

A3. This question is about nuclear reactions.

(a) State the meaning of the terms

(i) nuclide [2]

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(ii) isotope [1]

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(b) The isotope sodium-24 undergoes radioactive decay to the stable isotope magnesium-24.

(i) Complete the nuclear reaction equation for this decay. [2]



(ii) One of the particles emitted in the decay has zero rest-mass. Use the data below to estimate the rest mass, in atomic mass units, of the other particle emitted in the decay of ${}_{11}^{24}\text{Na}$. [3]

rest mass of ${}_{11}^{24}\text{Na} = 23.99096u$

rest mass of ${}_{12}^{24}\text{Mg} = 23.98504u$

energy released in decay = 5.002160 MeV

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(Question A3 continued)

- (c) The isotope sodium-24 is radioactive but the isotope sodium-23 is stable. Suggest which of these isotopes has the greater nuclear binding energy.

[2]

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