Problems: 40, 56, 60, 61, 77, 79, 92, 100(a, b), 104, 105, a, Extra Credit EC-118 points

2.40 a. $^{18}\text{O}$  
b. $^{9}\text{Be}$  
c. $^{56}\text{Fe}$  
d. $^{24}\text{Na}$

2.56 a. 

\[
\begin{array}{ccc}
1s & 2s & 2p \\
\uparrow & \uparrow & \uparrow \uparrow \uparrow \\
b. & \uparrow & \\
c. & \uparrow & \\
d. & \uparrow &\uparrow \\
\end{array}
\]

2.60 a. Na $[\text{Ne}]3s^1$  
b. O $[\text{He}]2s^22p^4$  
c. Ni $[\text{Ar}]4s^23d^8$  
d. Sn $[\text{Kr}]5s^24d^{10}5p^2$  

2.61 a. S has two electrons in the 3s and four electrons in the 3p sublevels  
b. Co (ends in 3d^7)  
c. Si has two electrons in the 3s and two electrons in the 3p sublevels  
d. Br (ends in 4p^5)

2.77 The atomic radius of representative elements decreases going across a period from Group 1A (1) to 8A (18) and increases going down a group.  
a. In Period 3, Na, which is on the left, is larger than O.  
b. In Group 1A (1), Rb, which is further down the group, is larger than Na.  
c. In Period 3, Na, which is on the left, is larger than Mg.  
d. In Period 3, Na, which is on the left, is larger than Cl.  

(6, half for the reason why) There's no (d) in the problem.

2.79 Arrange each of the following in order of increasing ionization energy.

a. F, Cl, Br  
b. Na, Cl, Al  
c. Na, K, Cs  

2.79 a. The ionization energy decreases going down a group: Br, Cl, F.  
b. Going across a period from left to right, the ionization energy generally increases: Na, Al, Cl.  
c. The ionization energy decreases going down a group: Cs, K, Na.  
d. Going across a period from left to right, the ionization energy generally increases. The ionization energy decreases going down a group as atoms become larger: Sn, Sb, As.  

(6, half for the reason why) There's no (d) in the textbook.
2.92 Indicate if each of the following are true or false.

a. The neutron is electrically neutral.

b. Most of the mass of the atom is due to the protons and neutrons.

c. The charge of an electron is equal, but opposite, to the charge of the neutrons.

d. The proton and the electron have about the same mass.

e. The mass number is the number of protons.

2.92 a. True
b. True
c. False. The charge of the electron is equal but opposite to the charge of the proton.
d. True. The proton and the electron have about the same mass.
e. False. The atomic number is the number of protons.

(5 pts)

2.100 a. 10 b. 5 (2)


(for d, some texts use Group 6A, which is Po)

a) What features must an atom or molecule have in order to be able to absorb visible light, thereby being colored?

1) It must have spacings between energy levels that correspond to the energy of visible photons.
2) The lower of these energy levels must have electrons that can absorb energy.

(4 pts)

2.105 Calcium has a greater net nuclear charge than K. The least-tightly-bound electron in Ca is further from the nucleus than in Mg and needs less energy to remove.

Extra Credit
2.118 has several electron orbital box diagrams.

2.118 a. This is possible.

b. Not possible. Two electrons in the same orbital cannot have the same spin.

c. Not possible. The 2p sublevel would fill before the 3s, and only two electrons are allowed in an orbital.

d. This is possible. The 4s sublevel promotes an electron to the 3d so that both are half filled.

(2)