The following problems sets are compiled from B. A. Averill and P. Eldredge, *General Chemistry: Principles, Patterns, and Applications*. License: CC BY-NC-SA. Source: Open Textbook Library.

Reading: Averill 6.6.3-6.6.4; 7.3; 8.1-8.3

1. Applying Pauli exclusion principle and Hund's rule

Averill Chapter 6, Section 6, Numerical Problem 20

Using the Pauli exclusion principle and Hund's rule, draw valence orbital diagrams for each element
   a) chlorine
   b) silicon
   c) scandium

2. Unpaired electrons

Averill Chapter 6, Section 6, Numerical Problem 21

How many unpaired electrons does each species contain?
   a) lead
   b) cesium
   c) copper
   d) silicon
   e) selenium

3. Lattice energy magnitude

Averill Chapter 8, Section 3, Conceptual Problem 7

Which would have the larger lattice energy- $CrCl_2$ or $CrCl_3$- assuming similar arrangements of ions in the lattice? Explain your answer.

4. Periodic trends: melting point

Averill Chapter 8, Section 3, Conceptual Problem 9

Which cation in each pair would be expected to forn an oxide with the higher melting point, assuming similar arrangements of ions in the lattice? Explain your reasoning.
   a) Mg^{2+}, Sr^{2+}
   b) Cs^+, Ba^{2+}
   c) Fe^{2+}, Fe^{3+}

5. Counting valence electrons

Averill Chapter 8, Section 5, Numerical Problem 7

Determine the total number of valence electrons in the following:

   a) Ag
   b) Pt^{2+}
   c) H_2S
   d) OH^-
   e) I_2
   f) CH_4
   g) SO_4^{2-}
   h) NH_4^+

6. Lewis structures

Averill Chapter 8, Section 5, Numerical Problem 9

Draw Lewis electron structures for the following:

   a) Br_2
   b) CH_3Br
   c) SO_4^{2-}
   d) O_2
   e) S_2^{2-}
   f) BF_3

7. Applying Lewis structures

Averill Chapter 8, Section 5, Numerical Problem 13

Use lewis dot symbols to predict whether ICl and NO_4^- are chemically reasonable formulas.

8. Formal charge within a molecule

Averill Chapter 8, Section 5, Numerical Problem 18

Draw the most likely structure for HCN based on formal charges, showing the formal charge on each atom in your structure. Does this compound have any plausible resonance structures? If so, draw one.

9. Exceptions to the octet rule

Averill Chapter 8, Section 6, Numerical Problem 4

Draw Lewis electron structures for ICl_3, Cl_3PO, Cl_2SO, and AsF_6^-.

10. Resonance in octet exceptions

Averill Chapter 8, Section 6, Numerical Problem 7

Using Lewis structures, draw all of the resonance structures for the BrO_3^- ion.

11. Bond type based on electronegativity

Averill Chapter 8, Section 9, Numerical Problem 2
    a) NO
    b) HF
    c) MgO
    d) $AlCl_3$
    e) SiO_2
    f) the C=O bond in acetone
    g) O_3