

## Ch. 2,7,22 Review Answers

1) D

2) A

3) A

4) A

5) C

6) B

7) B

8) C

4  
~~10~~ A) The outermost electrons in all the elements from Li to Ne are in the second energy level but the number of protons goes from 3 for Li to 10 for Ne. The more protons for an atom the greater the ionization energy, in general.

b) The first electron removed from a Be atom would come from a  $2p$  orbital which is slightly higher in energy than the  $2s$  orbital which is where the electron from a Be atom would come from. The  $2p$  is slightly farther away and this would offset the additional attractive force of the proton.

c) Both oxygen and nitrogen would have electrons in the  $2p$  orbital. Oxygen with one more proton would be expected to have a higher ionization energy but it is actually lower. This is due to the doubling up of electrons in the same orbital, in nitrogen each electron in the  $2p$  orbital is in its own orbital but in oxygen there are 2 electrons that are in the same orbital. This causes increased  $e^-e^-$  repulsion which offsets the additional  $p^+$ .

d) Sodium would have a lower 1<sup>st</sup> ionization energy than either Li or Ne. The outermost  $e^-$  would be in the  $3s$  orbital this is further from the nucleus and experiences more electron shielding making its ionization lower.

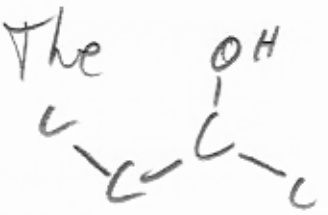
10 a) The outer most electron for Mg is in the 3s while the outer most electron for Calcium is in the 4s orbital. The 4s orbital is further from the nucleus and experiences more electron shielding so even though the Ca atom has more protons, the 4s electrons are more weakly attracted to the nucleus.

b) Calcium has an electron configuration of  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$ . The first two electrons removed come from the 4s orbital, while the third electron comes from the 3p orbital. The 3p orbital is closer to the nucleus and experiences less electron shielding than the 4s orbital so electrons in the 3p are much harder to remove.

c) The general trend for electron affinity is to increase from left to right across a period but nitrogen is lower than carbon. This is due to nitrogen have an electron in each of the 2p orbitals, so that any added electron would need to go into an orbital that already has an electron. This doubling of electrons in the same orbital means that the two electrons repel each other lowering the electron affinity.

~~21d~~  
10 Sodium has only 1 electron in its  $3s$  orbital while magnesium has 2. This means that the second electron removed from sodium has to come from the  $2p$  orbital which is much closer to the nucleus and experiences much less electron shielding, meaning it is much harder to remove.

~~22a~~  
11 
$$E = \frac{hc}{\lambda} \quad \lambda = \frac{hc}{E} = \frac{6.63 \cdot 10^{-34} \text{ J}\cdot\text{s} \cdot 3.0 \cdot 10^8 \text{ m}\cdot\text{s}^{-1}}{7.04 \cdot 10^{-19} \text{ J}}$$
$$\lambda = 282.5 \cdot 10^{-9} \text{ m} \cdot \frac{1 \text{ nm}}{10^{-9} \text{ m}} = 282 \text{ nm}$$

~~22b~~  
11 The  is an alcohol with four carbons this is butan-2-ol or 2-butanol.