Practice Question Set For A-Level
Subject : Physics
Paper-2 Topic: Fields And Their Consequences(Nuclear Physics)

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Name of the Student:_____
Max. Marks : 20 Marks **Time : 20 Minutes**

Q1.

(a) Calculate the radius of the $^{238}_{92}$U nucleus.

$r_0 = 1.3 \times 10^{-15}$ m

(2)

(b) At a distance of 30 mm from a point source of γ rays the corrected count rate is *C*. Calculate the distance from the source at which the corrected count rate is 0.10 *C*, assuming that there is no absorption.

(2)

(c) The activity of a source of β particles falls to 85% of its initial value in 52 s. Calculate the decay constant of the source.

(3)

(d) Explain why the isotope of technetium, $^{99}Tc_m$, is often chosen as a suitable source of radiation for use in medical diagnosis.

You may be awarded additional marks to those shown in brackets for the quality of written communication in your answer.

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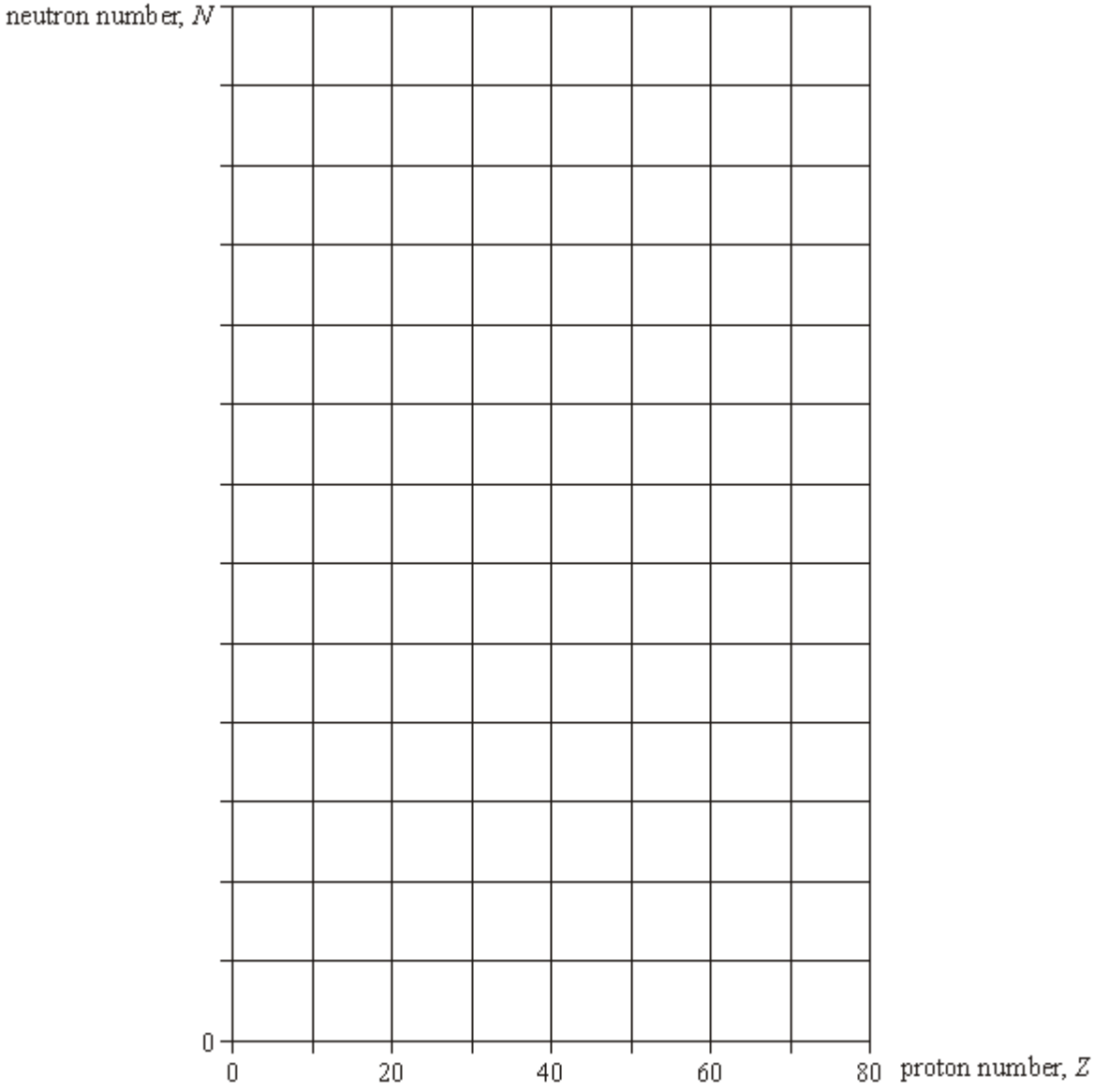
(3)

(Total 10 marks)

Q2.

(a) Sketch, using the axes provided, a graph of neutron number, *N*, against proton number, *Z*, for stable nuclei over the range *Z* = 0 to *Z* = 80. Show suitable numerical values on the *N* axis.



(2)

(b) On the graph indicate, for each of the following, a possible position of a nuclide that may decay

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by

(i) α emission, labelling the position with **W**,

(ii) β^- emission, labelling the position with **X**,

(iii) β^+ emission, labelling the position with **Y**.

(3)

(c) The isotope $^{222}_{86}Rn$ decays sequentially by emitting α particles and β^- particles, eventually forming the isotope $^{206}_{82}Pb$. Four α particles are emitted in the sequence.

Calculate the number of β^- particles in the sequence.

(2)

(d) A particular nuclide is described as proton-rich. Discuss **two** ways in which the nuclide may decay. You may be awarded marks for the quality of written communication in your answer.

(3)
(Total 10 marks)

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