

## AP WORKSHEET 01F: ANSWERS

- (a)  $1s^2 2s^2 2p^6 3s^2 3p^1$ ; aluminum

(b) Peaks at 1.1 and 0.58 since these represent the lowest energy required.

(c) The peaks in (b) represent three electrons so the element would most likely form a 3+ ion.

(d) The peak at 150 represents electrons in the 1s orbital that are directly adjacent to the nuclear charge with no shielding. The peak at 12.1 represents electrons in the second shell which is further from the pull of the nuclear charge so requires less energy.

(e) When electron configurations are written  $1s^2 2s^2 2p^6$  etc., the electrons that are easiest to remove are written to the right. These electrons have the lowest binding energies so writing the scale in this manner helps to match the electronic configuration and the binding energy/PES plot.
- (a)  $1s^2 2s^2 2p^6 3s^2 3p^5$ ; chlorine

(b) The grouped peaks represent electrons in the 1<sup>st</sup>, 2<sup>nd</sup> and 3<sup>rd</sup> shells.

(c) Since there are seven valence electrons (at peaks 2.4 and 1.25), the atom would gain an electron to produce a -1 charge.

(d) They all have the same number of electrons in their sub-shell.

(e) Each pair of peaks are in the same shell, but the different energies represent different sets of orbitals (sub-shells) within that shell.
- (a) Three. One for each of the electrons in the 1s, 2s and 2p sub-shells.

(b) All the same, since each sub-shell contains two electrons.

(c) Nitrogen's would be higher, since it contains three, 2p electrons as opposed to carbon's two.