AP Chem   **Name:** _____
In Class Exam Ch 5 – 7   **I have neither given nor received aid on this exam.**
Version B (76 pts)   **Period: 6   7**   **Date:** _____

Complete in pencil. Erase mistakes completely. If you need more space, use the back of the sheets as are necessary. Use significant figures for atomic masses as recorded on the Periodic Table and for the constants as given to you.

$\Delta E = h\nu$ $\qquad\qquad$ $c = \lambda\nu$ $\qquad\qquad$ $E_n = \dfrac{-2.178 \times 10^{-18}}{n^2}$ joule $\qquad\qquad$ $q = mc\Delta T$

$h = 6.63 \times 10^{-34}$ J s $\qquad$ $c = 3.0 \times 10^8$ m s^{-1}

Multiple Choice: Choose the option that is the best answer or completes each question or statement. (3 pts each) Write the letter of your answer in the space to the right.

1. Which of the following shows the standard state formation of sodium fluoride?
   a. $2\ Na\ (s) + F_2 \rightarrow 2\ NaF\ (s)$
   b. $Na\ (s) + \frac{1}{2}\ F_2 \rightarrow NaF\ (g)$
   c. $Na\ (s) + F_2 \rightarrow NaF\ (s)$
   d. $Na\ (s) + \frac{1}{2}\ F_2 \rightarrow NaF\ (s)$ $\qquad\qquad\qquad\qquad\qquad$ **Answer:** _____

2. When an exothermic reaction takes place, $q_{reaction}$ is:
   a. Equal to zero.
   b. Negative.
   c. Positive.
   d. None of the above. $\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad$ **Answer:** _____

3. How much heat is required to raise the temperature of 200.0 g water from 20.0ºC to 90.0ºC? (specific heat of water is 4.18 J/gºC.)
   a. 5.85×10^4 J
   b. $- 5.85 \times 10^4$ J
   c. 5.852×10^4 J
   d. 5.85×10^4 kJ $\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad$ **Answer:** _____

4. Energy transitions in which an excited electron "relaxes" to $n = 1$ are associated with:
   a. The Lyman series.
   b. Visible light.
   c. The Paschen series.
   d. Infrared light.
   e. The World Series. $\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad$ **Answer:** _____

5. What is a permissible set of quantum numbers for the highest energy electron of indium, $_{49}$In?
   a. 5, 1, 3, ½
   b. 5, 0, 0, ½
   c. 5, 1, 0, -½
   d. 4, 2, -2, ½ $\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad$ **Answer:** _____

6. Which series is ranked in order of increasing electronegativity?
   a. O, S, Se, Te
   b. Cl, S, P, Si
   c. In, Sn, N, O
   d. C, Si, P, Se $\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad$ **Answer:** _____

7. In any one group of the periodic table, the element in Period 1, as compared to the element in Period 6, has a
    a. Larger number of valence electrons.
    b. Lower electronegativity.
    c. Smaller radius.
    d. Lower ionization energy.
    e. None of the above.   **Answer:** ____

8. Which gaseous atom has the highest 2nd ionization energy?
    a. C
    b. Li
    c. F
    d. Ne   **Answer:** ____

9. Which of the following would have the greatest shielding effect?
    a. Sr
    b. Mg
    c. Ar
    d. K   **Answer:** ____

10. Which of the following sets of quantum numbers represents the lowest energy state?
    a. 5, 1, 1, -1/ 2
    b. 5, 2, 0, +1/2
    c. 4, 2, -1, +1/2
    d. 6, 0, 0, -1/2   **Answer:** ____
    e. 5, 2, 1, -1/2

11. Which of the following atoms is smallest in size?
    a. O
    b. Al
    c. Na
    d. F
    e. Mg   **Answer:** ____

12. Which of the following is most metallic?
    a. I
    b. O
    c. Cs
    d. K
    e. Te   **Answer:** ____

13. Which series is ranked in order of decreasing electronegativity?
    a. O, S, Se, Te
    b. Cl, S, P, Si
    c. In, Sn, N, O
    d. C, Si, P, Se   **Answer:** ____

Free Response

14. (4 pts) Make a sketch of the d_{x2-y2} electron density (or 95% probability) plot. Be sure to label your axes.

15. Modified from 1980 D (10 pts)

   a. (4 pts) Write the complete ground state electron configuration for a selenium atom, showing the number of electrons in each subshell.

   b. (6 pts) Briefly explain how the electron configuration of the arsenic atom in the ground state is consistent with the existence of the following known compounds: Na_2Se, $SeCl_4$, and SeF_6.

16. Modified from 1977 D (19 pts)
   The electron affinities of the elements from Na to Ar are given below.

   $_{11}$Na   -53 kJ/mole
   $_{12}$Mg + 21 kJ/mole
   $_{13}$Al   -43 kJ/mole
   $_{14}$Si   -134 kJ/mole
   $_{15}$P   -72 kJ/mole
   $_{16}$S   -200 kJ/mole
   $_{17}$Cl   -349 kJ/mole
   $_{18}$Ar + 35 kJ/mole

   a. (2 pts) Define the term "electron affinity" of an atom.

   Briefly (in 1 to 2 sentences) explain each of the following in terms of atomic structure.
   b. (4 pts) In general, there is an increase (here, becoming more negative) in the electron affinity from Na to Ar.

   c. (4 pts) The electron affinity of Al is lower (here, less negative) than that of Mg.

   d. (4 pts) The electron affinity of P is lower (here, less negative) than that of Si.

   e. (5 pts) Predict how the electron affinity of K compares to those of Na and of Ar. Explain.