These problems are for practice in drawing your molecular orbital diagrams, molecular electron configurations and determining bond order.

The following questions pertain to the $F_2$ molecule:

A) Draw the molecular orbital energy diagram for this molecule. Label all of the orbitals specifically.

B) Give the molecular electron configuration for the molecule:

$$\sigma_{1s}^2 \sigma_{1s}^* \sigma_{2s}^2 \sigma_{2s}^* \sigma_{2px}^2 \pi_{2p}^2 \pi_{2p}^* \pi_{2p}^*$$

C) Determine the bond order for the molecule:

$$\text{Bond Order} = \frac{(10 - 8)}{2} = 1$$

D) Indicate whether the species is paramagnetic or diamagnetic:

Diamagnetic: No unpaired electrons

F) Compare the relative stability of this molecule to $F_2^+$ and $F_2^-$:

$$F_2^+ > F_2 > F_2^- \text{ (Based on their Bond Orders)}$$
The following questions pertain to the $\text{C}_2^+$ ion:

A) Draw the molecular orbital energy diagram for this ion. Label all of the orbitals specifically.

![Molecular Orbital Energy Diagram]

B) Give the molecular electron configuration for the ion:

$$(\sigma_{1s})^2 (\sigma_{1s}^*)^2 (\sigma_{2s})^2 (\sigma_{2s}^*)^2 (\pi_{2p})^3$$

C) Determine the bond order for the ion:

$$\text{Bond Order} = \frac{7 - 4}{2} = 1.5$$

D) Indicate whether the species is paramagnetic or diamagnetic:

Paramagnetic: one unpaired electron

F) Compare the relative stability of this molecule to $\text{C}_2$ and $\text{C}_2^-$:

$$\text{C}_2^- > \text{C}_2 > \text{C}_2^+ \text{ (Based on their Bond Orders)}$$
The following questions pertain to the NO molecule:

A) Draw the molecular orbital energy diagram for this molecule. Label all of the orbitals specifically.

\[ \begin{align*}
\text{Energy:} & \\
1s^2 2s^2 2p^3 & \quad \text{N} \\
1s^2 2s^2 2p^4 & \quad \text{O}
\end{align*} \]

B) Give the molecular electron configuration for the molecule:

\[
(\sigma_{1s})^2 (\sigma_{1s}^*)^2 (\sigma_{2s})^2 (\sigma_{2s}^*)^2 (\sigma_{2px})^2 (\pi_{2p})^4 (\pi_{2p}^*)^1
\]

C) Determine the bond order for the molecule:

\[
\text{Bond Order} = \frac{(10 - 5)}{2} = 2.5
\]

D) Indicate whether the species is paramagnetic or diamagnetic:

Paramagnetic: One unpaired electron

F) Compare the relative stability of this molecule to NO$^+$ and NO$^-$:

\[
\text{NO}^+ > \text{NO} > \text{NO}^- \quad \text{(Based on their Bond Orders)}
\]