	Marks
• A solution of sodium iodide containing the radioisotope ^{131}I has an activity of 20 mCi L^{-1} when freshly prepared. Fifteen days later, a patient is given 0.50 mL of this solution. Calculate the dose of ^{131}I (in microcurie, μCi) received by the patient. The half-life of ^{131}I is 8.04 days.	**3**
Answer:	

- A watch contains a radioactive substance with a decay constant of 1.4×10^{-2} year^{-1}. After 50 years 25 mg of the radioactive material remains. Calculate the amount originally present.

2

Answer:

Marks

- Technetium-99 is used in imaging internal organs in the body, and is often used to assess heart damage. The rate constant for decay of $^{99m}_{43}\text{Tc}$ is 0.116 hour^{-1}. What is the half life of this nuclide? **2**

Answer:

What fraction is left after 30 minutes?

Answer:

- Boron-13 is a synthetic (not naturally occurring) isotope of boron. Using the *N*/*Z* ratio, predict a possible mode of decay for the isotope boron-13. Give a reason for your choice and write the nuclear equation for this decay. **2**

- If a medical procedure calls for 2.0 mg of ^{48}V, what mass of isotope would be required to be able to use it exactly one week later? The half life of ^{48}V is 1.61 days.

Marks 2

Answer:

- The half life of the radioactive isotope ^{16}N is 7.13 s. Calculate how long it takes to reduce the radioactivity of a given sample to 71.6% of the initial value.

2

Answer:

• Outline the rules that determine nuclear stability.	**Marks 3**

- Radioactive elements are used in medicine both as tracers and to treat diseases such as cancer. Describe what the ideal half-life of an element is for each application, and state the reasons for your choices.

3