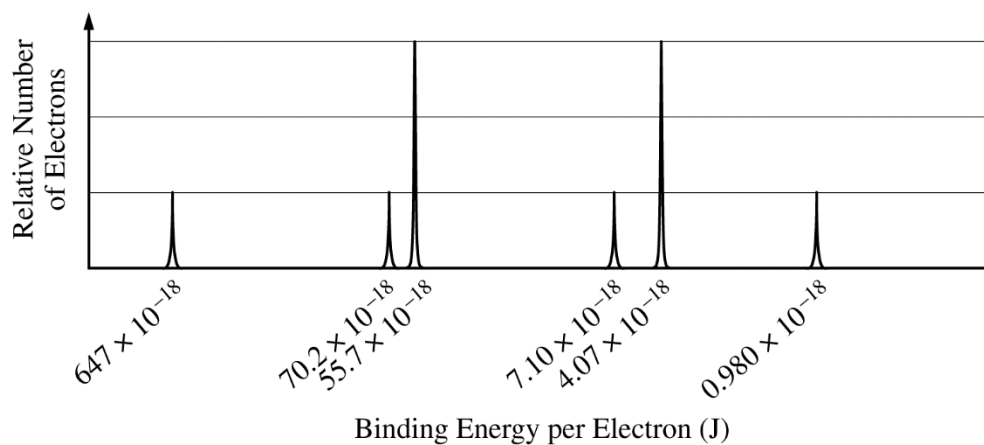


AP[®] CHEMISTRY
2019 SCORING GUIDELINES

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 $[\text{Ar}] 4s^2$	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.

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