ACS Review:

1. Which statement concerning the structure of the atom is correct?

   A. Protons and neutrons have most of the mass and occupy most of the volume of the atom.
   B. Electrons have most of the mass and occupy most of the volume of the atom.
   C. Electrons have most of the mass but occupy very little volume of the atom.
   D. Protons and neutrons have most of the mass but occupy very little of the volume of the atom.

2. What is the valence electron configuration for the element in Period 5, Group 3A?

   A. 5s²5p¹
   B. 3s²5p⁵
   C. 3s²3p³
   D. 5s²5p³

3. Molecules of which compounds violate the octet rule?

   1- NO₂
   2- CH₃Cl₂
   3- XeF₄
   4- NCl₃

   A. 1 and 2
   B. 1 and 3
   C. 2 and 3
   D. 2 and 4

   **Steps for Drawing Lewis Dot Structures**
   1. Count the total number of valence electrons.
   2. Draw molecular skeleton. Highest bonding capacity atom in center
   3. Draw single bonds between each element (each bond equals 2 electrons)
4. Assign other electrons to make octets
5. If octet is not filled, make more bonds

1. Draw Lewis Structures for...
   a. CH2O
   b. CCl4

2. What is the formal charges of the following:
   a. FC = (# of valence electrons - actual # of electrons associated with the atom).

3. Draw the resonance for SO2 and NO3

**Past exam questions:**

4. Which of the following is the condensed form of ground state electron configuration for iron, Fe?
a) [Ar]3d^8
b) [Kr]5s^25d^6
c) [Ar]4s^24p^6
d) [Kr]4s^24p^6
e) [Ar]4s^23d^6

5. Correct set of four quantum numbers for the valence (outermost) electron of rubidium, Rb is ___________.
   a) 5, 0, 0, +1/2
   b) 5, 1, 0, +1/2
   c) 5, 1, 1, 1/2
   d) 6, 0, 0, +1/2
   e) 5, 1, 1, +1/2

6. Which one of the following elements will have the smallest ionization energy?
   a) lithium
   b) sodium
   c) beryllium
   d) potassium
   e) cesium

7. What is the final temperature in degrees Celsius when 60.0 mL of water at 80.0 °C is mixed with 40.0 mL of water at 20.0 °C. The specific heat of water is 4.184 J/g·°C. [density of water = 1.00 g/mL]
   a) 38.0 °C
   b) 50.0 °C
   c) 56.0 °C
   d) 63.0 °C
   e) 100.0 °C
8. A neutral bromine atom has how many valence electrons?
   a) 1  b) 5  c) 7  d) 17

9. Which one of the following represents an acceptable possible set of quantum numbers (in the order n, l, m_l, m_s) for an electron in an atom?
   a) 2,1,−1,+1/2
   b) 2,1,0,0
   c) 2,2,0,+1/2
   d) 2,0,1,−1/2
   e) 2,0,2,+1/2

10. Of the following, which gives the correct order for atomic radius for Mg, Na, P, Si and Ar?
   a) Mg > Na > P > Si > Ar
   b) Ar > Si > P > Na > Mg
   c) Si > P > Ar > Na > Mg
   d) Na > Mg > Si > P > Ar
   e) Ar > P > Si > Mg > Na

11. Calculate the enthalpy change ΔHₒ in kilojoules for the following reaction representing the formation of glucose from water and carbon dioxide (photosynthesis). For full credit, show all work, use units, and report your answer to the correct number of significant figures.

12. Calculate ΔH for the reaction 2 C(s) + O2(g) ----> 2 CO(g)

given the following chemical equations and their respective enthalpy changes:
13. Consider the plot of the ionization energies for multiple ionizations of an atom in the third period. What is the element?

a) Na

b) Mg

c) Al

d) Si

e) P

f) S