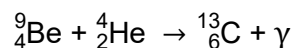


6 (a) State what is meant by nuclear fusion.

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.....  
.....[2]

(b) When beryllium is bombarded with  $\alpha$ -particles of energy  $8.0 \times 10^{-13}$  J, carbon atoms are produced, together with a very penetrating radiation. The nuclear reaction might be



(i) Explain what is meant by  ${}^{13}_6\text{C}$  in relation to carbon-12.

.....  
.....  
.....  
..... [2]

(ii) The energy of the penetrating radiation is found to be at least  $8.8 \times 10^{-12}$  J for each  $\gamma$  produced.

Data for the nuclei in the reaction are given in Table 6.1.

**Table 6.1**

nuclide	rest mass/ u
${}^9_4\text{Be}$	9.0150
${}^4_2\text{He}$	4.0010
${}^{13}_6\text{C}$	13.0075

1. Calculate the initial rest mass energy of reactants.

initial rest mass energy = ..... J [2]

[Turn over

2. Calculate the final rest mass energy of products.

final rest mass energy = ..... J [1]

3. Determine the energy released from the reaction.

energy released = ..... J [2]

4. Based on **b(ii)3.**, explain why the nuclear equation suggested in **(b)** cannot be valid.

.....  
.....  
.....  
..... [1]