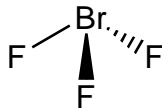


Part C (25 points) **MASTERY QUESTIONS** Answer ONE of the following two questions in the space provided. SHOW ALL YOUR WORK AND WRITE EXPLANATIONS IN COMPLETE SENTENCES.

9. Answer the following questions for the molecule BrF_3 , whose structure is shown below.



a) (6 points) Which orbitals on the F atoms are of correct energy to bond with the central Br atom? Explain briefly.

b) (7 points) Using the group theoretical approach to bonding, find the irreducible representations for the symmetry adapted linear combinations (SALCs) for the F orbitals that will form sigma (σ) bonds to the central Br.

c) (6 points) Use the SALCs you generated above to construct a qualitative molecular orbital diagram for the sigma (σ) bonds in BrF_3 .

d) (6 points) Determine the irreducible representations for the F 2p orbital-derived SALCs that can form pi (π) bonds to the central Br and state which orbitals on the central Br interact with the SALCs.