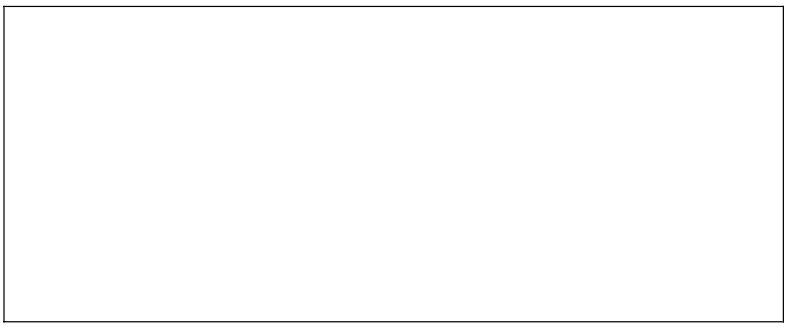
6. Answer the following questions, which pertain to binary compounds.

(a) In the box provided below, draw a complete Lewis electron-dot diagram for the 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 IF_3 molecule.

(c) In the 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 SO_2 molecule.



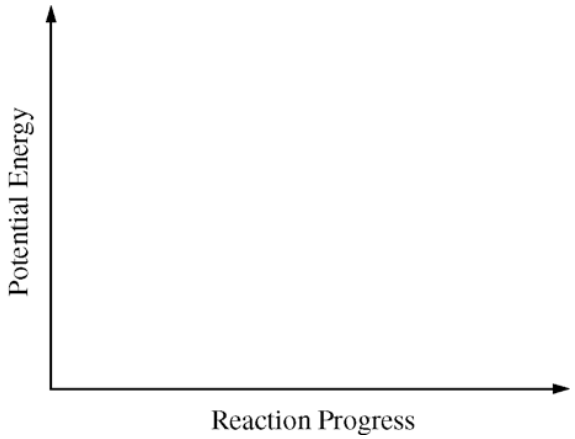
(d) On the basis of your Lewis electron-dot diagram(s) in part (c), identify the hybridization of the sulfur atom in the SO_2 molecule.

The reaction between $SO_2(g)$ and $O_2(g)$ to form $SO_3(g)$ is represented below.

$$2\ SO_2(g) + O_2(g) \rightleftarrows 2\ SO_3(g)$$

The reaction is exothermic. The reaction is slow at 25°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.



(f) Predict how the ratio of the equilibrium pressures, $\frac{p_{SO_2}}{p_{SO_3}}$, would change when the temperature of the uncatalyzed reaction mixture is increased. Justify your prediction.

(g) How would the presence of a catalyst affect the change in the ratio described in part (f)? Explain.

STOP

END OF EXAM