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The bond order of HeH\(^{+}\) is

(a) 1/2  (b) 1  
(c) 3/2  (d) 2
The bond order of Be$_2^+$ is

(a) $\frac{1}{2}$  (b) 1
(c) $\frac{3}{2}$  (d) 2
The bond order of Li$_2^+$ is

(a) greater than
(b) less than
(c) the same as

the bond order for Li$_2^-$. 
The fact that B₂ is paramagnetic indicates that the energies of its MO's have the relation

(a) \( \pi 2p < \sigma 2p \)
(b) \( \pi 2p > \sigma 2p \)
(c) \( \pi^* 2p < \sigma^* 2p \)
(d) \( \pi^* 2p > \sigma^* 2p \)
The fact that $\text{O}_2$ is paramagnetic indicates that the energies of its MO's have the relation

(a) $\pi 2p < \sigma 2p$
(b) $\pi 2p > \sigma 2p$
(c) $\pi^* 2p < \sigma^* 2p$
(d) $\pi^* 2p > \sigma^* 2p$
Which of the following has the strongest bond?

(a) $O_2^+$  (b) $O_2$

(c) $O_2^-$  (d) $O_2^{2-}$
The bond order of $F_2^+$ is

(a) 1/2  (b) 1  
(c) 3/2  (d) 2
The bond order of CF\(^+\) is

(a) 0  (b) 1
(c) 2  (d) 3
Given the correlation diagram

\[
\begin{array}{c}
\text{antibonding} \\
2s \\
\text{nonbonding} \\
bonding \\
\text{nonbonding} \\
2s
\end{array}
\]

Be \quad BeN \quad N

The bonding MO in BeN is of the type
(a) $\sigma$ \hspace{1cm} (b) $\pi$

The bond order of BeN is
(a) $1/2$ \hspace{1cm} (b) $1$ \hspace{1cm} (c) $3/2$ \hspace{1cm} (d) $2$

BeN is
(a) diamagnetic \hspace{1cm} (b) paramagnetic
What orbital(s) are used by the central atom for bonding in BCl₃?

(a) $s$
(b) $sp$
(c) $sp^2$
(d) $sp^3$
What orbital(s) are used by the central atom for bonding in NH₃?

(a) s  (b) sp
(c) sp²  (d) sp³
What orbital(s) are used by the central atom for bonding in $\text{NH}_2^-$?

(a) $s$  
(b) $sp$  
(c) $sp^2$  
(d) $sp^3$
In which of the following is the hybridization of the carbon $sp^2$?

(a) O=C=O
(b) HC≡CH
(c) HC≡N
(d) H₂C=O
The ground state of a dye has a large dipole moment, while the first excited state does not. The gap between the two states will be greater in a

(a) more  (b) less

polar solvent.

In solvent A, the dye exhibits a blue-violet color. In solvent B, the dye exhibits an orange color. Which is the more polar solvent?
The larger a delocalized $\pi$ system is, the closer together successive energy levels are. Lycopene, which gives the red color to tomatoes, has a chain of 22 $sp^2$ hybridized carbon atoms. $Br_2$ reacts with these “conjugated systems”, adding a Br atom to each of two neighboring carbons. This changes the hybridization of those carbons to

(a) $sp$  \hspace{1cm} (b) $sp^3$ \\

Upon bromination, the color of tomato juice is expected to undergo the change

(a) red $\rightarrow$ orange $\rightarrow$ yellow
(b) red $\rightarrow$ violet $\rightarrow$ blue