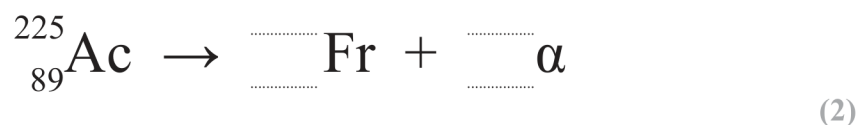


- 20 Actinium-225 is a radioactive isotope. It decays to francium by emitting alpha particles. Actinium-225 has a short half-life, which makes it suitable for medical applications.

(a) Complete the nuclear equation for this decay.



(b) In a radioactive decay, energy is released and the total mass decreases.

Show that the energy released if the mass decreases by 1 u is about 930 MeV.

(4)

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(c) The francium nucleus and the alpha particle move away from each other after the decay.

Explain why the kinetic energy given to the alpha particle is just less than 5.9 MeV.

mass decrease for the decay =  $6.35 \times 10^{-3} \text{ u}$

(4)

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(d) The activity of a sample of actinium-225 is  $7.4 \times 10^7 \text{ Bq}$  when it is prepared.

Calculate the number of actinium atoms in the sample 7.0 days later.

half-life of actinium-225 = 9.9 days

(4)

Number of actinium atoms after 7.0 days = .....

**(Total for Question 20 = 14 marks)**