

WS - Chapter 14 - electrons and The Periodic table 2010

C 1. In general, the atomic mass of elements increases as the atomic number increases. Which of these pairs of consecutive elements is an exception to this generalization?
 a) Li & Be b) N & O c) Ar & K d) Ni & Cu

2. Due to such exceptions, elements on the modern P.T. are ordered by their atomic number

3-7. Match each Electron Configuration with a region on the periodic table:

- | | |
|--|----------------------------|
| <u>C</u> 3. <i>s</i> and nearby <i>d</i> sublevel contain electrons | A. Noble Gases |
| <u>D</u> 4. outermost <i>s</i> and nearby <i>f</i> sublevels contain electrons | B. Representative Elements |
| <u>A</u> 5. outermost <i>s</i> and <i>p</i> sublevels are completely filled | C. Transition Metals |
| <u>B</u> 6. Outermost <i>s</i> and <i>p</i> sublevels are only partly filled | D. Inner Transition Metals |
| <u>B</u> 7. For these, the group number equals the number of valence <i>s</i> and <i>p</i> electrons | |

8. Nitrogen is a nonmetallic gas, while Bismuth is a solid metal. However, Nitrogen and Bismuth are both included in Group 5A because they have 5 valence electrons.

9. The Noble Gases are unreactive, because their 8 valance e- or full outershell

10. Name the groups whose elements have the following valence (outer) electron configuration:
 a) s^1 - Group 1A b) s^2p^5 - Group 7A c) s^2p^6 - Group 8A

11. How many valence electrons are found in each of the following?
 a) the elements of the oxygen family? 6 b) the element in Group 3A, Period 5 - 3
 c) the element with the electron configuration $1s^2 2s^2 2p^5$ - 7

12. See text, p. 398-400, Figure 14.8, p. 399 and Fig 14.10, p. 401
 a) As you go down a group, the atomic radius increases, because the number of energy levels increases and the outermost orbital is larger.
 b) As you go from left to right across a period, the atomic radius decreases: energy level remains the same, but increasing nuclear charge pull the electrons closer.
 c) Group 1A atoms all have very large radii, while Group 7A all have small radii.

13. See Table 14.1, p. 402 and Fig 14.12, p. 403
 a) The first ionization energy for Group IA is very low while the second ionization energy for Group IA is very high.
 b) Group 8A has the highest first ionization energy of all (doesn't want to let go at all!)
 c) K has a lower first i.e. than Li, because its outer electron is closer to the nucleus.

14. Identify the two elements below (write the symbol), using the information listed below:
 a) Element X - reacts with sodium to form Na_2X ; located in Period 2 = F
 b) Element Y - reacts with oxygen to form Y_2O ; largest atomic radius in Period 4;

Ca

lowest ionization energy in Period 4 = K, potassium

15. The atomic numbers listed below have these electron configurations:
 #3 - $1s^2 2s^1$ #11 - $1s^2 2s^2 2p^6 3s^1$ #19 - $1s^2 2s^2 2p^6 3s^2 3p^6 4s^1$
 a) How many valence electrons does each atom have? 1
 b) These elements are all located in Group 1A on the periodic table.
 c) You should expect to find out that the chemical properties of these elements are all reactive / explosive (Hint: British guys and bathtub)
 d) What "family" name is given to this group of elements? Alkali Metals

16. The atomic numbers listed below have these electron configurations:
 #9 - $1s^2 2s^2 2p^5$ #17 - $1s^2 2s^2 2p^6 3s^2 3p^5$ #35 - $[Ar] 4s^2 3d^{10} 4p^5$
 a) Comparing these three electron configurations, what do they have in common? They all have 7 valance electrons.
 b) These elements are all located in Group 7A on the periodic table.
 c) You should expect to find out that the chemical properties of these elements are all Similar / reactive (but not like the elements in IA).
 d) This "family" is named the halogens, because they form many common salts.

17. Calcium (Ca) element 20, forms Ca^{2+} as an ion by losing two electrons.
 The electron configuration for the neutral Ca atom is $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2$. ← notice
 Complete the electron configuration for the Ca^{2+} ion: $1s^2 2s^2 2p^6$ $3s^2 3p^6$ we get rid of 4s²
 18. Sulfur (S) element 16, forms S^{2-} as an ion by gaining two electrons.
 The electron configuration for the neutral S atom is $1s^2 2s^2 2p^6 3s^2 3p^4$. ← notice
 Complete the electron configuration for the S^{2-} ion: $1s^2 2s^2 2p^6$ $3s^2 3p^6$ we add 2e-

19. How do your answers for 17 and 18 compare? They should be the same, because both the Calcium and Sulfur ions are trying to achieve an inert gas configuration (in this case, the element Argon). (Their ions are isoelectronic with this element's neutral atom.)

20. Check the Ion Charges list on page 143 if you aren't sure how to answer the following:
 a) Group IA metals form ions with a +1 charge.
 b) Group IIA metals form ions with a +2 charge.
 c) Group IIIA metals form ions with a +3 charge.
 d) Group VIA elements form ions with a -2 charge.
 e) Group VIIA elements form ions with a -1 charge.
 f) What charge would Group 8A elements have? zero