Name: **Date:**   **Period:**   **Seat #:**

Show all work

1. In a photoelectron spectrum, photons of 165.7 MJ/mol strike atoms of an unknown element. If the kinetic energy of the ejected electrons is 25.4 MJ/mol, what is the ionization energy of the element? **140.3 MJ/mol**

2. What determines the position and the height (intensity) of each peak in a photoelectron spectrum?

3. Why is the distance of the energy level from the nucleus important in determining the corresponding peak position in the photoelectron spectrum?

4. The ionization energy of an electron from the first energy level of lithium is 6.26 MJ/mol. The ionization energy of an electron for the second energy level of lithium is 0.52 MJ/mol.
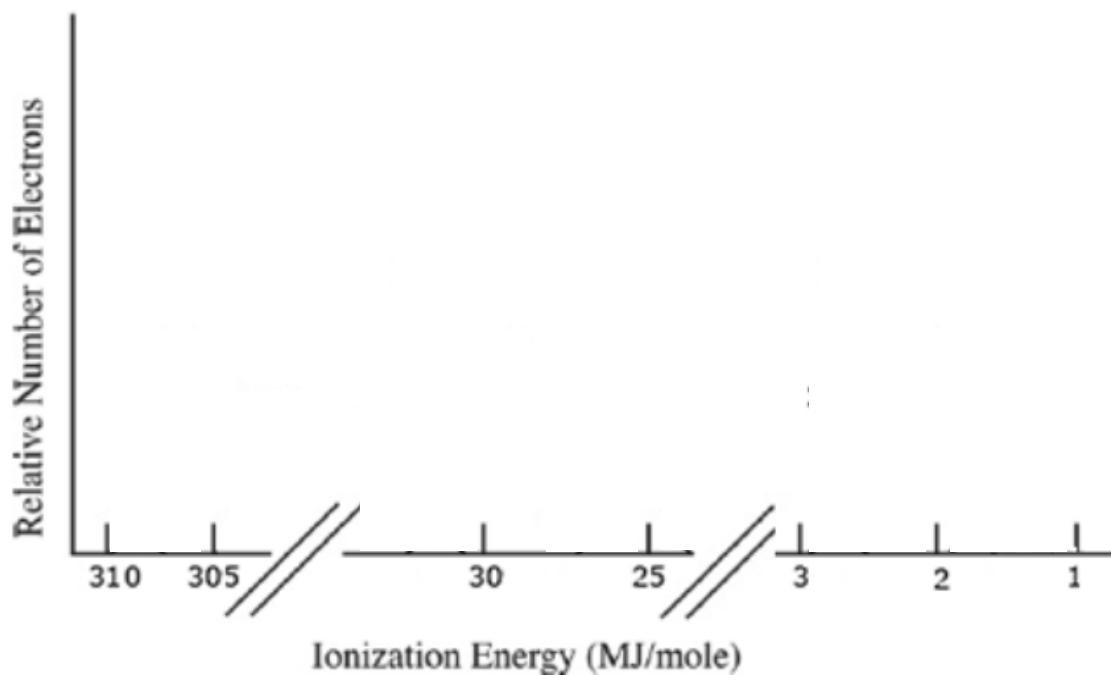   a. Draw an electron config. for lithium.

   b. Sketch the photoelectron spectrum for lithium is below; include the values of the ionization energies stated above and label peaks.
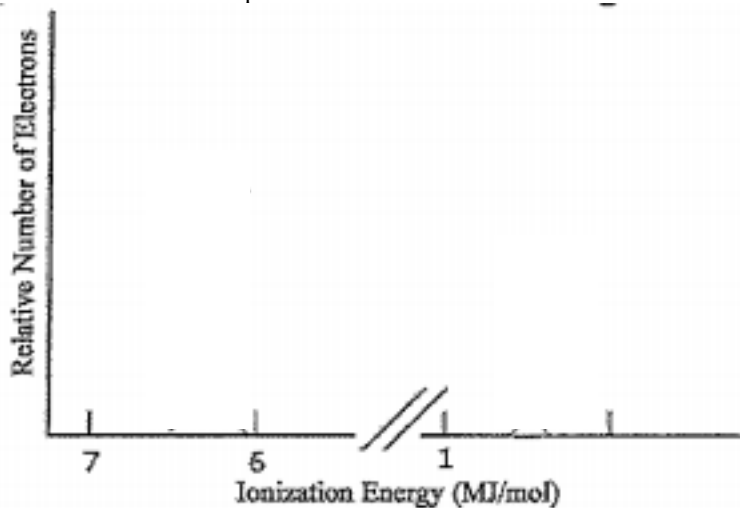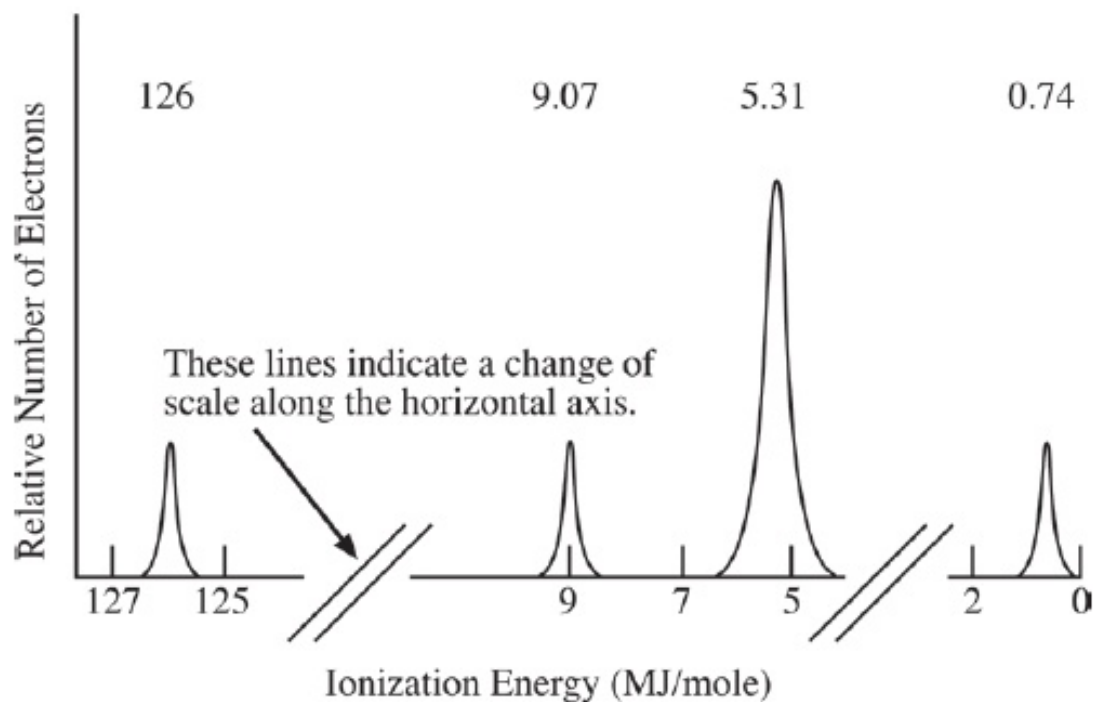
5. Based on the information provided below, draw a photoelectron spectrum for argon. Indicate the relative intensities and positions of all peaks.

$1s^2$	$2s^2$	$2p^6$	$3s^2$	$3p^6$
-309.0	-31.5	-24.1	-2.83	-1.52

Relative Number of Electrons

310   305   30   25   3   2   1

Ionization Energy (MJ/mole)

6. Identify the element in the photoelectron spectrum shown below. Explain your reasoning.

Relative Number of Electrons

126   9.07   5.31   0.74

These lines indicate a change of
scale along the horizontal axis.

127   125   9   7   5   2   0

Ionization Energy (MJ/mole)

Explain:

7. Identify if either of the following statements is correct. If yes, why. If not, why not:
a) The photoelectron spectrum of Mg^{2+} is expected to be identical to the photoelectron spectrum of Ne.
b) The photoelectron spectrum of ^{35}Cl is identical to the photoelectron spectrum of ^{37}Cl.

8. Is it possible to deduce the electron configuration for an atom from its photoelectron spectrum? If so, explain how. If not, explain why not.

Simulated Photoelectron Spectrum of Potassium.
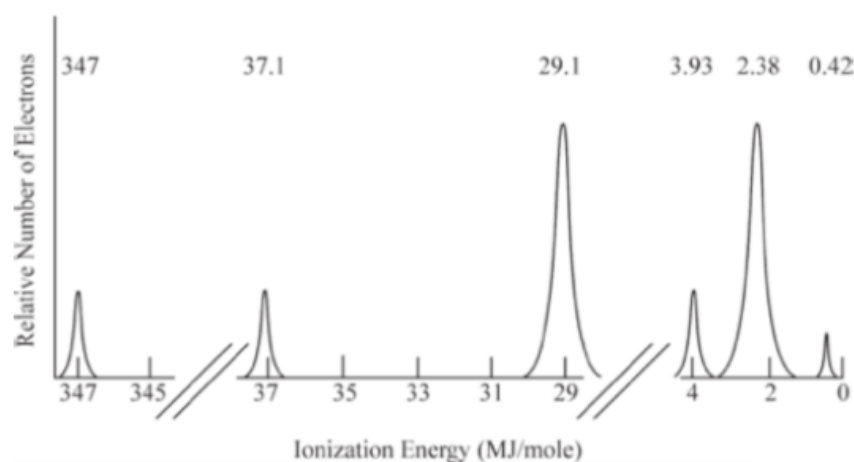
9. Why is the peak at 0.42 MJ/mol in the K photoelectron spectrum identified as being in the 4th energy level?