9 One likely means by which nuclear fusion may be achieved on a practical scale is the D-T reaction.

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

.....

..... [1]

(b) In the D-T reaction, a deuterium ($^{2}_{1}H$) nucleus fuses with a tritium ($^{3}_{1}H$) nucleus to form a helium-4 ($^{4}_{2}He$) nucleus. The nuclear equation for the reaction is

$$^{2}_{1}H + {}^{3}_{1}H \rightarrow {}^{4}_{2}He + {}^{1}_{0}n + \text{energy}$$

Some data for this reaction are given in Fig. 9.1.

	mass / u
deuterium ($^{2}_{1}H$)	2.01356
tritium ($^{3}_{1}H$)	3.01551
helium-4 ($^{4}_{2}He$)	4.00151
neutron ($^{1}_{0}n$)	1.00867

Fig. 9.1

(i) Calculate the energy, in MeV, equivalent to 1.00 u. Explain your working.

energy = ... MeV [3]

(ii) Use data from Fig. 9.1 and your answer in **(i)** to determine the energy released in this D-T reaction.

energy = ... MeV [2]

(iii) Suggest why, for the D-T reaction to take place, the temperature of the deuterium and the tritium must be high.

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..... [2]