

- 8 The isotope phosphorus-33 ($^{33}_{15}\text{P}$) undergoes β -decay to form sulfur-33 ($^{33}_{16}\text{S}$), which is stable.
The half-life of phosphorus-33 is 24.8 days.

- (a) (i) Define radioactive *half-life*.

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.....
.....

[2]

- (ii) Show that the decay constant of phosphorus-33 is $3.23 \times 10^{-7}\text{s}^{-1}$.

[1]

- (b) A pure sample of phosphorus-33 has an initial activity of $3.7 \times 10^6\text{Bq}$.

Calculate

- (i) the initial number of phosphorus-33 nuclei in the sample,

number = [2]

- (ii) the number of phosphorus-33 nuclei remaining in the sample after 30 days.

number = [2]

- (c) After 30 days, the sample in (b) will contain phosphorus-33 and sulfur-33 nuclei.
Use your answers in (b) to calculate the ratio

$$\frac{\text{number of phosphorus-33 nuclei after 30 days}}{\text{number of sulfur-33 nuclei after 30 days}}$$

ratio = [2]