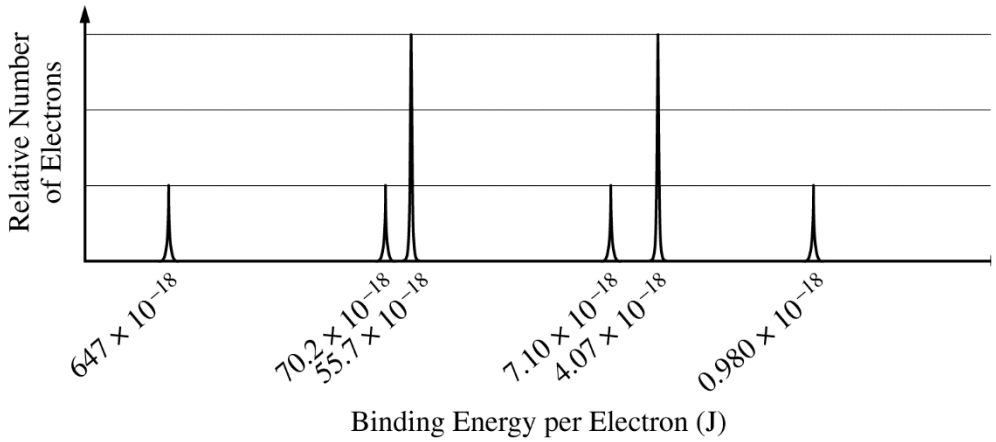
5. The complete photoelectron spectrum of an element in its ground state is represented below.



(a) Based on the spectrum,

(i) write the ground-state electron configuration of the element, and

(ii) identify the element.

(b) Calculate the wavelength, in meters, of electromagnetic radiation needed to remove an electron from the valence shell of an atom of the element.

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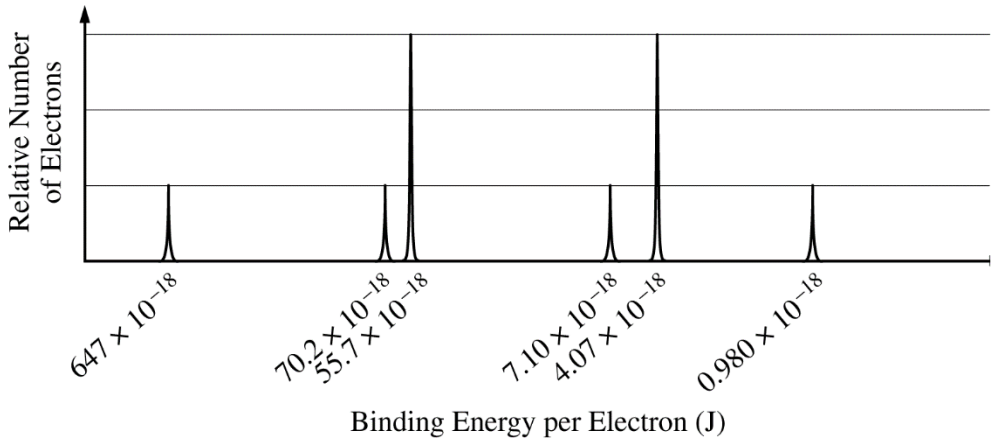
Question 5

The complete photoelectron spectrum of an element in its ground state is represented below.



(a) Based on the spectrum,

(i) write the ground-state electron configuration of the element, and

$1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 4s^2$ or [Ar] $4s^2$	1 point is earned for the correct answer.

(ii) identify the element.

Ca	1 point is earned for the correct answer.

(b) Calculate the wavelength, in meters, of electromagnetic radiation needed to remove an electron from the valence shell of an atom of the element.

Energy (E) required = 0.980×10^{-18} J $E = h\nu = \frac{hc}{\lambda} \Rightarrow \lambda = \frac{hc}{E}$ $\lambda = \frac{(6.626 \times 10^{-34}\ \text{Js})(2.998 \times 10^{8}\ \text{ms}^{-1})}{0.980 \times 10^{-18}\ \text{J}}$ $\lambda = 2.03 \times 10^{-7}\ \text{m}$	1 point is earned for the correct identification of the energy required to remove an electron from the valence shell (may be implicit). 1 point is earned for calculating the correct wavelength.