Introduction and Review

1. atomic structure
   a. isotopes
2. electronic structure of atoms
   a. wave equations
   b. wave functions
   c. atomic orbitals (s, p, d, f)
      i. nodes
      ii. mathematical sign of wave function
      iii. degenerate orbitals
   d. electronic configuration of atoms
      i. Pauli exclusion principle
      ii. Hund’s rule
      iii. Aufbau principle
      iv. valence electrons
3. molecular orbitals
   a. linear combination of atomic orbitals (LCAO)
   b. bonding, nonbonding, and antibonding orbitals
4. ionic bonding
   a. octet rule/noble gas configuration
   b. Coulombic attraction/repulsion
5. covalent bonding
   a. orbital overlap
   b. Morse potential
   c. octet rule/noble gas configuration
   d. sigma bonds
   e. pi bonds
   f. bond rotation/nonrotation
6. nonbonding electrons
7. hybridization (sp, sp², and sp³)
8. VSEPR rules
9. electron-domain geometry
10. molecular geometry
11. resonance structure and resonance hybrids
12. formal charge
13. bond dissociation enthalpy (BDE) and heat of formation (H_f)
14. bond cleavage
   a. homolysis
   b. heterolysis
15. curved-arrow notation
   a. half-headed arrows
   b. full-headed arrows
16. properties
   a. electronegativity
   b. intermolecular forces
      i. dipole-dipole
      ii. hydrogen bonding
      iii. London dispersion force
   c. polarity
      i. bond dipole moment
      ii. molecular dipole moment
   d. solubility
      i. effect of polarity
      ii. increased entropy
   e. acidity
      i. Arrhenius
      ii. Brønsted-Lowry
         a. acid strength
         b. base strength
         c. structural factors affecting acid strength
      iii. Lewis
         a. electrophiles
         b. nucleophiles
17. structural formulas
   a. Lewis
   b. condensed
   c. line-angle
18. classes of organic compounds