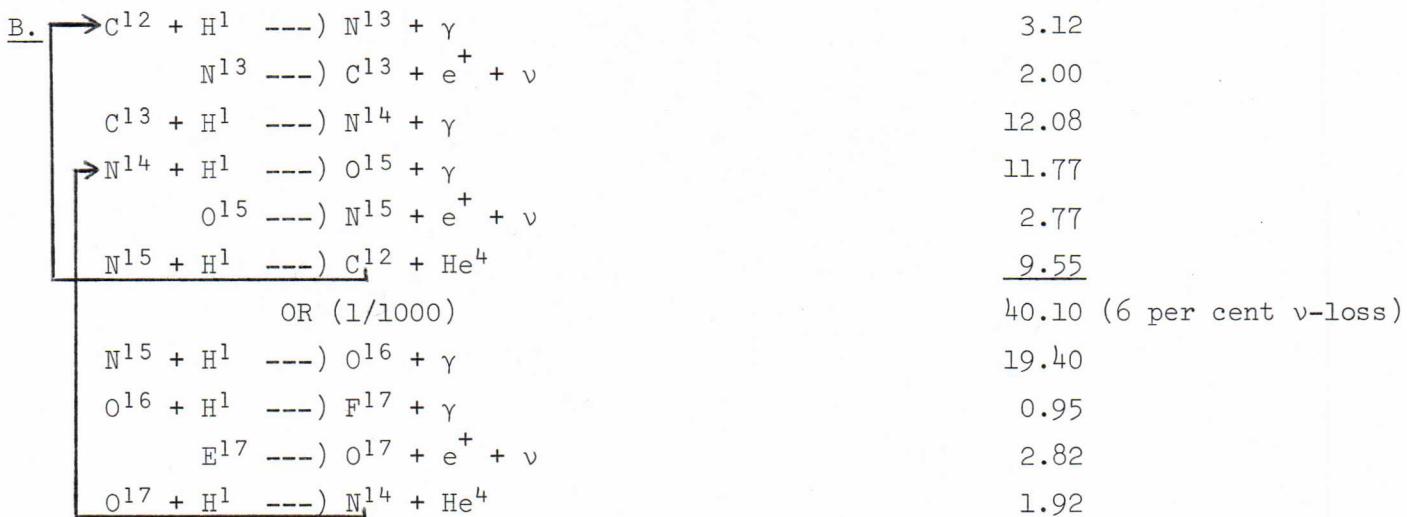
ENERGY RELEASE (Joules  $\times 10^{-13}$ )

$1.91 \times 2 = 3.82$
$8.79 \times 2 = 17.59$
<u>20.58</u>
41.99 (2 per cent $\nu$ -loss)
2.53
.08
<u>27.78</u>
41.09 (4 per cent $\nu$ -loss)
0.22
12.34
<u>4.81</u>
30.59 (29 per cent $\nu$ -loss)

 $4\text{H}^1 \rightarrow \text{He}^4$  direct would give  $42.81 \times 10^{-13}$  joules (no  $\nu$ -loss)
Key to symbols

H	Hydrogen	C	Carbon	$\gamma$	gamma-ray
He	Helium	N	Nitrogen	$\nu$	neutrino
Be	Beryllium	O	Oxygen	$e^-$	electron with - charge
Li	Lithium	F	Fluorine	$e^+$	electron with + charge

The series of reactions labelled A is the 'proton-proton' CHAIN, and will be predominant at temperatures between 5 and 10 million degrees.

The series labelled B is the 'carbon-nitrogen' CYCLE ('cycle because the  $\text{C}^{12}$  is re-generated and acts rather like a chemical catalyst) and will be predominant at higher temperatures; the higher temperatures are required to overcome the more powerful electrostatic repulsions of the reactants in this cycle.