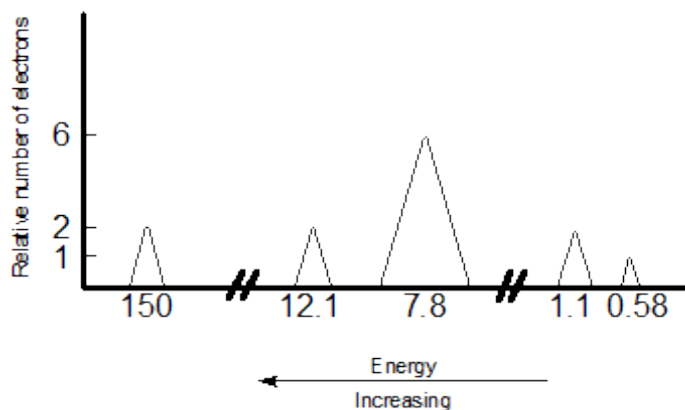


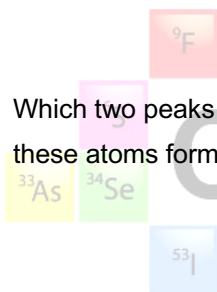
## AP WORKSHEET 01F: Photoelectron Spectroscopy

1. Consider the simulated PES plot shown below, that is produced by the analysis of the atoms of a single element. All peaks in the PES are shown.



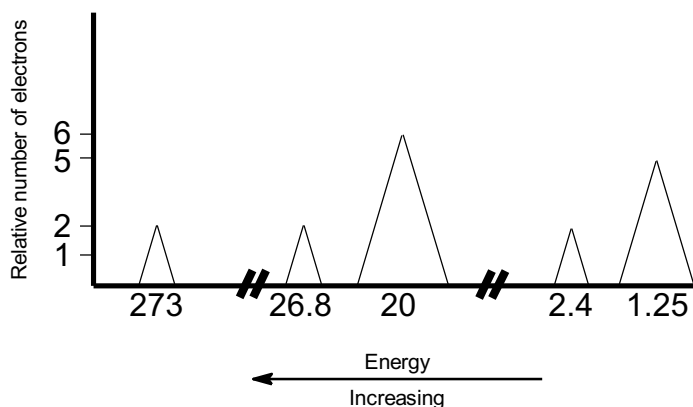
- (a) Using the plot, suggest the electron configuration of the element and hence identify the element. (2)

- (b) Which two peaks are likely to represent electrons that are most likely to be removed when these atoms form ions? Explain. (3)



- (c) Using your answer in (b), identify the mostly likely charge on an ion of this element. Explain (2)
- (d) Suggest a reason for the huge jump in energy between the peak at 12.1 and the peak at 150. (2)
- (e) Suggest a reason for the x-axis being labeled with increasing values from right to left. (1)

2. Consider the simulated PES plot shown below, that is produced by the analysis of the atoms of a single element. All peaks in the PES are shown.



- (a) Write the electron configuration and identify the element. (2)
- (b) The plot is divided into three separate areas on the x-axis. Why is the axis divided in this manner? (2)
- (c) What would be the charge on an ion formed from this atom? Justify your answer. (2)
- (d) What is the significance of three of the peaks having the same height? (2)
- (e) The peaks at 1.25 & 2.44, as well as the peaks at 20.2 & 26.8, are relatively close to one another but have different energies? Explain why they are of the same magnitude but slightly different. (2)

3. Consider a PES plot for carbon atoms.

- (a) How many peaks would you expect in the PES for carbon? Explain. (2)
- (b) What would be the relative heights of the peaks that you have identified in (a)? Explain your answer carefully. (2)
- (c) How would you expect the height of the 2p peak in carbon's PES to compare to the height of the 2p peak in nitrogen's PES? Explain. (2)

