



Module 8 Universe to Atom

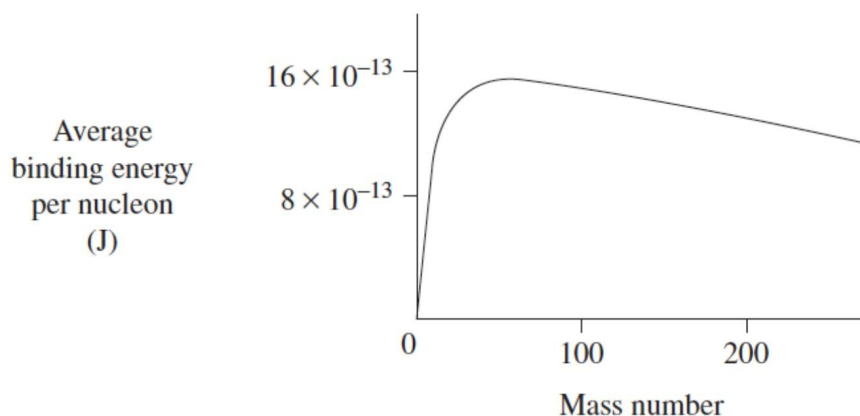
HSC Style questions

25 marks

2009

- (a) Marsden and Geiger conducted an experiment in which they fired alpha particles at a thin gold foil. Most of the particles passed straight through.
- (i) Describe how Rutherford's model of the atom explained these results. 2
 - (ii) Describe TWO problems associated with Rutherford's model and how these were explained by Bohr's model of the hydrogen atom. 4
- (b)
- (i) Describe de Broglie's proposal that a particle can exhibit both wave and particle properties. 2
 - (ii) Explain how Davisson and Germer were able to confirm de Broglie's proposal. 3
 - (iii) Calculate the velocity of an electron that has a wavelength of 3.33×10^{-10} m. 2
- (c)
- (i) Define *mass defect*. 1
 - (ii) The energy required to separate all the nucleons within a nucleus is the binding energy. The average binding energy per nucleon is a measure of the stability of a nucleus. 2

The graph shows how average binding energy per nucleon varies with mass number.



Use the graph to compare the stability of a nucleus of mass number 200 with a nucleus of mass number 50.

(d) In 1920, Rutherford suggested the existence of an undiscovered nuclear particle. Explain how Chadwick confirmed Rutherford's prediction using conservation laws. **3**

(e) Theories and experiments not only help increase our understanding but also generate new questions. **6**

Use the standard model of matter to support this statement.