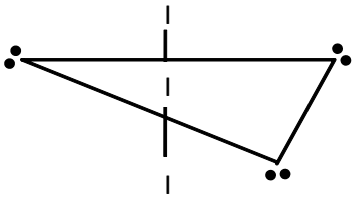
CHEMISTRY

111. (2)

I_3^- ion is made up of an I_2 molecule with an I^- bonded to it by means of a coordinate bond in which I_2 is lone pair acceptor (Lewis acid) and I^- the lone pair donor (Lewis base). There are two bond pairs and three lone pairs in the outer shell of central atom. To minimize the repulsive forces the three lone pair occupies the equatorial position. The ion is therefore, linear in shape with a bond angle of exactly 180°.



$$\underset{\text{Lewis acid}}{I_2} + \underset{\text{Lewis base}}{I^-} \longrightarrow [I - I \leftarrow I]^-$$

Similarly, N_3^- ion is also linear in shape.

112. (4)

Compound	Bond angle
NH_3	107°
PCl_3	101°
BCl_3	120°

113. (3)

This is due to intra molecular H-bonding.

114. (3)

Hydrogen bonding interactions are responsible for the low density of ice as compared to water.

115. (4)

Bond order

$C_2 = 2$ $\quad C_2^{2-} = 3$

$B_2 = 1$ $\quad B_2^+ = 0.5$

$Li_2 = 1$ $\quad Li_2^+ = 0.5$

$N_2 = 3$ $\quad N_2^+ = 2.5$

116. (4)

$$O_2 = \sigma ls^2 \overset{*}{\sigma ls^2} \sigma 2s^2 \overset{*}{\sigma 2s^2} \sigma 2p_z^2 \pi 2p_x^2 = \pi 2p_y^2 \pi 2\overset{*}{p}_{x'} = \pi 2\overset{*}{p}_{y'}$$

In O_2^+, one electron is removed from Na.

BO for $O_2 = 2$ and for $O_2^+ = 2.5$

Therefore, paramagnetism decreases, BO increases.

117. (2)

NO is paramagnetic in nature.

118. (2)

$$\text{Bond order} \propto \frac{1}{\text{bond length}}$$

BO of NO < BO of NO^+

$\therefore$ Bond length of NO is greater than the bond length of NO^+.

119. (2)

$\pi 2p_x$ and $\pi 2p_y$ or $\overset{*}{\pi} 2p_x$ and $\overset{*}{\pi} 2p_y$ orbitals have nearly equal energy and thus, are called degenerate orbitals.

120. (3)

O_2 (16) = $\sigma ls^2, \overset{*}{\sigma ls^2}, \sigma 2s^2, \overset{*}{\sigma 2s^2}, \sigma 2p_z^2$

$\pi 2p_x^2 = \pi 2p_y^2, \overset{*}{\pi} 2p_y^1 \approx \overset{*}{\pi} 2p_y^1$

$$BP = \frac{10-6}{2} = 2$$

O_2^{2-} (18) = $\sigma ls^2, \overset{*}{\sigma ls^2}, \sigma 2s^2, \overset{*}{\sigma 2s^2}, \sigma 2p_z^2$

$\pi 2p_x^2 = \pi 2p_y^2, \overset{*}{\pi} 2p_y^2 \approx \overset{*}{\pi} 2p_y^2$

$$BO = \frac{10-8}{2} = 1$$

$N_2(14)$ = $\sigma ls^2, \overset{*}{\sigma ls^2}, \sigma 2s^2, \overset{*}{\sigma 2s^2}$

$\pi 2p_x^2 = \pi 2p_y^2, \sigma 2p_z^2$

$$BO = \frac{10-4}{2} = 3$$

Thus, bond order is highest for N_2.