

**2007 AP® CHEMISTRY FREE-RESPONSE QUESTIONS**

6. Answer the following questions, which pertain to binary compounds.

(a) In the box provided below, draw a complete Lewis electron-dot diagram for the  $\text{IF}_3$  molecule.



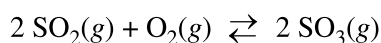
(b) On the basis of the Lewis electron-dot diagram that you drew in part (a), predict the molecular geometry of the  $\text{IF}_3$  molecule.

(c) In the  $\text{SO}_2$  molecule, both of the bonds between sulfur and oxygen have the same length. Explain this observation, supporting your explanation by drawing in the box below a Lewis electron-dot diagram (or diagrams) for the  $\text{SO}_2$  molecule.



(d) On the basis of your Lewis electron-dot diagram(s) in part (c), identify the hybridization of the sulfur atom in the  $\text{SO}_2$  molecule.

The reaction between  $\text{SO}_2(g)$  and  $\text{O}_2(g)$  to form  $\text{SO}_3(g)$  is represented below.



The reaction is exothermic. The reaction is slow at  $25^\circ\text{C}$ ; however, a catalyst will cause the reaction to proceed faster.

(e) Using the axes provided on the next page, draw the complete potential-energy diagram for both the catalyzed and uncatalyzed reactions. Clearly label the curve that represents the catalyzed reaction.