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4.5-110

The bond order of  $\text{HeH}^+$  is

(a)  $1/2$

(c)  $3/2$

(b) 1

(d) 2

4.5-120

The bond order of  $\text{Be}_2^+$  is

(a)  $1/2$

(c)  $3/2$

(b) 1

(d) 2

4.5-130

The bond order of  $\text{Li}_2^+$  is

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

the bond order for  $\text{Li}_2^-$ .

## 4.5-140

The fact that  $B_2$  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)  $\pi^*_{2p} > \sigma^*_{2p}$

## 4.5-150

The fact that O<sub>2</sub> 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)  $\pi^*_{2p} > \sigma^*_{2p}$

4.5-160

Which of the following has the strongest bond?



4.5-170

The bond order of  $F_2^+$  is

(a)  $1/2$

(b) 1

(c)  $3/2$

(d) 2

4.5-180

The bond order of  $\text{CF}^+$  is

- |     |   |     |   |
|-----|---|-----|---|
| (a) | 0 | (b) | 1 |
| (c) | 2 | (d) | 3 |



## 4.5-311

What orbital(s) are used by the central atom for bonding in  $\text{BCl}_3$ ?

(a)  $s$

(c)  $sp^2$

(b)  $sp$

(d)  $sp^3$

## 4.5-312

What orbital(s) are used by the central atom for bonding in  $\text{NH}_3$ ?

(a)  $s$

(c)  $sp^2$

(b)  $sp$

(d)  $sp^3$

## 4.5-313

What orbital(s) are used by the central atom for bonding in  $\text{NH}_2^-$  ?

(a)  $s$

(c)  $sp^2$

(b)  $sp$

(d)  $sp^3$

## 4.5-330

In which of the following is the hybridization of the carbon  $sp^2$  ?

- (a)  $O=C=O$
- (b)  $HC\equiv CH$
- (c)  $HC\equiv N$
- (d)  $H_2C=O$

## 4.5-520

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?

## 4.5-540

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)  $sp$

(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