9 **(a)** State what is meant by the binding energy of a nucleus.

.....

.....

..... [2]

(b) Table 9.1 shows the masses of two sub-atomic particles and a polonium-212 ($^{212}_{84}$Po) nucleus.

Table 9.1

	mass / u
proton	1.007 276
neutron	1.008 665
polonium-212 nucleus	211.942 749

For the polonium-212 nucleus, determine:

(i) the mass defect Δm, in kg

Δm = ... kg [3]

(ii) the binding energy

binding energy = ... J [2]

(iii) the binding energy per nucleon.

binding energy per nucleon = ... J [1]

(c) **(i)** On Fig. 9.1, sketch the variation with nucleon number *A* of binding energy per nucleon for values of *A* from 1 to 250.

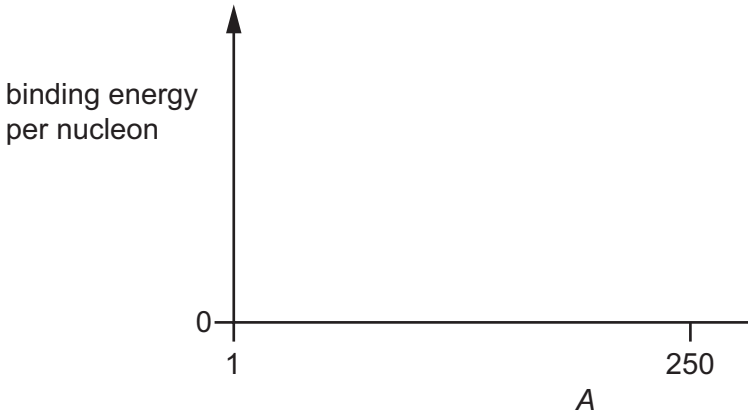

Fig. 9.1

[2]

(ii) On your line in Fig. 9.1, draw an X to show the approximate position of polonium-212.

[1]

(iii) Polonium-212 is radioactive and undergoes alpha-decay.

Suggest and explain, with reference to Fig. 9.1, why the alpha-decay of polonium-212 results in a release of energy.

.....

.....

..... [2]

[Total: 13]