

- 7 (a) The β -decay of nuclei of tungsten-185 is spontaneous and random.

State what is meant by

- (i) *spontaneous* decay,

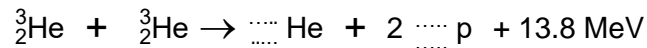
.....
[1]

- (ii) *random* decay.

.....

[2]

- (b) 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.



- (i) Complete the nuclear equation. [1]

- (ii) Radiation is produced in this nuclear reaction.
 State

1. a possible type of radiation that may be produced,

..... [1]

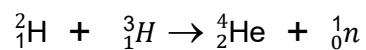
2. why the energy of this radiation is less than the 13.8 MeV given in the equation.

.....
[1]

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

number =s⁻¹ [2]

- (c) Using the data below, calculate in MeV, the energy released in the following reaction.



The binding energy per nucleon of

- deuterium ${}^2_1\text{H}$ is 1.11 MeV
- tritium ${}^3_1\text{H}$ is 2.66 MeV
- helium ${}^4_2\text{He}$ is 7.20 MeV

energy released =MeV [3]