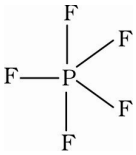
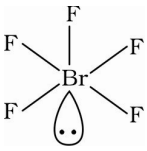
31.(C) PF_5 trigonal bipyramidal



BrF_5 square pyramidal (distorted)



32.(B) $Li_2 (3+3=6) = \sigma 1s^2, \overset{*}{\sigma} 1s^2, \sigma 2s^2$

Bond order $= \dfrac{N_b - N_a}{2} = \dfrac{4-2}{2} = 1$

$Li_2^+ (3+3-1=5) = \sigma 1s^2, \overset{*}{\sigma} 1s^2, \sigma 2s^1$

Bond order $= \dfrac{3-2}{2} = \dfrac{1}{2} = 0.5$

$Li_2^- (3+3+1=7) = \sigma 1s^2, \overset{*}{\sigma} 2s^2, \sigma 2s^2, \overset{*}{\sigma} 2s^1$

Bond order $= \dfrac{4-3}{2} = \dfrac{1}{2} = 0.5$

Stability order is $Li_2^- < Li_2^+ < Li_2$ (because Li_2^- has more number of electrons in antibonding orbitals which destabilises the species).

33.(C) Species having zero or negative bond order do not exist.

$H_2^{2+} (1+1-2=0) = \sigma 1s^0$

Bond order = 0

$He_2 (2+2=4) = \sigma 1s^2, \overset{*}{\sigma} 1s^2$

Bond order $= \dfrac{N_b - N_a}{2} = \dfrac{2-2}{2} = 0$ So, both H_2^{2+} and He_2 do not exist.

34.(B) I_3^- is an ion made of I_2 and I^- which has linear shape. While Cs^+ is an alkali metal cation.

35.(B) Ion-ion interaction is dependent on the square of distance, i.e. ion-ion interaction $\propto \dfrac{1}{r^2}$

Similarly, ion-dipole interaction $\propto \dfrac{1}{r^3}$

London force $\propto \dfrac{1}{r^6}$ and dipole-dipole interaction $\propto \dfrac{1}{r^3}$ Superficially it seems as both ion-dipole interaction and hydrogen bonding vary with the inverse cube of distance between the molecules but when we look at the exact expressions of field (force) created in two situations, it comes as

$|E| \text{ or } |F| = \dfrac{2|P|}{4\pi \in r^3}$ (In case of ion-dipole interaction)

and $F = \frac{2q^2r - 4q^2q}{4\pi \in_0 r^3}$ (In case of dipole-dipole interaction)

from the above, it is clear that the ion-dipole interaction is the better answer as compared to dipole-dipole interaction, i.e. hydrogen bonding.

36.(B) Shape of $XeOF_4$ is square pyramidal

37.(B) Dipole moment = |charge| × bond length

$0.38 \times 10^{-8} \text{esu cm} = |\text{charge}| \times 1.6 \times 10^{-8} \text{cm}$

$$\text{Charge} = \frac{0.38}{1.6} \times 10^{-10} \text{esu}$$

$$\text{Fraction of charge present on each atom} = \frac{0.23 \times 10^{-10}}{4.8 \times 10^{-10}} = 0.05$$

38.(D) NO_2^- : Sp^2

NO_3^- : sp^2

NO_2 : odd e^- species

NO_2^+ : sp

39.(C) In bonding molecular orbital electron density increased between two nuclei.
Bonding molecular orbital form by constructive interference of combing electron wave.

40.(A) In X_2O_3, $X_2(SO_4)_3$ and XPO_4

X is tripositive metal ion therefore X_2Cl_3 is wrong.

41.(B) ClF_3, $XeOF_2$ and XeF_3^+ all have Bent T shape.

42.(A) In the given compound CH_4 has greatest bond angle.

43.(C) Total $e^- = 14 \rightarrow$ it is diamagnetic

44.(B) All have 10 electrons

45.(D) B_2 is paramagnetic.