

### Question 375

Alpha decay is a type of radioactive decay occurring in heavy nuclides.

(a) Explain why alpha decay typically occurs in heavier nuclides.

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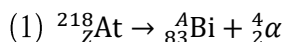
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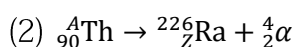
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(2 marks) KA2

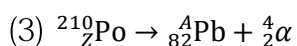
(b) Determine the unknown atomic and mass numbers in the following alpha decays.



Z: \_\_\_\_\_ A: \_\_\_\_\_ (2 marks) KA1



Z: \_\_\_\_\_ A: \_\_\_\_\_ (2 marks) KA1



Z: \_\_\_\_\_ A: \_\_\_\_\_ (2 marks) KA1

(c) Write equations for the following alpha decays.

(1) The decay of uranium (U) to thorium (Th) if the atomic number of uranium is 92 and the mass number of thorium is 234.

\_\_\_\_\_ (2 marks) KA1

(2) The decay of gadolinium (Gd) to samarium (Sm) if the atomic number of samarium is 62 and the mass number of gadolinium is 152.

\_\_\_\_\_ (2 marks) KA1

(3) The decay of platinum (Pt) to osmium (Os) if the atomic number of platinum is 78 and the mass number of platinum is 174.

\_\_\_\_\_ (2 marks) KA1

(4) The decay of plutonium (Pu) to uranium (U) if the atomic number of uranium is 92 and the mass number of uranium is 235.

\_\_\_\_\_ (2 marks) KA1

(d) Uranium-232 undergoes alpha decay to thorium-228.

Six different alpha particles are emitted in this process, each with a discrete energy.

Explain why the emitted alpha particles have a range of discrete energies.

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(3 marks) KA2