Activity 1.3

Question 1

This question is about atomic particles and radioactivity.

(a) Name the type of radioactive decay that is the most ionizing.

_____ [1]

(b) (i) An atom of radium (Ra) of mass number 226 and atomic number 88 decays by alpha emission to radon (Rn). Write the nuclear reaction for this decay in the space provided.

[2]

(ii) A sample of iodine-128 has a half-life of 25 minutes. Define the term half-life.

_____

_____ [2]

(iii) The sample of iodine-128 has a mass of 1.4 kg. Estimate how much of it is left in grams after 1.5 hours have passed.

[2]

(iv) Why would iodine-128 be suitable as a medical tracer?

_____ [1]

(c) Carbon dating is another use for radioactive isotopes. Define isotope and state the isotope of carbon that is used for this purpose?

_____

_____ [2]

TOTAL MARKS [10]

Question 2

(a) $^{238}_{92}U$, a radioactive isotope of uranium, decays by α-particle emission and has a half-life of 4.5×10^9 years. It decays into a radioactive isotope of thorium (Th). Thorium itself is radioactive, decaying by β-particle emission to protactinium (Pa), and has a half-life of 24 days.

(i) Define the term half-life.

_____

_____

_____ [2]

(ii) Given 100 grams of the two isotopes, which one will have the larger mass after 2 years.

Explain your answer.

_____

_____ [2]

(b) Give one property of an alpha (α)- and one property of a beta (β)-particle.

α- _____

β- _____ [2]

(c) Give one use of β-particles.

_____ [1]

(f) Copy and complete the radioactive decay equations below for uranium decaying to thorium and thorium decaying to protactinium.

(i) $^{238}_{92}U \longrightarrow {}^{234}_{90}Th + \_\_\_\_ \alpha$

(ii) $^{234}_{90}Th \longrightarrow \_\_\_\_ Pa + \_\_\_\_ \beta$

[3]

TOTAL MARKS [10]