

- 7 In the original Rutherford alpha particle scattering experiment, alpha particles were fired at a thin gold ($^{197}_{79}\text{Au}$) foil. As a result of the experiment, the model of the atom was changed.

- (a) State and explain the evidence from this experiment that changed the model of the atom in terms of its charge distribution and its mass distribution.

charge distribution

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mass distribution

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[4]

- (b) The alpha particles had an initial energy of 5.59 MeV when a long distance from a gold ($^{197}_{79}\text{Au}$) nucleus.

Calculate the minimum possible separation between an alpha particle and the gold nucleus.

separation = m [3]





- (c) Alpha particles may be produced from the radioactive decay of an isotope of radon ($^{222}_{86}\text{Rn}$) into an isotope of polonium (Po).

A stationary nucleus of radon emits an alpha particle.

The alpha particle has a binding energy per nucleon of 7.08 MeV.

The products of the radioactive decay have a total kinetic energy of 6.62 MeV.

The binding energy per nucleon of radon is 7.69 MeV.

Determine the binding energy per nucleon of polonium. Show your working.

binding energy per nucleon = MeV [4]

[Total: 11]