6 **(a)** β-radiation is emitted during the spontaneous radioactive decay of an unstable nucleus.

(i) State the nature of a β-particle.

..... [1]

(ii) State two properties of β-radiation.

1. .....

2. .....
[2]

(iii) Explain the meaning of *spontaneous radioactive decay*.

.....

..... [1]

(b) The following equation represents the decay of a nucleus of hydrogen-3 by the emission of a β-particle.

Complete the equation.

$$^{3}_{1}\mathrm{H} \rightarrow \overset{\ldots\ldots}{\underset{\ldots\ldots}{\ }}\mathrm{He} + \overset{\ldots\ldots}{\underset{\ldots\ldots}{\ }}\beta \qquad [2]$$

(c) The β-particle is emitted with an energy of 5.7×10^{3} eV.

Calculate the speed of the β-particle.

speed = ... $\mathrm{m\,s^{-1}}$ [3]

(d) A different isotope of hydrogen is hydrogen-2 (deuterium). Describe the similarities and differences between the atoms of hydrogen-2 and hydrogen-3.

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