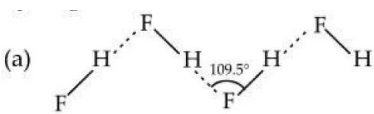
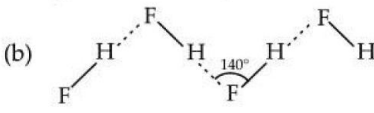
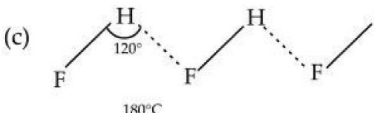
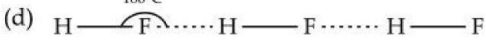


TOPICS : Periodicity and Chemical Bonding

- The increasing order of the first ionisation enthalpies of the elements B, P, S and F (lowest first) is
 (a) $F < S < P < B$ (b) $P < S < B < F$
 (c) $B < P < S < F$ (d) $B < S < P < F$
- Which of the following processes involves absorption of energy ?
 (a) $S_{(g)} + e^- \rightarrow S^-_{(g)}$
 (b) $O^-_{(g)} + e^- \rightarrow O^-_{(g)}$
 (c) $Cl_{(g)} + e^- \rightarrow Cl^-_{(g)}$
 (d) $O_{(g)} + e^- \rightarrow O^-_{(g)}$
- Which of the following does not show amphoteric behaviour ?
 (a) $Zn(OH)_2$ (b) BeO
 (c) Al_2O_3 (d) SO_2
- The effective nuclear charge of Mg ($Z = 12$) is
 (a) 3 (b) 2
 (c) 4 (d) 1
- Which of the following is correct representatin of hydrogen bonds in H – F ?
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 - 
 - 
 - 
- A molecule (X) has (i) four sigma bonds formed by the overlapping of sp^2 and s-orbital. (ii) one sigma bond formed by sp^2 and sp^2 orbitals and (iii) one π bond is formed by p_x and p_x orbitals. Which of the following is X ?
 (a) C_2H_6 (b) C_2H_3Cl
 (c) C_2H_2Cl (d) C_2H_4
- The electronegativity of H and Cl are 2.1 and 3.0 respectively. The correct statement about the nature of HCl is
 (a) 17% ionic (b) 83% ionic
 (c) 50% ionic (d) 100% ionic
- Which of the following species is diamagnetic in nature ?
 (a) He_2^+ (b) H_2
 (c) H_2^+ (d) H_2^-
- XeF_2 is isostructural with
 (a) $SbCl_3$ (b) $BaCl_2$
 (c) TeF_2 (d) ICl_2^-

- N_2 and O_2 are converted into monoanions N_2^- and O_2^- respectively. Which of the following statements is wrong ?
 (a) In N_2^+ , N – N bond weakens
 (b) O_2^+ , O – O bond order increases
 (c) In O_2^+ , paramagnetism decreases
 (d) N_2^+ becomes diamagnetic

TOPICS : Periodicity and Chemical Bonding (SOLUTION)

1. (d): In general as we move from left to right in a period, the ionisation enthalpy increases with increasing atomic number. The ionisation enthalpy decreases as we move down a group. P($1s^2 2s^2 2p^6 3s^2 3p^3$) has a stable half filled electronic configuration hence, its ionisation enthalpy is higher than that of S.
 \therefore Increasing order of ionization energy is
 $B < S < P < F$.

2. (b): Processes (a), (c) and (d) represent EA_1 of the atoms which is their natural tendency and hence energy is evolved. But (b) process is EA_2 of O atom and involves absorption of energy.

3. (d): $Zn(OH)_2$, BeO and Al_2O_3 are all amphoteric in character.

4. (a): Mg ($Z = 12$)
 E.C. $1s^2$ $2s^2 2p^6$ $3s^2$
 $(n-2)$ $(n-1)$ n
 σ of $2e^-$ in $(n-2)^{th}$ $8e^-$ in $(n-1)^{th}$ $1e^-$ in n^{th} orbit
 $2.0 + 6.8 + 0.35 = 9.15$
 $Z^* = 12 - 9.15 = 2.85 \approx 3$

5. (b): The bond angle in hydrogen bonding of HF is 140° .

6. (d): $\begin{matrix} H \\ \diagdown \\ C \\ \diagup \\ H \end{matrix} = \begin{matrix} H \\ \diagdown \\ C \\ \diagup \\ H \end{matrix}$ $\sigma(sp^2 - sp^2) = 1$; $\sigma(sp^2 - s) = 4$; $\pi = 1$

7. (a): % ionic character = $16(\chi_A - \chi_B) + 3.5(\chi_A - \chi_B)^2$
 (Here χ_A and χ_B are the electronegativities of bonded atoms of chlorine and hydrogen)
 $= 16(3.0 - 2.1) + 3.5(3.0 - 2.1)^2$
 $= 14.4 + 2.835 = 17.235 \approx 17\%$

8. (b) : $\text{He}_2^+ : (\sigma 1s)^2 (\sigma^* 1s)^1$ - one unpaired electron
- paramagnetic
 $\text{H}_2 : (\sigma 1s)^2$ - no unpaired electron - diamagnetic
 $\text{H}_2^+ : (\sigma 1s)^1$ - one unpaired electron - paramagnetic
 $\text{H}_2^- : (\sigma 1s)^2 (\sigma^* 1s)^1$ - one unpaired electron
- paramagnetic

9. (d) : $\text{F}-\ddot{\text{Xe}}-\text{F}$ sp^3d , Linear
 $\text{Cl}-\overset{\ominus}{\underset{\cdot\cdot\cdot}{\text{I}}}-\text{Cl}$ sp^3d , Linear
 $\begin{array}{c} \text{Cl} \quad \overset{\cdot\cdot\cdot}{\text{Sb}} \quad \text{Cl} \\ \diagdown \quad \diagup \\ \text{Cl} \quad \text{Cl} \end{array}$ sp^3 , Pyramidal
 $\begin{array}{c} \text{F} \quad \overset{\cdot\cdot\cdot}{\text{Te}} \quad \text{F} \\ \diagdown \quad \diagup \\ \text{F} \quad \text{F} \end{array}$ sp^3 , V-shaped

10. (d) : When N_2 is converted to N_2^+ , it becomes paramagnetic due to the presence of 1 unpaired electron so the wrong statement is (d).