

- 6 The isotopes Radium-224 ( $^{224}_{88}\text{Ra}$ ) and Radium-226 ( $^{226}_{88}\text{Ra}$ ) both undergo spontaneous  $\alpha$ -particle decay. The energy of the  $\alpha$ -particles emitted from Radium-224 is 5.68 MeV and from Radium-226, 4.78 MeV.

- (a) (i) State what is meant by the *decay constant* of a radioactive nucleus.

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[2]

- (ii) Suggest, with a reason, which of the two isotopes has the larger decay constant.

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[3]

- (b) Radium-224 has a half-life of 3.6 days.

- (i) Calculate the decay constant of Radium-224, stating the unit in which it is measured.

decay constant = ..... [2]

- (ii) Determine the activity of a sample of Radium-224 of mass 2.24 mg .

activity = ..... Bq [4]

- (c) Calculate the number of half-lives that must elapse before the activity of a sample of a radioactive isotope is reduced to one tenth of its initial value.

number of half-lives = ..... [2]