7 A nuclear reaction between two helium nuclei produces a second isotope of helium, two protons and 13.8 MeV of energy. The reaction is represented by the following equation.

For Examiner's Use

$$^{3}_{2}\text{He} + {}^{3}_{2}\text{He} \rightarrow {}^{\cdots\cdots}_{\cdots\cdots}\text{He} + 2\,{}^{\cdots\cdots}_{\cdots\cdots}\text{p} + 13.8\,\text{MeV}$$

(a) Complete the nuclear equation. [2]

(b) By reference to this reaction, explain the meaning of the term *isotope*.

.....

.....

.....[2]

(c) State the quantities that are conserved in this nuclear reaction.

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.....[2]

(d) Radiation is produced in this nuclear reaction.

State

(i) a possible type of radiation that may be produced,

.....[1]

(ii) why the energy of this radiation is less than the 13.8 MeV given in the equation.

.....[1]

(e) Calculate the minimum number of these reactions needed per second to produce power of 60 W.

number = ... s^{-1} [2]