Laude's CH301 Worksheet 7: VB and MO

1. Use valence-bond theory to predict the hybridization and other properties of these compounds

Cmpd	Lewis structure	Hybridization of central atom	# of σ bonds	# of π bonds	Atomic orbits that form the σ and π bonds: Example: σ_{sp2-1s}
CH_4					
N_2					
CO_2					
NH_3					
C_2H_2					
SF_6					
NH_2^-					

2. Build these compound using molecular orbital theory and predict

Compound	MO building			Bond order	Para or dia-magnetic?
Li_2	Li --- $2s^2$ --- ---		Li $2s^2$ ---		
N_2	N --- --- --- $2p^3$ --- --- --- --- --- --- --- $2s^2$ --- ---		N $2p^3$ --- --- --- $2s^2$ ---		

O_2	O			O		

		--- ---				
	$2p^3$ --- --- ---			$2p^3$ --- --- ---		
		--- ---				

	$2s^2$ ---			$2s^2$ ---		

$O_2{}^{2-}$	O			O		

		--- ---				
	$2p^3$ --- --- ---			$2p^3$ --- --- ---		
		--- ---				

	$2s^2$ ---			$2s^2$ ---		

F_2	F			F		

		--- ---				
	$2p^3$ --- --- ---			$2p^3$ --- --- ---		
		--- ---				

	$2s^2$ ---			$2s^2$ ---		

CN^-	C			N-		

		--- ---				
	$2p^3$ --- --- ---			$2p^3$ --- --- ---		

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3. Rank the bond energy and bond length for the 6 compounds in problem 2 based on bond order.

Increasing bond length:

Increasing bond energy: