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](https://open.lib.utexas.edu/textbooks/). 

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- CrCl₂ or CrCl₃- 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 form an oxide with the higher melting point, assuming similar arrangements of ions in the lattice? Explain your reasoning.

a) Mg²⁺, Sr²⁺  
b) Cs⁺, Ba²⁺  
c) Fe²⁺, Fe³⁺
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^-
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 ICl₃, Cl₃PO, Cl₂SO, and AsF₆⁻.

10. Resonance in octet exceptions
Averill Chapter 8, Section 6, Numerical Problem 7

Using Lewis structures, draw all of the resonance structures for the BrO₃⁻ ion.

11. Bond type based on electronegativity
Averill Chapter 8, Section 9, Numerical Problem 2
   a) NO
   b) HF
   c) MgO
   d) AlCl₃
   e) SiO₂
   f) the C=O bond in acetone
   g) O₃