

- 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_1H is 1.11 MeV
- tritium ^3_1H is 2.66 MeV
- helium ^4_2He is 7.20 MeV

energy released =MeV [3]