

Answer EITHER Question 7 below OR Question 8 printed on page 24. Only one of these two questions will be graded. If you start both questions, be sure to cross out the question you do not want graded. The Section II score weighting for the question you choose is 15 percent.

7. Answer the following questions about the element selenium, Se (atomic number 34).

- Samples of natural selenium contain six stable isotopes. In terms of atomic structure, explain what these isotopes have in common, and how they differ.
- Write the complete electron configuration (e.g., $1s^2 2s^2 \dots$ etc.) for a selenium atom in the ground state. Indicate the number of unpaired electrons in the ground-state atom, and explain your reasoning.
- In terms of atomic structure, explain why the first ionization energy of selenium is
 - less than that of bromine (atomic number 35), and
 - greater than that of tellurium (atomic number 52).
- Selenium reacts with fluorine to form SeF_4 . Draw the complete Lewis electron-dot structure for SeF_4 and sketch the molecular structure. Indicate whether the molecule is polar or nonpolar, and justify your answer.

7a. All six isotopes have 34 protons and 34 electrons. Each isotope has a different number of neutrons and a different mass number. All six isotopes have the same electron configuration.

7b. $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^4$ $\uparrow \uparrow \uparrow$

There are two unpaired electrons because the outermost subshell has three orbitals and four electrons. According to Hund's rule, all of the orbitals must have one electron before any can have two. This rule leaves two unpaired electrons in the 4p subshell.

7c. Se has fewer protons than Br, but both have the same number of subshells. Since Br has an extra electron, its pull on its electrons is greater.