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I-CHEMISTRY

DPP

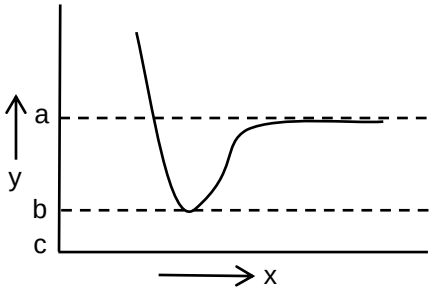
DAILY PRACTICE PROBLEMS

DPP NO. 3

## Organic Chemistry : CHEMICAL BONDING

## DPP No. : 3

**1.** The potential energy (y) curve for $H_2$ formations as a function of internuclear distance (x) of the H atoms is shown below.




The bond energy of $H_2$ is

(1) (b – a) (2) $\frac{(c-a)}{2}$ (3) $\frac{(b-a)}{2}$ (4) (c – a)

**2.** Among the following alkaline earth metal halides one which is covalent and soluble in organic solvents is

(1) Strontium chloride (2) Magnesium chloride

(3) Beryllium chloride (4) Calcium chloride

**3.** $BF_3$ is planar and electron deficient compound. Hybridization and number of electrons around the central atom, respectively are :

(1) $sp^3$ and 6 (2) $sp^2$ and 6 (3) $sp^3$ and 8 (4) $sp^3$ and 4

**4.** Match **List-I** with **List-II**

| | **List-I** | | **List-II** |
|---|---|---|---|
| (a) | $PCl_5$ | (i) | Square pyramidal |
| (b) | $SF_6$ | (ii) | Trigonal planar |
| (c) | $BrF_5$ | (iii) | Octahedral |
| (d) | $BF_3$ | (iv) | Trigonal bipyramidal |

Choose the **correct** answer from the options given below

(1) (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i) (2) (a)-(iii), (b)-(i), (c)-(iv), (d)-(ii)

(3) (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i) (4) (a)-(iv), (b)-(iii), (c)-(i), (d)-(ii)

**5.** Which of the following molecules is non-polar in nature ?

(1) $CH_2O$ (2) $SbCl_5$ (3) $NO_2$ (4) $POCl_3$

**6.** **Statement I :** Acid strength increases in the order given as HF << HCl << HBr << HI.

**Statement II :** As the size of the elements F, Cl, Br, I increases down the group, the bond strength of HF, HCl, HBr and HI decreases and so the acid strength increases.

In the light of the above statements, choose the **correct** answer from the options given below.

(1) Both **Statement I** and **Statement II** are false.

(2) **Statement I** is correct but **Statement II** are false.

(3) **Statement I** is incorrect but **Statement II** is true.

(4) Both **Statement I** and **Statement II** are true.

**7.** The Cl–C–Cl bond angle in 1, 1, 2, 2– tetrachloroethene and tetrachloromethane respectively are

(1) 120° and 109.5° (2) 90° and 109.5° (3) 109.5° and 90° (4) 109.5° and 120°

**8.** Math the columns.

| **List I** | **List II** |
|---|---|
| a. $IF_2^{\ominus}$ | i. sp |
| b. HCN | ii. $sp^3d$ |
| c. $PCl_4^+$ | iii. $sp^3d^2$ |
| d. $XeF^4$ | iv. $sp^3$ |

(1) a - i, b - iv, c - ii, d - iii (2) a - ii, b - i, c - iv, d - iii

(3) a - iii, b - ii, c - i, d - iv (4) a - iv, b - iii, c - ii, d - i

**9.** Which among the following statements are correct ?

(a) $\ddot{C}F_2$ is more stable than $\ddot{C}Cl_2$

(b) $\ddot{C}Cl_2$ is more stable than $\ddot{C}Br_2$

(c) Singlet $\ddot{C}H_2$ is more stable than triplet $\ddot{C}H_2$

(d) Singlet $\ddot{C}H_2$ has planar geometry

(1) (a), (b), (d) (2) (b), (c), (d) (3) (a), (b), (c) (4) only (a)

**10.** Which of the following has greater bond length ?

(1) P–O (2) S–O (3) Cl–O (4) O=O

**11.** In $SiF_6^{2-}$ and $SiCl_6^{2-}$ which one is known and why?

(1) $SiF_6^{2-}$ because of small size of F

(2) $SiF_6^{2-}$ because of large size of F

(3) $SiCl_6^{2-}$ because of small size of Cl

(4) $SiCl_6^{2-}$ because of large size of Cl

**12.** Match List-I with List-II.

| | **List-I** | | **List-II** |
|---|---|---|---|
| | **(Hydrides)** | | **(Nature)** |
| (a) | $MgH_2$ | (i) | Electron precise |
| (b) | $GeH_4$ | (ii) | Electron deficient |
| (c) | $B_2H_6$ | (iii) | Electron rich |
| (d) | HF | (iv) | Ionic |

Choose the correct answer from the options given below :

(1) (a) – (i), (b) – (ii), (c) – (iv), (d) – (iii) (2) (a) – (ii), (b) – (iii), (c) – (iv), (d) – (i)

(3) (a) – (iv), (b) – (i), (c) – (ii), (d) – (iii) (4) (a) – (iii), (b) – (i), (c) – (ii), (d) – (iv)

**13.** Given below are two statements : one is labelled as **Assertion (A)** and the other is labelled as **Reason (R).**

**Assertion (A):** ICl is more reactive than $I_2$.

**Reason (R) :** I-Cl bond is weaker than I-I bond. In the light of the above statements, choose the most appropriate answer from the options given below:

(1) (A) is correct but (R) is not correct

(2) (A) is not correct but (R) is correct.

(3) Both (A) and (R) are correct and (R) is the correct explanation of (A).

(4) Both (A) and (R) are correct but (R) is not the correct explanation of (A)

**14.** Amongst the following which one will have maximum lone pair - lone pair' electron repulsions?

(1) $SF_4$ (2) $XeF_2$ (3) $ClF_3$ (4) $IF_5$

**15.** Which amongst the following is incorrect statement?

(1) $H_2^+$ ion has one electron.

(2) $O_2^+$ ion is diamagnetic.

(3) The bond order of $O_2^+$, $O_2$, $O_2^-$ are 2.5, 2, 1.5 and 1, respectively.

(4) $C_2$ molecule has four electrons in its two degenerate $\pi$ molecular orbitals.

**16.** Which one of the following statements is true about the structure of $CO_3^{2-}$ ion ?

(1) Out of the three C-O bonds, two are longer and one is shorter.

(2) It has three sigma and three $\pi$-bonds.

(3) All three C-O bonds are equal in length with a bond order in between 1 and 2.

(4) It can be explained' by considering $Sp^3$ hybridization.

**17.** The correct order of bond angle in the following compounds/species is:

(1) $H_2O < NH_3 < \overset{+}{N}H_4 < CO_2$ (2) $H_2O < \overset{+}{N}H_4 < NH_3 < CO_2$

(3) $H_2O < \overset{+}{N}H_4 = NH_3 < CO_2$ (4) $CO_2 < NH_3 < H_2O < \overset{+}{N}H_4$

**18.** Match List –I with List-II

| | **List-I (Molecules)** | | **List-II (Shape)** |
|---|---|---|---|
| (a) | $NH_3$ | (i) | Square pyramidal |
| (b) | $ClF_3$ | (ii) | Trigonal bipyramidal |
| (c) | $PCl_5$ | (iii) | Trigonal pyramidal |
| (d) | $BrF_5$ | (iv) | T-shape |

Choose the **correct answer** from the options given below :

(1) (a) – (ii), (b) – (iii), (c) – (iv), (d) – (i)

(2) (a) – (iii), (b) – (iv), (c) – (ii), (d) – (i)

(3) (a) – (iv), (b) – (iii), (c) – (i), (d) – (ii)

(4) (a) – (iii), (b) – (iv), (c) – (i), (d) – (ii)

**19.** Given below are two satements : one is labelled as :

**Assertion (A)** and the other is labelled as **Reason (R).**

**Assertion (A) :** The meral carbon bond in metal carbonyl possesses both $\sigma$ and $\pi$ character.

**Reason (R) :** The ligand to metal bond is a $\pi$ bond and metal to ligand bond is a $\sigma$ bond. In the light of the above statements, choose the most appropriate answer from the option given below:

(1) Both **(A)** and **(R)** are correct and **(R)** is the correct explanation of **(A)**

(2) Both **(A)** and **(R)** are correct but **(R)** is not the correct explanation of **(A)**

(3) **(A)** is correct but **(R)** is not correct

(4) **(A)** is not correct but **(R)** is correct.

**20.** Amongst the following, the total number of species NOT having eight electrons around central atom in its outer most shell, is

$NH_3$, $AlCl_3$, $BeCl_2$, $CCl_4$, $PCl_5$

(1) 2 (2) 4 (3) 1 (4) 3

**21.** The **correct** order of energies of molecular orbitals of $N_2$ molecule, is:

(1) $\sigma\,1s < \sigma\,1s < \sigma\,2s < \sigma\,2s < \sigma\,2p_z <$ $(\pi 2p_x = \pi 2p_y) < (\pi 2p_x = \pi 2p_y) < \sigma\,2p_z$

(2) $\sigma\,1s < \sigma\,1s < \sigma\,2s < \sigma\,2s < \sigma\,2p_z <$ $\sigma\,2p_z < (\pi 2p_x = \pi 2p_y) < (\pi 2p_x = \pi 2p_y)$

(3) $\sigma\,1s < \sigma\,1s < \sigma\,2s < \sigma\,2s < (\pi 2p_x = \pi 2p_y) <$ $(\pi 2p_x = \pi 2p_y) < \sigma\,2p_z < \sigma\,2p_z$

(4) $\sigma\,1s < \sigma\,1s < \sigma\,2s < \sigma\,2s < (\pi 2p_x = \pi 2p_y) <$ $\sigma\,2p_z < (\pi 2p_x = \pi 2p_y) < \sigma\,2p_z$

**22.** Intermolecular forces are forces of attraction and repulsion between interacting particles that will include

(A) dipole – dipole forces.

(B) dipole – Induced dipole forces.

(C) hydrogen bonding.

(D) covalent bonding.

(E) dispersion forces

Choose the most appropriate answer form the options given below:

(1) A, B, C, D are correct. (2) A, B, C, E are correct.

(3) A, C, D, E are correct. (4) B, C, D, E are correct.

**23.** Amongst the given options which of the following molecules/ ion acts as a Lewis acid?

(1) $H_2O$ (2) $BF_3$ (3) $OH^-$ (4) $NH_3$

**24.** The correct order of dipole moments for molecules $NH_3$,$H_2S$,$CH_4$ and HF is :

(1) $CH_4 > H_2S > NH_3 > HF$

(2) $H_2S > NH_3 > HF > CH_4$

(3) $NH_3 > HF > CH_4 > H_2S$

(4) $HF > NH_3 > H_2S > CH_4$

**25.** Which one of the following statements is **incorrect** related to Molecular Orbital Theory?

(1) The $\pi$ antibonding molecular orbital has a node between the nuclei

(2) In the formation of bonding molecular orbital, the two electron waves of the bonding atoms reinforce each other.

(3) Molecular orbital obtained from $2P_x$ and $2P_y$ orbitals are symmetrical around the bond axis.

(4) A $\pi$ – bonding molecular orbital has larger electron density above and below the internuclear axis.

# Answer Key

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **1.** | 1 | **2.** | 3 | **3.** | 2 | **4.** | 4 | **5.** | 2 | **6.** | 4 | **7.** | 1 |
| **8.** | 2 | **9.** | 1 | **10.** | 1 | **11.** | 1 | **12.** | 3 | **13.** | 3 | **14.** | 2 |
| **15.** | 2 | **16.** | 3 | **17.** | 1 | **18.** | 2 | **19.** | 3 | **20.** | 3 | **21.** | 4 |
| **22.** | 2 | **23.** | 1 | **24.** | 4 | **25.** | 3 | | | | | | |