

- 7 A nucleus of bismuth-212 ($^{212}_{83}\text{Bi}$) decays by the emission of an α -particle and γ -radiation.

- (a) State the number of protons and the number of neutrons in the nucleus of bismuth-212.

number of protons =

number of neutrons =

[1]

- (b) The γ -radiation emitted from the nucleus has a wavelength of 3.8 pm.

Calculate the frequency of this radiation.

frequency = Hz [3]

- (c) Explain how a single beam of α -particles and γ -radiation may be separated into a beam of α -particles and a beam of γ -radiation.

.....
.....
.....
.....

[2]

- (d) The α -particle emitted from the bismuth nucleus has an initial kinetic energy of 9.3×10^{-13} J. As the α -particle moves through air it causes the removal of electrons from atoms. The α -particle loses energy and is stopped after removing 1.8×10^5 electrons as it moved through the air.

Determine the energy, in eV, needed to remove one electron.

energy = eV [2]

[Total: 8]

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