

5 (a) Radioactive decay is both random and spontaneous.

(i) State what is meant by random.

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[1]

(ii) State what is meant by spontaneous.

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[1]

(iii) State **one** piece of evidence for the random nature of decay.

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[1]

(b) (i) Describe the differences between nuclear fission and nuclear fusion.

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[3]

(ii) Explain, with reference to the variation of binding energy per nucleon with nucleon number, why the processes of nuclear fission and nuclear fusion both result in a release of energy.

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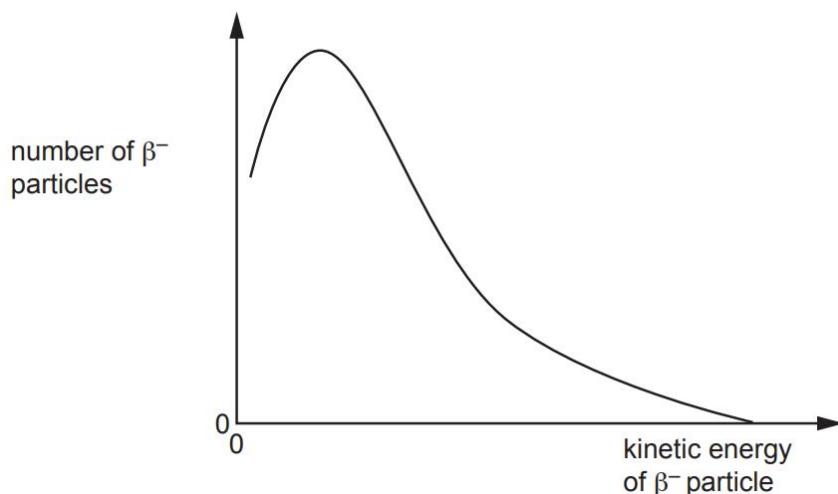
[2]

- (c) Nuclei of an isotope of copper (Cu) each have 29 protons and 37 neutrons. This isotope is a  $\beta^-$  emitter.

- (i) State the nuclide notation in the form  ${}^A_Z X$  for this nucleus of copper.

..... [1]

- (ii) The energy spectrum of the  $\beta^-$  radiation emitted by a sample of this isotope is shown in Fig. 5.1.



**Fig. 5.1**

Use Fig. 5.1 to explain why other particles apart from the  $\beta^-$  particles must be emitted during this decay.

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[3]

- (iii) In Fig. 5.1, sketch how the energy spectrum will look like if the beta decay were a two-body process. [1]