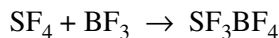


## 2006 AP<sup>®</sup> CHEMISTRY FREE-RESPONSE QUESTIONS

Answer EITHER Question 7 below OR Question 8 printed on page 14. 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.

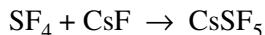
7. Answer the following questions about the structures of ions that contain only sulfur and fluorine.

(a) The compounds  $\text{SF}_4$  and  $\text{BF}_3$  react to form an ionic compound according to the following equation.



- (i) Draw a complete Lewis structure for the  $\text{SF}_3^+$  cation in  $\text{SF}_3\text{BF}_4$ .
- (ii) Identify the type of hybridization exhibited by sulfur in the  $\text{SF}_3^+$  cation.
- (iii) Identify the geometry of the  $\text{SF}_3^+$  cation that is consistent with the Lewis structure drawn in part (a)(i).
- (iv) Predict whether the F–S–F bond angle in the  $\text{SF}_3^+$  cation is larger than, equal to, or smaller than  $109.5^\circ$ . Justify your answer.

(b) The compounds  $\text{SF}_4$  and  $\text{CsF}$  react to form an ionic compound according to the following equation.



- (i) Draw a complete Lewis structure for the  $\text{SF}_5^-$  anion in  $\text{CsSF}_5$ .
- (ii) Identify the type of hybridization exhibited by sulfur in the  $\text{SF}_5^-$  anion.
- (iii) Identify the geometry of the  $\text{SF}_5^-$  anion that is consistent with the Lewis structure drawn in part (b)(i).
- (iv) Identify the oxidation number of sulfur in the compound  $\text{CsSF}_5$ .