

- 5** The number of radioactive atoms, N , in a sample of a sodium isotope after time t hours can be modelled by

$$N = N_0 e^{-kt}$$

where N_0 is the initial number of radioactive atoms in the sample and k is a positive constant.

The model remains valid for large numbers of atoms.

- 5 (a)** It takes 15.9 hours for half of the sodium atoms to decay.

Determine the number of days required for at least 90% of the number of atoms in the original sample to decay.

[5 marks]

- 5 (b)** Find the percentage of the atoms remaining after the first week.

Give your answer to two significant figures.

[2 marks]

- 5 (c)** Explain why the model can only provide an estimate for the number of remaining atoms.

[1 mark]

- 5 (d)** Explain why the model is invalid in the long run.

[1 mark]