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NEET, JEE(Main/Advanced)
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Educational Services Private Limited

9th, 10th, NEET, JEE(Main/Advanced)

अभ्यास ही सबसे बड़ा गुरू है।

CLASS : XI (INORGANIC CHEMISTRY)

D P P

DAILY PRACTICE PROBLEM

DPP-1 to 28

INORGANIC CHEMISTRY

DPP
DAILY PRACTICE PROBLEMS

DPP No. 1

Total Marks : 27

Max. Time : 28 min.

Topic : Periodic Table and Periodicity

Type of Questions		**M.M., Min.**
Single choice Objective ('–1' negative marking) Q.1 to Q.4	**(3 marks, 3 min.)**	**[12, 12]**
Multiple choice objective ('–1' negative marking) Q.5 to Q.6	**(4 marks, 4 min.)**	**[8, 8]**
Comprehension ('–1' negative marking) Q.7	**(3 marks, 3 min.)**	**[3, 3]**
Subjective Questions ('–1' negative marking) Q.8	**(4 marks, 5 min.)**	**[4, 5]**

1. Li resembles Mg due to diagonal relationship which is attributed to :
(A) nearly similar polarising power (B) same value of electron affinity
(C) penetration of sub-shells (D) identical effective nuclear charge

2. Atomic number of 15, 33, 51 represents the following family :
(A) carbon family (B) nitrogen family (C) oxygen family (D) None

3. The element with atomic number Z = 118 will be :
(A) noble gas (B) transition metal (C) alkali metal (D) alkanline earth metal

4. What is the position of the element in the Modern periodic table satisfying the electronic configuration $(n-1)\,d^1\,ns^2$ for n = 4 :
(A) 3rd period and 3rd group (B) 4th period and 4th group
(C) 3rd period and 2nd group (D) 4th period and 3rd group

5.* Which of the following statement(s) is/are correct ?
(A) An element with three electrons in the outer most subshell belongs to nitrogen family.
(B) An element that would tend to lose two electrons belongs to alkaline earth metal group i.e. 2^{nd} group.
(C) An element that would tend to gain two electrons belongs to chalcogen family i.e. 16^{th} group.
(D) 17^{th} group have only non-metals which may exist as solid, liquid as well as gas at room temp.

6.* Which of the following statements are correct ?
(A) In the long form of periodic table, the number of period indicates the value of principal quantum number.
(B) There are four d-block series comprising of total 40 elements in the long form of periodic table.
(C) s-block, d-block and f-block elements are metals.
(D) All p-block elements are non-metal.

7. **Comprehension #**
Read the following comprehension carefully and answer the questions (a) to (c).
Two friends Rohit and John, students of chemistry once discussing on periodic table, reach to a conclusion that because of Aufbau rule and other principles their thoughts are restricted for further discussion on electronic arrangements of atoms. They decided not to obey Aufbau rule and capacity of each orbital is increased to three electrons i.e. instead of two each orbital can take maximum of three electrons. Now on the basis of new arrangement of rohit and john answer the following questions assuming the total no. of elements is 112.

(a). What is the number of elements in third period and fifth period respectively ?
(A) 12, 27 (B) 27, 22 (C) 12, 22 (D) 22, 27

(b). What is the block of the elements with atomic number 9, 28, 44 ?
(A) s, p, d (B) p, s, d (C) p, d, s (D) d, p, s

(c). What is electric configuration of the element with atomic number 43 ?
(A) $1s^2 2s^3 3p^9 3s^3 3p^9 3d^{13}$ (B) $1s^3 2s^3 2p^9 3s^3 3p^9 3d^{15} 4s^1$
(C) $1s^2 2s^2 2p^6 3s^2 3p^6 3d^{10} 4s^2 4p^6 5s^2 4d^2$ (D) $1s^2 2s^3 2p^9 3s^2 3p^9 3d^{15} 4s^1$

8. Total Number of elements which are belong to same period (II).
Li, Na, Mg, F, Ne,Sc, P, Ar

INORGANIC CHEMISTRY

DPP
DAILY PRACTICE PROBLEMS

DPP No. 2

Total Marks : 27

Max. Time : 28 min.

Topic : Periodic Table and Periodicity

Type of Questions		M.M., Min.
Single choice Objective ('–1' negative marking) Q.1 to Q.4	(3 marks, 3 min.)	[12, 12]
Multiple choice objective ('–1' negative marking) Q.5 to Q.6	(4 marks, 4 min.)	[8, 8]
Comprehension ('–1' negative marking) Q.7	(3 marks, 3 min.)	[3, 3]
Subjective Questions ('–1' negative marking) Q.8	(4 marks, 5 min.)	[4, 5]

1. Which of the following species will have the smallest size ?
(A) Li^+ (B) Mg^{2+} (C) Al^{3+} (D) K^+

2. In the isoelectronic species, the ionic radii (Å) of N^{3-}, O^{2-} and F^- are respectively given by :
(A) 1.36, 1.40, 1.71 (B) 1.36, 1.71, 1.40 (C) 1.71, 1.40, 1.36 (D) 1.71, 1.36, 1.40

3. The first ionisation energy of Al is smaller than that of Mg because :
(A) the atomic number of Al is greater than that of Mg.
(B) the atomic size of Al is less than that of Mg.
(C) Penetration of s-subshell electrons in case of Mg is greater than that of p-subshell in Al
(D) Mg has incompletely filled s-orbital.

4. The correct order of second ionization potential of carbon, nitrogen, oxygen and fluorine is :
(A) C > N > O > F (B) O > N > F > C (C) O > F > N > C (D) F > O > N > C

5.* Which of the following are isoelectronic series ?
(A) Cl^-, P^{3-}, Ar (B) N^{3-}, Ne, Mg^{2+} (C) B^{3+}, He, Li^+ (D) N^{3-}, S^{2-}, Cl^-

6.* In which of the following pairs, the first members has higher first ionization energy ?
(A) N, O (B) B, Be (C) Al , Ga (D) F , Cl

7. **Comprehension #**
Read the following comprehension carefully and answer the questions (a) to (c).
The minimum amount of energy required to remove the most loosely bound electron from an isolated atom in the gaseous state is known as ionisation energy or first ionisation energy or ionisation enthalpy (IE_1) of the element. The energy required to remove the second electron from the monovalent cation is called second ionisation enthalpy (IE_2). Similarly, we have third, fourth ..... ionisation enthalpies. The values of ionisation energy depends on a number of factors such as (i) size of the atom (ii) screening effect (iii) nuclear charge (iv) half filled and fully filled orbitals (v) shape of orbital. In periodic table, ionisation energy increases from left to right except few exceptions and decreases from top to bottom in the group. Inert gas has the highest value of I.E. in the period.

IONISATION ENERGIES OF THREE HYPOTHETICAL ELEMENTS ARE GIVEN BELOW (in kJ/mole):

	I	II	III
X.	122	340	1890
Y.	99	931	1100
Z.	118	1220	1652

(a). Which of the following is likely to be 2nd group element :
(A) X (B) Z (C) Y (D) Both X & Y

(b). Which of the following pair represents elements of the same group :
(A) Y, Z (B) X, Y (C) X, Z (D) X, Y, Z

(c). Energy (in kJ/mole) required for the process $Z \longrightarrow Z^{2+} + 2e^-$ will be :
(A) 118 (B) 1220 (C) 1338 (D) 2872

8. Arrange the following in increasing radii :
(a) Li^+, Na^+, K^+ (b) Mg, Mg^+, Mg^{2+} (c) O^{2-}, N^{3-}, F^- (d) O, O^-, O^{2-}
(e) Mg^{2+}, Ca^{2+} (f) P^{3-}, N^{3-} (g) K^+, Ca^{2+} (h) I^+, I^-

INORGANIC CHEMISTRY

DPP
DAILY PRACTICE PROBLEMS

DPP No. 3

Total Marks : 27

Max. Time : 28 min.

Topic : Periodic Table and Periodicity

Type of Questions		**M.M., Min.**
Single choice Objective ('–1' negative marking) Q.1 to Q.4	**(3 marks, 3 min.)**	**[12, 12]**
Multiple choice objective ('–1' negative marking) Q.5 to Q.6	**(4 marks, 4 min.)**	**[8, 8]**
Comprehension ('–1' negative marking) Q.7	**(3 marks, 3 min.)**	**[3, 3]**
Subjective Questions ('–1' negative marking) Q.8	**(4 marks, 5 min.)**	**[4, 5]**

1. For an element 'A', the first ionisation energy will be numerically equal to :
(A) EA of A^+ (B) EA of A^{2+} (C) IE of A^{2+} (D) None of these

2. Which of the following relation is correct if EN value is on Mulliken scale and IP & EA are in eV :
(A) 2 I.P. – E.A. – E.N. = 0 (B) 2 I.P. – E.A. + E.N. = 0
(C) 2 E.N. – I.P. – E.A. = 0 (D) E.N. – I.P. – E.A. = 0

3. The five successive ionisation energies of an element 'X' are 800, 1427, 2658, 25024 and 32824 KJ $mole^{-1}$ respectively. The valency of 'X' is :
(A) 1 (B) 2 (C) 3 (D) 4

4. Number of elements which has value of electronegative is less than 3.
H, N, Li, B, O, P, F
(A) 3 (B) 4 (C) 5 (D) 6

5.* Which of the following statements are correct :
(A) F is the most electronegative and Cs is the most electropositive element in periodic table.
(B) The EN of halogens decreases from F to I.
(C) The E.A. of Cl is higher than that of F, though their EN values are in the reverse order.
(D) The E.A. of noble gases is low.

6.* For electron affinity of halogens which of the following is correct ?
(A) Br > F (B) F < Cl (C) Br < Cl (D) F < I

7. **Comprehension #**
Read the following comprehension carefully and answer the questions (a) to (c).
The properties of the elements (atomic/ionic radii, electron gain enthalpy, ionization enthalpy, electronegativity, valency, oxidising/reducing power, acid/base character, etc.) which are directly or indirectly related to their electronic configurations are called periodic properties. These properties show a regular gradation on moving from left to right in a period or from top to bottom in a group. Down a group, the atomic/ ionic radii, metallic character and reducing character increases while ionization enthalpy and electronegativity decreases. Along a period from left to right, atomic/ionic radii and metallic character decreases while ionization enthalpy, electronegativity, non-metallic character and oxidising power increases. However, electron gain enthalpy becomes less negative down a group but more negative along a period. In contrast, inert gases have positive electron gain enthalpies which do not show any regular trend.

(a). Which of the following isoelectronic ions has the lowest first ionization enthalpy :
(A) K^+ (B) Ca^{2+} (C) Cl^- (D) S^{2-}

(b). The outermost electronic configuration of the most electronegative element is :
(A) $ns^2\ np^3$ (B) $ns^2\ np^4$ (C) $ns^2\ np^5$ (D) $ns^2\ np^6$

(c). Amongst the following elements (whose electronic configurations are given below), the one having the highest ionization enthalpy is :
(A) [Ne] $3s^2\ 3p^1$ (B) [Ne] $3s^2\ 3p^3$ (C) [Ne]$3s^2\ 3p^2$ (D) [Ar] $3d^{10}\ 4s^2\ 4p^3$

8. Among the elements with atomic numbers 9,12, 36, identify by atomic number, an element which is :
(a) highly electronegative (b) an inert gas (c) highly electropositive

INORGANIC CHEMISTRY

DPP

DAILY PRACTICE PROBLEMS

DPP No. 4

Total Marks : 26

Max. Time : 27 min.

Topic : Periodic Table and Periodicity

Type of Questions		M.M., Min.
Single choice Objective ('–1' negative marking) Q.1 to Q.6	(3 marks, 3 min.)	[18, 18]
Multiple choice objective ('–1' negative marking) Q.7	(4 marks, 4 min.)	[4, 4]
Subjective Questions ('–1' negative marking) Q.8	(4 marks, 5 min.)	[4, 5]

1. An element with atomic number 107 has recently been discovered. Its block, group number, period and outershell electronic configuration respectively are :

(A) s-block, group 2, period 6, $6s^2$
(B) p-block, group 13, period 5, $5s^2\ 5p^4$
(C) d-block, group 7, period 7, $7s^2$
(D) f-block, group 3, period 6, $6s^2$

2. What is atomic number of Ununhexium ?

(A) 106 (B) 96 (C) 116 (D) 118

3. Which of the following represents the correct order of increasing electron gain enthalpy with negative sign for the elements O, S, F and Cl ?

(A) O < S < F < Cl
(B) F < S < O < Cl
(C) S < O < Cl < F
(D) Cl < F < O < S

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

5. Among the following oxides, the least acidic is :

(A) P_4O_6
(B) P_4O_{10}
(C) As_4O_6
(D) As_4O_{10}

6. The correct order of acidic strength is :

(A) $Cl_2O_7 > SO_3 > P_4O_{10}$
(B) $CO_2 > N_2O_5 > SO_3$
(C) $Na_2O > MgO > Al_2O_3$
(D) $K_2O > CaO > MgO$

7.* Which one of the following statements are correct ?

(A) The elements like F, Cl, Br, O etc having high values of electron affinity act as strong oxidising agent.
(B) The elements having low values of ionisation energies act as strong reducing agent.
(C) The formation of $S^{2-}(g)$ is an exothermic process.
(D) If an element A having EN = 7 on Mulliken scale makes an oxide, then its nature will be acidic.

8. How does EN difference between bonded atoms affect the % ionic character of the bond and the bond length? Compare the bond lengths of N–O and C–O bonds using EN values.

(Given $r_N \Rightarrow 0.75$ Å; $r_0 \Rightarrow 0.74$ Å; $r_c \Rightarrow 0.77$Å)

INORGANIC CHEMISTRY

DPP
DAILY PRACTICE PROBLEMS

DPP No. 5

Total Marks : 32

Max. Time : 40 min.

Topic : Basic Inorganic Chemistry

Type of Questions **M.M., Min.**

Subjective Questions ('–1' negative marking) Q.1 to Q.8 **(4 marks, 5 min.)** **[32, 40]**

1. Write down the chemical name of following compounds :

(i) $NaAlO_2$	(ii) $NaBO_2$	(iii) $K_4P_2O_7$	(iv) Na_2ZnO_2
(v) $Hg_2(BO_2)_2$	(vi) $K_2Cr_2O_7$	(vii) NaH_2PO_4	(viii) Na_2HPO_4
(ix) Na_3PO_4	(x) $Ca(H_2PO_4)_2$	(xi) $CaHPO_4$	(xii) $Ca_3(PO_4)_2$
(xiii) $Mg(ClO_3)_2$	(xiv) NaOBr	(xv) $Ca(ClO_2)_2$	(xvi) $CuPbO_2$
(xvii) $KClO_3$	(xviii) $(NH_4)_2MoO_4$	(xix) $BaCrO_4$	(xx) Na_2SnO_3
(xxi) $FeWO_4$	(xxii) K_2MnO_4	(xxiii) KH_2PO_2	

2. Write the chemical formula of following compounds :

(i) Magnesium phosphate	(ii) Calcium nitrite	(iii) Calcium metaborate
(iv) Ferric phosphate	(v) Calcium hypochlorite	(vi) Meta phosphate ion
(vii) Ammonium pyroantimonate	(viii) Arsenous oxide	(ix) Sodium pyrosulphate
(x) Potassium perchlorate	(xi) Silver sulphite	(xii) Silver arsenite
(xiii) Lead(II) dichromate	(xiv) Zinc nitrate	(xv) Silver plumbate
(xvi) Sodium ammonium hydrogen phosphate		

3. Write the name of following acidic radicals :

CO_3^{2-}	SO_3^{2-}	S^{2-}	NO_2^-	CH_3COO^-	Cl^-	Br^-
I^-	NO_3^-	$C_2O_4^{2-}$	BO_3^{3-}	PO_4^{3-}	SO_4^{2-}	

4. If you are given that $2Na_2HPO_4 \xrightarrow{\Delta} Na_4P_2O_7 + H_2O$, then predict this reaction :

$MgHPO_4 \xrightarrow{\Delta} A + B$?

5. It is given that, $2FeCl_3 \xrightarrow{\Delta} 2FeCl_2 + Cl_2$.

Can you predict the product if we heat $CuBr_2$? Write the chemical name of $CuBr_2$ and product.

6. It is given that, $2NaHCO_3 \xrightarrow{\Delta} Na_2CO_3 + CO_2 + H_2O$.

Then, $Mg(HCO_3)_2 \xrightarrow{\Delta}$?

Write the chemical formula and name of solid product, if the chemical name of Na_2CO_3 is Sodium carbonate.

7. James Bond has reveived a case involving an intricate murder. The element (A) responsible for poisoning forms a compound (B) with sodium. (A) also forms two chlorides (C) and (D), covalent in nature. Both (B) and (C) contain four atoms per molecular formula of the substance. If (A) is neither a pure metal nor a pure non-metal, identify (A) to (D) and help Mr. Bond solving the case. Suggest all possibilities if more than one such possibilities exist.

8. Certain elements combine with oxygen as well as halides to form oxyhalides. e.g. (i) Bi^{3+} can form BiOCl (obtained by replacing two Cl atoms in $BiCl_3$ by one O atom) (ii) S (VI) can form SO_2Cl_2 (obtained by replacing one O atom in SO_3 by two Cl atoms). In a similar fashion, write the oxyhalide formulae containing:

(a) S (IV), O and Cl (b) Xe (VI), O and F (two possibilities)

(c) S (VI), O and F (two possibilities) (d) V (V), O and Cl (two possibilities) (e) N(III), O and Cl

INORGANIC CHEMISTRY

DPP

DAILY PRACTICE PROBLEMS

DPP No. 6

Total Marks : 16

Max. Time : 20 min.

Topic : Basic Inorganic Chemistry

Type of Questions		**M.M., Min.**
Subjective Questions ('–1' negative marking) Q.1 to Q.4	**(4 marks, 5 min.)**	**[16, 20]**

1. Write the name of the following :

(a) Ca_3P_2 (b) $Ba(CN)_2$ (c) Na_2S

(d) ClF_3 (e) SF_4 (f) $Co(BO_2)_2$

(g) $Sc_2Si_2O_7$ (h) $Na_2S_2O_7$ (i) $Ba(NO_3)_2$

(j) Na_2SiO_3 (k) $Na_2H_2P_2O_5$ (l) $Al_2(SO_4)_3$

2. Write down the formula of the following :

(a) Sulphur hexafluoride (b) Lithium nitride (c) stroncium chloride

(d) dioxygen di fluoride (e) barium azide (f) barium perchlorate

(g) sodium hypochlorite (h) calcium phosphate (i) magnesium pyro phosphate

(j) Copper (II) metaborate (k) Sodium pyrosulphite (l) Ferric nitrate

3. Write the name of the following :

(a) H_3BO_3 (b) H_4SiO_4 (c) H_2CrO_4

(d) H_4xeO_6 (e) H_3PO_3 (f) HPO_3

(g) H_2SO_3 (h) $H_2S_2O_4$ (i) $H_2S_2O_3$

(j) H_2SO_5 (k) $HClO_3$ (l) $H_2N_2O_2$

(m) HBr (n) HN_3

4. Write down the formula of the following :

(a) Carbonic acid (b) Pyro silicic acid (c) Meta boric acid

(d) Manganic acid (e) Xenic acid (f) Hypophosphorus acid

(g) Phosphoric acid (h) Pyrosulphurous acid (i) Dithionic acid

(j) Chlorous acid (k) Nitrous acid (l) Peroxy nitric acid

(m) Hydroiodic acid (n) Hydrocyanic acid

INORGANIC CHEMISTRY

DPP
DAILY PRACTICE PROBLEMS

DPP No. 7

Total Marks : 27

Max. Time : 28 min.

Topic : Periodic Table and Periodicity

Type of Questions		**M.M., Min.**
Single choice Objective ('–1' negative marking) Q.1 to Q.5	**(3 marks, 3 min.)**	**[15, 15]**
Multiple choice objective ('–1' negative marking) Q.6 to Q.7	**(4 marks, 4 min.)**	**[8, 8]**
Subjective Questions ('–1' negative marking) Q.8	**(4 marks, 5 min.)**	**[4, 5]**

1. If the value of IE_1 for He-atom is 24.6 eV, then the energy required for the reaction :

$He(g) \longrightarrow He^{2+}(g) + 2e^-$ is :

(A) 79 eV (B) 38.2 eV

(C) 147 eV (D) Cannot be determined since data is insufficient.

2. Which of the following is the strongest oxy-acid among the following :

(A) H_2SO_4 (B) H_3PO_4 (C) $HClO_4$ (D) H_2SiO_3

3. Which of the following is the anhydride of Nitric acid (HNO_3) :

(A) NO_2 (B) N_2O_3 (C) N_2O_5 (D) N_2O

4. Which of the following statement is incorrect ?

(A) Oxide of aluminium (Al_2O_3), and arsenic (As_2O_3) are amphoteric.

(B) Oxide of chlorine (Cl_2O_7) is less acidic than oxide of nitrogen (N_2O_5).

(C) Oxide of carbon (CO_2) is more acidic than oxide of silica (SiO_2).

(D) The correct increasing order of basic character of various oxides is $H_2O < CuO < MgO < CaO$.

5. Which of the following is the **INCORRECT** order of acidic strength :

(A) $H_2O < H_2S < H_2Se < H_2Te$ (B) $HIO_4 < HBrO_4 < HClO_4$

(C) $HNO_2 < HNO_3$ (D) $HI < HBr < HCl < HF$

6.* Select equations having endothermic step :

(A) $S^-(g) + e^-(g) \longrightarrow S^{2-}(g)$ (B) $Ne(g) + e^-(g) \longrightarrow Ne^-(g)$

(C) $N(g) + e^-(g) \longrightarrow N^-(g)$ (D) $Al^{2+}(g) \longrightarrow Al^{3+}(g) + e^-(g)$

7.* Which is correct order for the properties specified ?

(A) I < Br < Cl < F (oxidising character)

(B) K > Mg > Al > B (metallic character)

(C) C < O < N < F (Non-metallic character)

(D) Li > Na > K > Rb > Cs (chemical reactivity)

8. The ionisation potentials of atoms A and B are 400 and 300 kcal mol^{-1} respectively. The electron affinities of these atoms are 80.0 and 85.0 kcal mol^{-1} respectively. Prove that which of the atoms have higher electronegativity

INORGANIC CHEMISTRY

DPP

DAILY PRACTICE PROBLEMS

DPP No. 8

Total Marks : 25

Max. Time : 26 min.

Topic : Chemical Bonding

Type of Questions		**M.M., Min.**
Single choice Objective ('–1' negative marking) Q.1 to Q.7	**(3 marks, 3 min.)**	**[21, 21]**
Subjective Questions ('–1' negative marking) Q.8	**(4 marks, 5 min.)**	**[4, 5]**

1. What is the nature of chemical bonding between Cs and F ?

(A) Ionic (B) Covalent (C) Coordinate (D) Metallic

2. The lattice energy of sodium chloride crystal is the energy released when one mole of NaCl(s) is formed from:

(A) Na(g) and Cl(g) atoms (B) Na^+(g) and Cl^-(g) ions

(C) Na(s) and Cl_2(g) (D) crystallization from aqueous solution of sodium chloride.

3. Which does not favour the formation of ionic compound :

(A) the ionization energy of the metal atom should be low.

(B) the lattice energy of the compound formed must be low.

(C) the electron affinity of the non-metal should be high.

(D) the lattice energy of the compound formed must be high.

4. Octet configuration cannot be achieved through :

(A) loss of electrons (B) gain of electrons

(C) sharing of electrons (D) exchange of electrons

5. In which of the following molecules, bonding is not taking place in excited state :

(A) CH_4 (B) BF_3 (C) IF_7 (D) PCl_3

6. The bonds present in N_2O are :

(A) only ionic (B) covalent and co-ordinate

(C) only covalent (D) covalent and ionic

7. Which of the following species does not obey octet rule :

(A) SiF_4 (B) PCl_5 (C) ICl (D) BF_4^-

8. Answer the following :

(i) What is the covalency of Carbon in C_2H_4 ?

(ii) What types of bonds and how many of each are present in NH_4^+ ion ?

INORGANIC CHEMISTRY

DPP

DAILY PRACTICE PROBLEMS

DPP No. 9

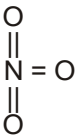
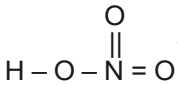
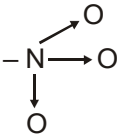
Total Marks : 32

Max. Time : 36 min.

Topic : Chemical Bonding

Type of Questions		**M.M., Min.**
Single choice Objective ('–1' negative marking) Q.1 to Q.4	**(3 marks, 3 min.)**	**[12, 12]**
Match the Following (no negative marking) Q.5	**(8 marks, 10 min.)**	**[8, 10]**
Multiple choice objective ('–1' negative marking) Q.6	**(4 marks, 4 min.)**	**[4, 4]**
Subjective Questions ('–1' negative marking) Q.7 to Q.8	**(4 marks, 5 min.)**	**[8, 10]**

1. The correct representation of Lewis dot structure of HNO_3 is :

(A)  (B)  (C) (D) 

2. Species not obeying octet rule is/are :

(A) CO_3^{2-} (B) BF_3 (C) NO_2^- (D) PCl_3

3. PCl_5 exists but NCl_5 does not, because :

(A) Nitrogen has no vacant 2d-orbitals (B) N and Cl have almost same EN

(C) N-atom is much smaller than P-atom (D) Nitrogen is highly inert

4. The molecular without any lone pair around the centred atom is :

(A) XeO_3 (B) XeO_4 (C) XeF_6 (D) XeO_2F_2

5. Match the species in column (I) with their characteristics in column (II) :

Column-I	**Column-II**
(P) BH_4^-	(1) 2 bond pair and 3 lone pair on central atom
(Q) ICl_2^+	(2) 4 bond pair and no lone pair on central atom
(R) ICl_2^-	(3) 3 bond pair and 1 lone pair on central atom
(S) ICl_4^-	(4) 2 bond pair and 2 lone pair on central atom
	(5) 4 bond pair and 2 lone pair on central atom

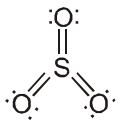
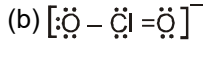
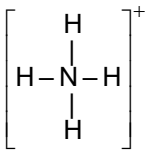
(A) P = 2; Q = 4; R = 3; S = 1 (B) P = 2; Q = 4; R = 1; S = 5

(C) P = 2; Q = 1; R = 5; S = 4 (D) P = 2; Q = 1; R = 3; S = 4

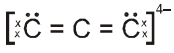
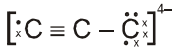
6.* The odd electron molecules among the following is/are :

(A) NO_2 (B) NO (C) ClO_2 (D) CO

7. Assign formal charges to all atoms in the given species :

(a)  (b)  (c)  (d)

8. Explain on the basis of formal charge, which of the following is a more appropriate structure for C_3^{4-} ion :

 or 

INORGANIC CHEMISTRY

DPP

DAILY PRACTICE PROBLEMS

DPP No. 10

Total Marks : 26

Max. Time : 26 min.

Topic : Chemical Bonding

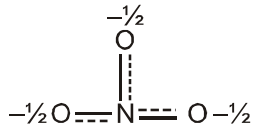
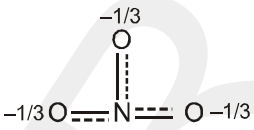
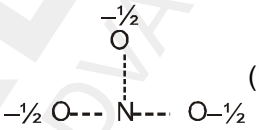
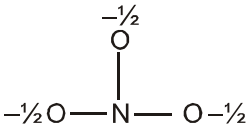
Type of Questions		**M.M., Min.**
Single choice Objective ('–1' negative marking) Q.1 to Q.6	**(3 marks, 3 min.)**	**[18, 18]**
Multiple choice objective ('–1' negative marking) Q.7 to Q.8	**(4 marks, 4 min.)**	**[8, 8]**

1. Resonating structures have different :

(A) Atomic arrangements (B) Electronic arrangements

(C) Functional groups (D) Sigma bond

2. Resonance hybrid of nitrate ion is :

(A)  (B)  (C)  (D) 

3. The correct order of C–N bond length in the given compounds is :

P : CH_3CN Q : HNCO R : CH_3CONH_2

(A) P > Q > R (B) P = Q = R (C) R > Q > P (D) R > P > Q

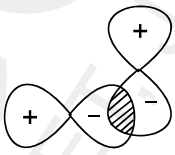
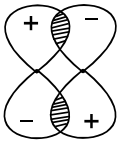
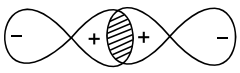
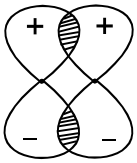
4. Correct order of bond length is :

(A) $CO_3^{2-} > CO_2 > CO$ (B) $CO_2 > CO > CO_3^{2-}$ (C) $CO > CO_2 > CO_3^{2-}$ (D) None of these.

5. The strength of bonds by $s-s$, $p-p$, $s-p$ overlap is generally in the order :

(A) $s-s > s-p > p-p$ (B) $s-s > p-p > s-p$ (C) $s-p > s-s > p-p$ (D) $p-p > s-s > s-p$

6. Which of the following atomic orbital overlappings are not allowed :

(i)  (ii)  (iii)  (iv)  (v) 

(A) All (B) (i) (ii) (iii) (C) (i) (iii) (v) (D) (ii) only

7.* Indicate the wrong statement according to VBT :

(A) A sigma bond has no free rotation about the inter-nuclear axis.

(B) p-orbitals always have only sidewise overlapping.

(C) s-orbitals never form π - bonds.

(D) There can be more than one sigma bond between two atoms.

8.* Which of the following overlaps is/are incorrect [assuming X-axis to be the internuclear axis] :

(a) $2p_y + 2p_y \rightarrow \pi$ (b) $2p_z + 2p_z \rightarrow \sigma$ (c) $2p_x + 2p_x \rightarrow \pi$ (d) $1s + 2p_y \rightarrow \pi$

(e) $2p_y + 2p_z \rightarrow \pi$ (f) $1s + 2s \rightarrow \sigma$

(A) 'a' & 'b' (B) 'b' & 'd' (C) 'd' & 'f' (D) 'c' & 'e'

INORGANIC CHEMISTRY

DPP

DAILY PRACTICE PROBLEMS

DPP No. 11

Total Marks : 31

Max. Time : 34 min.

Topic : Chemical Bonding

Type of Questions		**M.M., Min.**
Single choice Objective ('–1' negative marking) Q.1 to Q.5	**(3 marks, 3 min.)**	**[15, 15]**
Multiple choice objective ('–1' negative marking) Q.6	**(4 marks, 4 min.)**	**[4, 4]**
Subjective Questions ('–1' negative marking) Q.7	**(4 marks, 5 min.)**	**[4, 5]**
Match the Following (no negative marking) Q.8	**(8 marks, 10 min.)**	**[8, 10]**

1. Hybridization of orbitals of carbon in CH_4 is necessary to explain which of the following :

(A) Equality of strength of all C-H bonds (B) Methane is non-polar

(C) Tetravalency of Carbon (D) Carbon has complete octet

2. In which of the following, 'N' atom is sp^2 hybridised :

(A) NH_3 (B) NH_4^+ (C) NH_2^- (D) NOCl

3. The hybridization of carbon atoms in $C_2 - C_3$ single bond of $\overset{4}{H}\overset{}{C} \equiv \overset{3}{C} - \overset{2}{C}H = \overset{1}{C}H_2$ is :

(A) $sp^3 - sp^3$ (B) $sp^2 - sp$ (C) $sp - sp^2$ (D) $sp^3 - sp$

4. In C_3O_2, the hybridization state of Carbon is :

(A) sp (B) sp^2 (C) sp^3 (D) Both sp and sp^2

5. Shape of NH_3 is very similar to :

(A) BF_3 (B) CH_3^- (C) SO_3 (D) $CH_3^{\oplus}$

6.* Which starred carbon atom in the following molecules show sp^2 hybridisation :

(A) $CH_3\overset{*}{C}HO$ (B) $CH_3\overset{*}{C}OCl$ (C) $(\overset{*}{C}H_3)_3N \rightarrow O$ (D) $CH_3COCH_2\overset{*}{C}OOC_2H_5$

7. In how many of the following species, the central atoms have two lone pairs of electrons ?

XeF_4	XeF_5^-	F_2SeO_2
XeF_3^+	$XeOF_4$	$ClOF_3$
ICl_4^-	SCl_2	OSF_4

8. Match the following :

Column (I) **Species**	**Column (II)** **Characteristics of central atom**
(A) IBr_2^-	(p) sp^3d^2, 2 lone pairs
(B) XeF_5^-	(q) sp^3d, 1 lone pair
(C) ICl_4^-	(r) sp^3d^3, 1 lone pair
(D) IF_6^-	(s) sp^3d^3, 2 lone pair
	(t) sp^3d, 3 lone pairs

INORGANIC CHEMISTRY

DPP
DAILY PRACTICE PROBLEMS

DPP No. 12

Total Marks : 26

Max. Time : 27 min.

Topic : Chemical Bonding

Type of Questions		**M.M., Min.**
Single choice Objective ('–1' negative marking) Q.1 to Q.6	**(3 marks, 3 min.)**	**[18, 18]**
Multiple choice objective ('–1' negative marking) Q.7	**(4 marks, 4 min.)**	**[4, 4]**
Subjective Questions ('–1' negative marking) Q.8	**(4 marks, 5 min.)**	**[4, 5]**

1. Carbon atoms in $C_2(CN)_2$ are :
(A) All sp-hybridised (B) All sp^2-hybridised (C) All sp^3-hybridised (D) sp and sp^2–hybridised.

2. $BF_3 + F^- \rightarrow BF_4^-$
What is the hybridiation state of B in BF_3 and BF_4^- :
(A) sp^2, sp^3 (B) sp^3, sp^3 (C) sp^2, sp^2 (D) sp^3, sp^3d

3. The hybridisation of P in phosphate ion (PO_4^{3-}) is the same as :
(A) I in $IC\ell_4^-$ (B) S in SO_3 (C) N in NO_3^- (D) S in SO_3^{2-}

4. Specify the hybridisations of central atom in the following species respectively {N_3^-, NOCl, N_2O}
(A) sp , sp^2 , sp (B) sp , sp , sp^3 (C) sp^2 , sp , sp (D) sp^2 , sp^2 , sp.

5. The correct order of increasing s character (in percentage) in the hybrid orbitals in below molecules / ions is (assume all hybrid orbitals are exactly equivalent) :

CO_3^{2-}	XeF_4	I_3^-	NCl_3	$BeCl_2$ (g)
I	II	III	IV	V

(A) II < III < IV < I < V (B) II < IV < III < V < I
(C) III < II < I < V < IV (D) II < IV < III < I < V

6. Consider the following statements :

In $\overset{I}{CH_2} = \overset{II}{CH} - \overset{III}{C} \equiv \overset{IV}{C} - H$

1. There are 6 σ and 3 π bonds.
2. Carbon I & II are sp^2 hybridised.
3. Carbon III & IV are sp hybridised.

The above statements 1, 2, 3 respectively are (T = True, F = False) :
(A) T T T (B) F T T (C) F T F (D) T F T

7.* Which of the following species have linear shape with central atom sp hybridised :
(A) NO_2^+ (B) SCN^- (C) $HgCl_2$ (D) C_2H_2

8. Predict the hybridisation of the central atom in following molecules :

1.	BeH_2 (g)	.....	2.	BeF_2	.....
3.	CO_2	.....	4.	$HC \equiv CH$	.....
5.	O_3	.....	6.	BF_3	.....
7.	$CH_2=CH_2$	.....	8.	CH_3^+	.....
9.	HNO_3	.....	10.	HNO_2	.....
11.	SO_2	.....	12.	SO_3	.....
13.	HCO_3^-	.....	14.	$HCOO^-$	.....
15.	$SnCl_2$	.....	16.	$AlCl_3$	.....
17.	AlH_4^-	.....	18.	NF_3	.....
19.	PF_3	.....	20.	$AsCl_3$	.....
21.	CH_3^-	.....	22.	OF_2	.....
23.	SCl_2	.....	24.	SF_4	.....
25.	$[SiF_6]^{2-}$	.....	26.	PCl_6^-	.....
27.	ICl_2^-	.....	28.	ICl_5	.....
29.	ICl_4^-	.....	30.	XeF_6	.....

INORGANIC CHEMISTRY

DPP
DAILY PRACTICE PROBLEMS

DPP No. 13

Total Marks : 31

Max. Time : 33 min.

Topic : Chemical Bonding

Type of Questions		M.M., Min.
Single choice Objective ('–1' negative marking) Q.1 to Q.5	(3 marks, 3 min.)	[15, 15]
Multiple choice objective ('–1' negative marking) Q.6 to Q.7	(4 marks, 4 min.)	[8, 8]
Match the Following (no negative marking) Q.8	(8 marks, 10 min.)	[8, 10]

1. Which of the following is V-shaped :

(A) S_3^{2-} (B) I_3^- (C) N_3^- (D) none of these

2. Which of the following should have pyramidal shape :

(A) $[ClOF_2]^+$ (B) ICl_3 (C) $[BrICl]^-$ (D) SO_3

3. Accroding to VSEPR theory in $[IO_2F_2]^-$ ion the $F\hat{I}F$ bond angle will be nearly

(A) 120° (B) 90° (C) 109°–28′ (D) 180°

4. Among the following, the pair in which the two species are not isostructural is

(A) IO_3^- and XeO_3 (B) $A\ell H_4^-$ and PH_4^+ (C) AsF_6^- and SF_6 (D) SiF_4 and SeF_4

5. Consider the structures of the following two molecules :

X : $F_2C = C = CF_2$

Y : $F_2B - C \equiv C - BF_2$

In which of these two, it is impossible for all the four F atoms to lie in the same plane :

(A) X (B) Y (C) both (D) none

6.* Which is/are true according to VSEPR theory :

(A) The order of repulsion between different pair of electrons is $\ell p - \ell p > \ell p - bp > bp - bp$
(ℓp = lone pair electrons, bp = bond pair electrons)

(B) Lone pair and double bond occupy equitorial position in trigonal bipyramidal structure.

(C) More electronegative atoms occupy axial position in trigonal bipyramidal structure.

(D) Bigger atoms occupy axial positions in trigonal bipyramidal structure.

7.* In which of the following species, one of bond angle is expected to be more than 120º.

(A) N_2O (B) NO_2^- (C) NO_2^+ (D) XeF_3^+

8. Match the isostructural pairs :

(a) SF_4	(i) IF_6^+
(b) PCl_5	(ii) ClF_4^+
(c) ICl_3	(iii) $SnCl_5^-$
(d) I_3^-	(iv) ClF_3
(e) ICl_4^-	(v) ClF_2^-
(f) PCl_6^-	(vi) XeF_4

INORGANIC CHEMISTRY

DPP
DAILY PRACTICE PROBLEMS

DPP No. 14

Total Marks : 32

Max. Time : 35 min.

Topic : Chemical Bonding

Type of Questions		**M.M., Min.**
Single choice Objective ('–1' negative marking) Q.1 to Q.4	**(3 marks, 3 min.)**	**[12, 12]**
Multiple choice objective ('–1' negative marking) Q.5 to Q.6	**(4 marks, 4 min.)**	**[8, 8]**
Match the Following (no negative marking) Q.7	**(8 marks, 10 min.)**	**[8, 10]**
Subjective Questions ('–1' negative marking) Q.8	**(4 marks, 5 min.)**	**[4, 5]**

1. Which of the following is ionic solid :
(A) XeF_6 (s) (B) PBr_5(s) (C) CaC_2(s) (D) All of these

2. Which of the following statements are correct :
(1) The number of sigma bonds in $CH_2 = C = C = CH_2$ is 7.
(2) All the hydrogen atoms in $CH_2 = C = C = CH_2$ lie in the same plane.
(A) Only (1) (B) Only (2) (C) Both (1) and (2) (D) Neither (1) nor (2)

3. Match the list-I with List–II and select the correct answer using the codes given below with the lists.

List–I (Compounds)	**List-II (Shape)**
(a) XeF_4	(i) Tetrahedral
(b) XeO_3	(ii) Square planar
(c) XeO_4	(iii) Trigonal bipyramidal
(d) XeO_3F_2	(iv) Pyramidal

(A) a – iv, b – iii, c – i, d – ii (B) a – ii, b – iv, c – i, d – iii
(C) a – i, b – iv, c – ii, d – iii (D) a – ii, b – i, c – iii, d – iv

4. Gaseous SO_3 molecule :
(A) is planar triangular in shape with three σ bonds from sp^2 – p overlap and three π-bonds formed by two $p\pi$ – $p\pi$ overlap and one $p\pi$ – $d\pi$ overlap.
(B) is planar triangular in shape with three σ-bonds from sp^2 – p overlap and three π-bonds formed by one $p\pi$ – $p\pi$ overlap and two $p\pi$ – $d\pi$ overlap.
(C) is a pyramidal molecule with one double bond and two single bonds
(D) is planar triangular in shape with two double bonds between S and O and one single bond

5.* Which of the following is a planar molecule :
(A) XeF_4 (B) $\ddot{N}H_3$ (C) BrO_3^- (D) $C\ell F_3$

6.* Identify pairs containing isomorphous species :
(A) $MgCO_3$, $NaNO_3$ (B) Na_2CO_3 , Na_2SO_3 (C) $BaSO_4$, $KMnO_4$ (D) $NaNO_3$, $KClO_3$

7. Match the following :

	Molecule / ion		**Hybridisation of central atom**
(A)	$IO_2F_2^-$	(p)	sp^3d
(B)	F_2SeO	(q)	sp^3
(C)	$ClOF_3$	(r)	sp^2
(D)	XeF_5^+	(s)	sp^3d^2

8. There will be three different flourine-flourine distances in molecule $F_2C=C=C=CF_2$. Assuming ideal bond angles for a particular hybridisation (assume no distortion due to double bonds), find out the two smaller flourine-flourine distances (in pm).

(Given that C–F bond length = 134 pm, C = C bond length = 134 pm, $\sqrt{3}$ = 1.7)

INORGANIC CHEMISTRY

DPP
DAILY PRACTICE PROBLEMS

DPP No. 15

Total Marks : 27

Max. Time : 28 min.

Topic : Chemical Bonding

Type of Questions		M.M., Min.
Single choice Objective ('–1' negative marking) Q.1 to Q.5	(3 marks, 3 min.)	[15, 15]
Multiple choice objective ('–1' negative marking) Q.6 to Q.7	(4 marks, 4 min.)	[8, 8]
Subjective Questions ('–1' negative marking) Q.8	(4 marks, 5 min.)	[4, 5]

1. Correct order of bond length is

(A) $SO_3^{2-} > SO_4^{2-} > SO_3$ (B) $SO_4^{2-} > SO_3^{2-} > SO_3$

(C) $SO_3 > SO_3^{2-} > SO_4^{2-}$ (D) None of these.

2. Which of the following molecule contains shortest N–O bond ?

(A) NOF (B) NO_2^- (C) NO_3^- (D) NH_2OH

3. How many types of bond length are there in SO_4^{2-} ?

(A) one (B) two (C) three (D) four

4. Select the correct order for bond angle.

(A) $PH_3 < AsH_3 < NH_3 < SbH_3$ (B) $F_2O < H_2O < Cl_2O$

(C) $SbI_3 < SbBr_3 < SbCl_3$ (D) $BF_3 > BCl_3 > BBr_3$

5. Select the correct order of bond angle of the following species.

ClO_3^-, BrO_3^-, IO_3^-

(A) $BrO_3^- > IO_3^- > ClO_3^-$ (B) $ClO_3^- > BrO_3^- > IO_3^-$

(C) $IO_3^- > BrO_3^- > ClO_3^-$ (D) $IO_3^- < BrO_3^- > ClO_3^-$

6.* Which of the following order is/are correct about the bond angle.

(A) $OF_2 < H_2O < Cl_2O < ClO_2$ (B) $COF_2 < COCl_2 < COBr_2 < COI_2$ ($X\hat{C}X$ bond angle)

(C) $PH_3 > PF_3$ (D) $KrF_4 < SF_2 < N_2H_2$

7.* CO_3^{2-} anion has which of the following charcteristics

(A) Bonds of unequal length (B) sp^2 hybridisation of C atom

(C) Resonance stabilization (D) Same bond angles.

8. Compare bond angles in the following pairs :

(a) F_2O and H_2O (b) NH_3 and PH_3 (c) SO_2 and SO_3 (d) NO_2^+ and NO_2^-

INORGANIC CHEMISTRY

DPP

DAILY PRACTICE PROBLEMS

DPP No. 16

Total Marks : 25

Max. Time : 25

Topic : Chemical Bonding

Type of Questions		**M.M., Min.**
Single choice Objective ('–1' negative marking) Q.1 to Q.7	**(3 marks, 3 min.)**	**[21, 21]**
Multiple choice objective ('–1' negative marking) Q.8	**(4 marks, 4 min.)**	**[4, 4]**

1. Hydrogen forms bridge in the chemical structure of :
(A) Hydrogen peroxide (B) Lithium hydride (C) Diborane (D) Sodium peroxide

2. In B_2H_6 :
(A) There is a direct boron-boron bond.
(B) The structure is similar to that of C_2H_6.
(C) The boron atoms are linked through hydrogen bridges.
(D) All the atoms are in one plane.

3. The hybridization of central atom and shape of $(SiH_3)NCO$ is :
(A) sp^2, planner (B) sp^3, tetrahedral (C) sp^3, pyramidal (D) sp, linear

4. The main factor responsible for weak Lewis acid nature of BF_3 among all boron trihalides is :
(A) Large electronegativity of F (B) Three centred-two electron bonds in BF_3
(C) $p\pi$-$d\pi$ back bonding (D) $p\pi$-$p\pi$ back bonding

5. Which is not true about B_2H_6
(A) Both 'B' atoms are sp^3 hybridised (B) Boron atom is in ground state
(C) Two hydrogens occupy special positions (D) There are two, three centre two electron bonds

6. **Statement-1 :** Geometry of $(CH_3)_3N$ is pyramidal but in case of $(SiH_3)_3$ N, it is planar.
Statement-2 : Silicon is less electronegative than Carbon.
(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
(C) Statement-1 is True, Statement-2 is False
(D) Statement-1 is False, Statement-2 is True

7. **Statement-1 :** Calculated bond length of B–F bond in BF_3 is 152 pm, whereas observed bond length is 130 pm.
Statement-2 : B–F bond in boron trifluoride possesses partial double bond character due to $p\pi$-$p\pi$ back bonding.
(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
(C) Statement-1 is True, Statement-2 is False
(D) Statement-1 is False, Statement-2 is True

8.* BCl_3 does not exist as dimer but BH_3 exist as dimer (B_2H_6) because:
(A) Chlorine is more electronegative than hydrogen
(B) There is $p\pi$-$p\pi$ back bonding in BCl_3 but BH_3 does not contain such bonding
(C) Large sized chlorine atoms do not fit between the small boron atoms whereas small sized hydrogen atoms get fitted between boron atoms
(D) None of these

INORGANIC CHEMISTRY

DPP
DAILY PRACTICE PROBLEMS

DPP No. 17

Total Marks : 25

Max. Time : 26 min.

Topic : Chemical Bonding

Type of Questions		**M.M., Min.**
Single choice Objective ('–1' negative marking) Q.1 to Q.7	**(3 marks, 3 min.)**	**[21, 21]**
Subjective Questions ('–1' negative marking) Q.8	**(4 marks, 5 min.)**	**[4, 5]**

1. Diamond is a hard substance because :
(A) it has ionic bond.
(B) it has planar arrangement of carbon atoms.
(C) it has sp^3 hybridized carbon atoms which are arranged tetrahedrally in a cross-network structure.
(D) it has sp^2 hybridized carbon atoms arranged in a planar geometry.

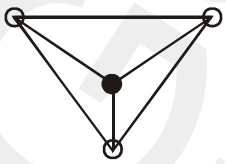
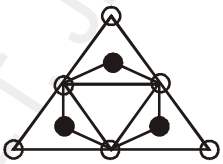
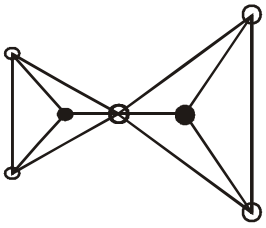
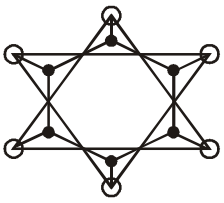
2. Graphite is a good conductor of heat and electricity, while diamond is not because :
(A) graphite has ionic bonds and diamond has covalent bonds.
(B) graphite has covalent bonds and diamond has ionic bonds.
(C) graphite has delocalized electrons whereas diamond has not.
(D) graphite has sp^3 hybridized carbon atoms and diamond has sp^2 hybridized carbon atoms.

3. Most recently developed carbon allotrope 'C-60' Buckminster Fullerene has shape of :
(A) football (B) thin sheet of steel (C) diamond (D) none of these

4. Two types of carbon-carbon covalent bond lengths are present in :
(A) diamond (B) graphite (C) C_{60} (D) benzene

5. The fundamental unit found in silicates is :
(A) SiO_2 (B) SiO_4^{4-} (C) SiO_3 (D) $Si_2O_5^{2-}$

6. Which of the following represents a pyrosilicate structure :
○ — Oxygen ● — Silicon

(A) 
(B) 
(C) 
(D) 

7. On the basis of structure of graphite, which of the following is/are true for it :
(A) It is a diamagnetic substance.
(B) It behaves like metallic conductor as well as semiconductor upon changes in temperature.
(C) It is less dense than diamond.
(D) All C–C bond lengths are same and intermediate between single and double bonds.

8. Answer the following questions.
(i) What is the hybridisation of B and N in inorganic benzene ?
(ii) How many position isomers are possible for dichloro substituted inorganic benzene ?
(iii) How many B–H bonds are there in inorganic benzene ?
(iv) How many N–B bonds are there in inorganic benzene ?

INORGANIC CHEMISTRY

DPP

DAILY PRACTICE PROBLEMS

DPP No. 18

Total Marks : 26

Max. Time : 28 min.

Topic : Chemical Bonding

Type of Questions		**M.M., Min.**
Single choice Objective ('–1' negative marking) Q.1 to Q.6	**(3 marks, 3 min.)**	**[18, 18]**
Subjective Questions ('–1' negative marking) Q.7 to Q.8	**(4 marks, 5 min.)**	**[8, 10]**

1. Which is the hybridization of the central atom of SiO_2 :

(A) sp (B) sp^2 (C) sp^3 (D) sp^3d

2. In SO_2 molecule, there are two σ-bonds and two π-bonds. The two π-bonds are formed by :

(A) $p\pi - p\pi$ overlap between S and O atoms

(B) $sp^2 - p$ overlap between S and O atoms

(C) one by $p\pi - p\pi$ overlap and other by $p\pi - d\pi$ overlap

(D) both by $p\pi - d\pi$ overlap

3. White phosphours has :

(A) six P – P single bonds (B) four lone pairs of electrons

(C) PPP angle of 60ºC (D) all of these

4. **STATEMENT-1 :** NO_2 and ClO_2 both being odd electron molecules dimerise.

STATEMENT-2 : On dimerisation, NO_2 is converted to stable N_2O_4 molecule with even number of electrons.

(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.

(B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1

(C) Statement-1 is True, Statement-2 is False

(D) Statement-1 is False, Statement-2 is True

5. In P_4O_{10} molecule

(A) There are 4 P–P bond (B) There are 8 P–O bond

(C) The $P\hat{O}P$ bond angle is 180° (D) The phosphorus atom is in excited state

6. In P_4S_3 how many P–P bonds are present.

(A) 3 (B) 4 (C) 5 (D) 2

7. Nitrogen exists as diatomic molecule and phosphorus as P_4 . Why ?

8. In SiO_2, each silicon atom is covalently bonded in a tetrahedral manner to four oxygen atoms and each oxygen atom in turn is covalently bonded to another two silicon atoms giving a three dimensional network solid. Find the total number of atoms comprising each ring forming the three dimensional network solid.

INORGANIC CHEMISTRY

DPP
DAILY PRACTICE PROBLEMS

DPP No. 19

Total Marks : 29

Max. Time : 30 min.

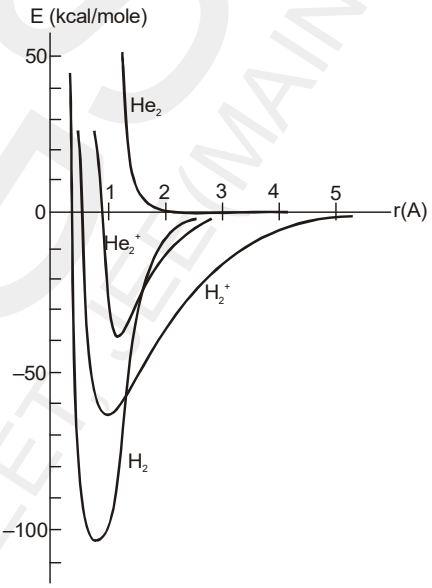
Topic : Chemical Bonding

Type of Questions		**M.M., Min.**
Single choice Objective ('–1' negative marking) Q.1 to Q.3	**(3 marks, 3 min.)**	**[12, 12]**
Multiple choice objective ('–1' negative marking) Q.4	**(4 marks, 4 min.)**	**[4, 4]**
Comprehension ('–1' negative marking) Q.5 to Q.7	**(3 marks, 3 min.)**	**[9, 9]**
Subjective Questions ('–1' negative marking) Q.8	**(4 marks, 5 min.)**	**[4, 5]**

1. Which of the following forms only π-bond using Molecular orbital theory :
(A) Li_2 (B) C_2 (C) N_2 (D) O_2

2. Which of the following statements is not correct from the point of view of molecular orbital theory :
(A) Be_2 is not a stable molecule.
(B) He_2 is not stable, but He_2^+ is expected to exist.
(C) Bond strength of N_2 is maximum amongst the homonuclear diatomic molecules.
(D) The order of energies of molecular orbitals in F_2 molecule is :
$E(\sigma 2s) < E(\sigma^* 2s) < E(\pi 2p_x) = E(\pi 2p_y) < E(\sigma 2p_z) < E(\pi^* 2p_x) = E(\pi^* 2p_y) < E(\sigma^* 2p_z)$

3. The following graph is given between total energy and distance between the two nuclei for species H_2^+, H_2, He_2^+ & He_2. Which of the following statements is correct :



(A) He_2^+ is more stable than H_2^+.
(B) Bond dissociation energy of H_2^+ is more than bond dissociation energy of He_2^+.
(C) Since bond orders of He_2^+ and H_2^+ are equal, hence both will have equal bond dissociation energy.
(D) Bond length of H_2^+ is less than bond length of H_2 .

4.*_ Which of the following is/are gerade molecular orbitals :
(A) σ (B) σ^* (C) π (D) π^*

Comprehension # (Q.5 to Q.7)

In principle, Schrondinger equation can be written for any molecule. However, since it cannot be solved exactly for any system containing more than one electron, molecular orbitals which are one electron wave functions for molecules are difficult to obtain directly from the solution of the Schrondinger equation. This difficulty is overcome by resorting to an approximation method called linear combination of atomic orbitals (LCAO) method to form molecular orbitals.

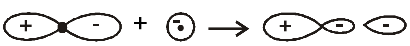
The molecular orbtial formed by the addition of atomic orbtials is called the bonding molecular orbital and the molecular orbital formed by the substration of atomic orbitals is called antibonding molecular orbital. Qualitaively, the formation of molecular orbitals can be understood in terms of the constructive or destructive interference of the electron waves of the combining atoms. In the formation of bonding molecular orbital, the two electron waves of the bonding atoms reinforce each other (constructive interference) while in the formation of antibonding molecular orbtial, these electron waves cancel each other (destructive interference). The result is that in a bonding molecular orbital most of the electron density is located between the nuclei of the bonded atoms and hence the repulsion between the nuclei is very low while in an antibonding molecular orbital, most of the electron density is located away from the space between the nuclei, as a matter of fact there is a nodal plane (i.e., plane in which the electron density is zero)

5. How many nodal plane is/are present in σ_{1s} bonding molecular orbital :

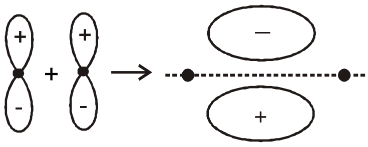
(A) zero (B) 1 (C) 2 (D) 3

6. Which of the following combination of orbitals is correct :

(A) 

(B) 

(C) 

(D) 

7. Which of the following statements is not correct regarding bonding molecular orbitals :

(A) Bonding molecular orbtials possess less energy than the atomic orbitals from which they are formed.

(B) Bonding molecular orbtials have low electron density between the two nuclei.

(C) Every electron in bonding molecular orbitals contibutes to the attraction between atoms

(D) They are formed when the lobes of the combining atomic orbtials have the same sign i.e. proper symmetry of electron waves.

8. Predict whether the He_2^+ ion in its electronic ground state is stable toward dissociation into He and He^+.

INORGANIC CHEMISTRY

DPP
DAILY PRACTICE PROBLEMS

DPP No. 20

Total Marks : 27

Max. Time : 29 min.

Topic : Chemical Bonding

Type of Questions		M.M., Min.
Single choice Objective ('–1' negative marking) Q.1 to Q.5	(3 marks, 3 min.)	[15, 15]
Multiple choice objective ('–1' negative marking) Q.6	(4 marks, 4 min.)	[4, 4]
Subjective Questions ('–1' negative marking) Q.7 to Q.8	(4 marks, 5 min.)	[8, 10]

1. Which of the following pairs of species would you expect to have largest difference in spin magnetic moment:
(A) O_2, O_2^+ (B) O_2,O_2^{2-} (C) O_2^+, O_2^{2-} (D) O_2^-, O_2^+

2. According to Molecular orbital theory, HOMO in O_2^- is :
(A) $\pi\, 2p_x = \pi\, 2p_y$ (B) $\pi^* 2p_x = \pi^* 2p_y$ (C) $\sigma\, 2p_z$ (D) $\sigma^* 2p_z$

3. Order of stability of N_2, N_2^+ and N_2^- is :
(A) $N_2 > N_2^+ > N_2^-$ (B) $N_2^+ > N_2 > N_2^-$ (C) $N_2^- > N_2 > N_2^+$ (D) $N_2^- = N_2^+ > N_2$

4. The bond order in NO is 2.5 while that in NO^+ is 3. Which of the following statements is true for these two species :
(A) Bond length comparison is unpredictable. (B) Bond length in NO is greater than in NO^+.
(C) Bond length in NO^+ is equal to that in NO. (D) Bond length in NO^+ is greater than in NO.

5. According to Molecular orbital theory, which of the following statement about the magnetic character and bond order of O_2^+ is correct :
(A) Paramagnetic and bond order less than that of O_2
(B) Paramagnetic and bond order greater than that of O_2.
(C) Diamagnetic and bond order less than that of O_2
(D) Diamagnetic and bond order greater than that of O_2.

6.* Which of the following is/are correct :
(A) Carbon-carbon bond length in CaC_2 will be more than in CH_2CCH_2
(B) O–O bond length in KO_2 will be more than in Na_2O_2.
(C) O–O bond length in $O_2[PtF_6]$ will be less than that in KO_2
(D) N–O bond length in NO gaseous molecule will be smaller than in NOCl gaseous molecule.

7. Of the following species, which has the highest bond order and shortest bond length : NO, NO^+, NO^{2+}, NO^-

8. Explain why NO^+ is more stable towards dissociation than NO, whereas CO^+ is less stable towards dissociation than CO.

INORGANIC CHEMISTRY

DPP
DAILY PRACTICE PROBLEMS

DPP No. 21

Total Marks : 120

Max. Time : 120 min.

Topic : Chemical Bonding

Type of Questions		**M.M., Min.**
Single choice Objective ('–1' negative marking) Q.1 to Q.4	**(3 marks, 3 min.)**	**[12, 12]**
Comprehension ('–1' negative marking) Q.5 to Q.7	**(3 marks, 3 min.)**	**[9, 9]**
Subjective Questions ('–1' negative marking) Q.8	**(4 marks, 5 min.)**	**[4, 5]**

1. Choose the compounds of maximum and minimum ionic character from LiCl, RbCl, $BeCl_2$ and $MgCl_2$:
(A) LiCl and RbCl (B) RbCl and $BeCl_2$ (C) RbCl and $MgCl_2$ (D) $MgCl_2$ and $BeCl_2$

2. An ion without pseudo-inert gas configuration is :
(A) Ag^+ (B) Cd^{2+} (C) Zn^{2+} (D) Fe^{3+}

3. Correct order of increasing solubility in water of RbI, CdI_2 and PbO_2 is :
(A) PbO_2, CdI_2, RbI (B) RbI, CdI_2, PbO_2 (C) CdI_2, PbO_2, RbI (D) PbO_2, RbI, CdI_2

4. AgCl is colourless whereas AgI is yellow, because :
(A) Ag^+ possesses 18 electrons in shell to screen the nuclear charge.
(B) Ag^+ shows pseudo inert gas configuration.
(C) Distortion of I^- is more pronounced than Cl^- ion.
(D) Existence of d-d transition.

Comprehension # (Q.5 to Q.7)

Fajan's Rule

When anions and cation approach each other, the valence shell of anions are pulled towards cation nucleus and thus, shape of anion is deformed. The phenomenon of deformation of anion by a cation is known as polarization and the ability of the cation to polarize the anion is called as polarizing power of cation. Due to polarization, sharing of electrons occurs between two ions to some extent and the bond shows some covalent character.

The magnitude of polarization depends upon a number of factors. These factors were suggested by Fajan and are known as Fajan's rules.

(i) Greater is the polarization in a molecule, more is covalent character.
(ii) As the charge on cation increases, its tendency to polarize the anion increases.
(iii) As the size of the cation decreases or size of the anion increases, the polarization increases.
(iv) The cations with 18 electrons in the outermost shell bring greater polarization of the anion than those with inert gas configuration even if both the cation have same size and same charge.

Many important properties of ionic compounds like solubility, melting point, thermal stability, etc. can be explained on the basis of Fajan's rule.

5. Arrange the following in decreasing order of melting point : $BeCl_2$, $MgCl_2$, $CaCl_2$ and $BaCl_2$
(A) $BeCl_2 > MgCl_2 > CaCl_2 > BaCl_2$ (B) $BaCl_2 > MgCl_2 > CaCl_2 > BeCl_2$
(C) $BeCl_2 > CaCl_2 > MgCl_2 > BaCl_2$ (D) $BaCl_2 > CaCl_2 > MgCl_2 > BeCl_2$

6. Which among the following has maximum covalent character :
(A) NaCl (B) $MgCl_2$ (C) $A\ell Cl_3$ (D) $CaCl_2$

7. Which of the following statements is INCORRECT :
(A) AgI is less soluble in water than AgF due to more polarisation of I^- in comparison to F^- ion.
(B) LiI is less soluble in water than LiF due to more polarisation of I^- in comparison to F^- ion.
(C) Colour of some compounds can also be explained on the basis of polarisation of anion.
(D) The greater covalent character of AgCl as compared to NaCl can be explained on the basis of Fajan's rule.

8. Answer the following question :
(a) Among LiF and LiI, which has more covalent character ?
(b) LiI is soluble in water but LiF is not. Why ?

INORGANIC CHEMISTRY

DPP
DAILY PRACTICE PROBLEMS

DPP No. 22

Total Marks : 31

Max. Time : 35 min.

Topic : Chemical Bonding

Type of Questions		**M.M., Min.**
Single choice Objective ('–1' negative marking) Q.1 to Q.3	**(3 marks, 3 min.)**	**[9, 9]**
Multiple choice objective ('–1' negative marking) Q.4	**(4 marks, 4 min.)**	**[4, 4]**
True or False (no negative marking) Q.5	**(2 marks, 2 min.)**	**[2, 2]**
Subjective Questions ('–1' negative marking) Q.6 to Q.7	**(4 marks, 5 min.)**	**[8, 10]**
Match the Following (no negative marking) Q.8	**(8 marks, 10 min.)**	**[8, 10]**

1. Which of the following molecule is/are non polar :

(A) XeF_2 (B) PCl_3F_2 (C) XeF_4 (D) All of these

2. The dipole moments of the given molecules are such that :

(A) $BF_3 > NF_3 > NH_3$ (B) $NF_3 > BF_3 > NH_3$ (C) $NH_3 > NF_3 > BF_3$ (D) $NH_3 > BF_3 > NF_3$.

3. In which type of molecule, the dipole moment may be non-zero :

(where A – Central atom, B – Bonded atom, L – Lone pair)

(A) AB_2L_2 (B) AB_2L_3 (C) AB_4L_2 (D) AB_4

4.* Which is incorrect order for net dipole moment :

(A) HF > HCl > HBr > HI (B) $CH_3 – F > CD_3 – F$

(C) $SO_3 > SO_2$ (D) $CH_3 – CH = CHCl$ (cis)> $CH_3 – CH = CHCl$ (trans)

5. **True or False**

(a) The dipole moment of HCl molecule is 1.05 D and its internuclear separation is 1.25 Å. The charge effectively held by the chlorine atom is 7/40 times the electronic charge.

(Given : charge of an electron = 4.8×10^{-10} esu)

(b) All the N–N bond lengths are same in azide ion and hydroazoic acid.

6. Arrange in order of increasing dipole moment : BF_3, H_2S, H_2O.

7. The gaseous Potassium chloride molecule has a measured dipole moment of 9.6 D, which indicates that it is a very polar molecule. The separation between the nuclei in this molecule is 2.67×10^{-8} cm. Calculate the percentage ionic character in KCl molecule.

8. **Match the following :**

Column I (Species)		**Column II (Characteristics)**
(A) NH_3	(p)	Non-polar molecule
(B) PF_2Cl_3	(q)	Polar molecule
(C) XeF_2	(r)	Bonding taking place in ground state
(D) H_2S	(s)	Bonding taking place in excited state.

INORGANIC CHEMISTRY

DPP
DAILY PRACTICE PROBLEMS

DPP No. 23

Total Marks : 26

Max. Time : 27 min.

Topic : Chemical Bonding

Type of Questions		M.M., Min.
Single choice Objective ('–1' negative marking) Q.1 to Q.3	(3 marks, 3 min.)	[9, 9]
Multiple choice objective ('–1' negative marking) Q.4	(4 marks, 4 min.)	[4, 4]
Comprehension ('–1' negative marking) Q.5 to Q.7	(3 marks, 3 min.)	[9, 9]
Subjective Questions ('–1' negative marking) Q.8	(4 marks, 5 min.)	[4, 5]

1. The order of strength of hydrogen bond is :
(A) Cl–H....Cl > N–H....N > O–H....O > F–H....F
(B) N–H....N > Cl–H....Cl > O–H....O > F–H....F
(C) O–H....O > N–H....N > Cl–H....Cl > F–H....F
(D) F–H....F > O–H....O > N–H....N > Cl–H....Cl

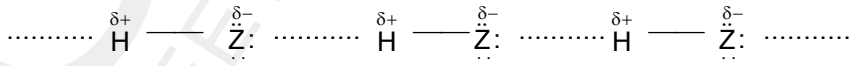
2. Which one among the following does not have hydrogen bonds :
(A) boric acid (solid) (B) N_2H_4 (liquid)
(C) H_2O_2 (liquid) (D) C_6H_6 (liquid)

3. When two ice cubes are pressed over each other, they unite to form one cube. Which of the following force is responsible for holding them together :
(A) Vander Waal's forces (B) Hydrogen bond
(C) Covalent attraction (D) Dipole-dipole attraction.

4.* Correct order of boiling point is/are :
(A) $CH_3 — O — CH_3 < CH_3 — CH_2 — OH$ (B) $F_2 < Cl_2 < Br_2 < I_2$
(C) HF < HCl < HBr < HI (D) $NH_3 > PH_3 > AsH_3$

Comprehension # (Q.5 to Q.7)

When a H-atom is bonded to a highly electronegative atom with lone pair of electron (say, Z) by a covalent bond, the bond pair of electrons is displaced towards the electronegative atom. When solitary electron of hydrogen atom lies away from it, its nucleus gets exposed and behaves as a bare proton. Such a bare hydrogen nucleus exerts a strong electrostatic attraction on the electronegative atom of the adjacent molecule. This interaction



between hydrogen atom of one molecule and the electronegative atom of the other molecules is referred to as hydrogen bond.
Larger the electronegativity of the other atom, greater is the strength of hydrogen bond. For example, electronegativities of F, O and N decrease as F > O > N consequently, strengths of H-bonds decreases. If the size of electronegative atom is large, its attractive force with hydrogen atom will be less and consequently, strength of H–bond will be less. Strength of H-bond increases with the increase in availability of lone pair of electron on the electronegative element. The order of the availability of lone pair of electron is N > O > F.
The presence of two hydrogen atoms and two lone pair of electrons in each water molecule results in a three dimensional tetrahedral cage like structure. This accounts for the fact that ice is less dense than water at 0°C. If temperature is increased hydrogen bond starts breaking and molecule come closer. Which increases the density but after 4°C density of water decreases with increase in temperature due to normal thermal expansion.

5. Which of the following substances does not form H-bond with water :

(A) CH_3CH_2OH (B) $CH_3-\overset{\overset{O}{\|}}{C}-OH$ (C) $CH_3-CH_2-CH_3$ (D) $CH_3-\overset{\overset{O}{\|}}{C}-NH_2$

6. Which of the above statement is true :

I. When ice is melted, hydrogen bond starts breaking & molecule of water come closer by moving into vacant space. As a result, density of water decreases upto 4°C.

II. Due to open cage like structure, ice has a relatively large volume for a given mass of liquid water.

III. In ice, there are four water molecules attached tetrahedrally.

(A) I, II and III (B) I and III (C) II and III (D) II only

7. Which of the following conditions is required for the formation of hydrogen bond :

(A) Hydrogen atom should be bonded to a highly electronegative atom.

(B) The size of electronegative atom should be small.

(C) There should be a lone pair of electron on the electronegative atom.

(D) All of the above.

8. State the type of force of attraction existing in the sample of following compounds :

(i) $CH_3 — O — CH_3$ (ii) sugar (iii) ice (iv) CH_3COCH_3

(v) $CH_3 — OH$ (vi) $N(CH_3)_3$ (vii) gold (viii) $CH_3 — NH_2$

(ix) H_2S (x) $Na^+(aq.)$ (xi) CCl_4 (xii) diamond

(xiii) Cl_2 (xiv) NH_4Cl (xv) HCl and Cl_2 (xvi) Ar

INORGANIC CHEMISTRY

DPP
DAILY PRACTICE PROBLEMS

DPP No. 24

Total Marks : 28

Max. Time : 30 min.

Topic : Chemical Bonding

Type of Questions		**M.M., Min.**
Single choice Objective ('–1' negative marking) Q.1 to Q.4	**(3 marks, 3 min.)**	**[12, 12]**
Multiple choice objective ('–1' negative marking) Q.5 to Q.6	**(4 marks, 4 min.)**	**[8, 8]**
Subjective Questions ('–1' negative marking) Q.7 to Q.8	**(4 marks, 5 min.)**	**[8, 10]**

1. Among the following compounds the one that is polar and has central atom with sp^3 hybridisation is
(A) H_2CO_3 (B) SiF_4 (C) BF_3 (D) $HClO_2$

2. Which of the following compounds are electron deficient ?
(A) B_2H_6 (B) BF_4^- (C) $BeCl_2(s)$ (D) Al_2Cl_6

3. Identify incorrect order of bond angles
(A) $Cl_2O > F_2O$ and $F_2O < H_2O$
(B) $AsI_3 > AsBr_3 > AsCl_3$
(C) $NO_2^+ > NO_2^-$
(D) $H_b\hat{B}H_b > H_t\hat{B}H_t$; where H_t is terminal Hydrogen of B_2H_6 and H_b is the bridging Hydrogen of B_2H_6

4. **Statement-1 :** LiCl is predominantly a covalent compound.
Statement-2 : Electronegativity difference between Li and Cl is too small.
(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
(C) Statement-1 is True, Statement-2 is False
(D) Statement-1 is False, Statement-2 is True

5.* The correct set/s of order is/are
(A) $LiCl < BeCl_2 < BCl_3 < CCl_4$ (Covalent character)
(B) $Be(OH)_2 < Mg(OH)_2 < Ca(OH)_2 < Sr(OH)_2 < Ba(OH)_2$ (water solubility)
(C) $XeF_4 < H_2O < NH_3 < BF_3$ (bond angle)
(D) $sp^3 < sp^2 < sp$ (% s–character)

6.* On the basis of MOT which is **<u>correct</u>** :
(A) The bond order for C_2 molecule is two and both bonds are π-bonds
(B) The LUMO in this molecule is $\sigma 2p$ anti bonding type of molecular orbital
(C) The HOMO in this molecule are π type of antibonding molecular orbital containing total 4 electrons
(D) None of the above is correct

7. ICl_3 is an orange colored solid that dimerizes in solid state as I_2Cl_6. Based on VSEPR theory, number of 90 degree Cl – I – Cl bond angles is ..... in the dimeric species.
Neglect any minor deviations from ideal bond angle.

8. Sum of antibonding π electrons (π^* electrons) in species O_2, O_2^- and O_2^{2-} are .

INORGANIC CHEMISTRY

DPP
DAILY PRACTICE PROBLEMS

DPP No. 25

Total Marks : 53

Max. Time : 56 min.

Topic : s-block Elements

Type of Questions		M.M., Min.
Single choice Objective ('–1' negative marking) Q.1 to Q.11	(3 marks, 3 min.)	[33, 33]
Subjective Questions ('–1' negative marking) Q.12 to Q.14	(4 marks, 5 min.)	[12, 15]
True or False (no negative marking) Q.16	(2 marks, 2 min.)	[2, 2]
Short Subjective Questions ('–1' negative marking) Q.17	(3 marks, 3 min.)	[3, 3]
Assertion and Reason (no negative marking) Q.18	(3 marks, 3 min.)	[3, 3]

1. Sodium and potassium react with water much more vigorously than lithium because :
(A) sodium and potassium have high values of hydration energy as compared to that of lithium.
(B) sodium and potassium have higher melting point than that of lithium.
(C) sodium and potassium have lower melting point than that of lithium.
(D) sodium and potassium have lower hydration energy than that of lithium.

2. Which of the following statements is not true about the dilute solutions of alkali metals in liquid ammonia ?
(A) They are deep blue coloured solutions.
(B) They are highly conducting in nature.
(C) They are diamagnetic in nature.
(D) Ammoniated cation and solvated electron are formed in the solution.

3. The following compounds have been arranged in order of their increasing thermal stabilities. Identify the correct order. K_2CO_3 (I), $MgCO_3$ (II), $CaCO_3$ (III), $BeCO_3$(IV)
(A) I < II < III < IV (B) IV < II < III < I
(C) IV < II < I < III (D) II < IV < III < I.

4. Identify the correct statement :
(A) Sodium metal can be prepared by the electrolysis of an aqueous solution of NaCl.
(B) Sodium metal can be kept under ethyl alcohol.
(C) Sodium metal is insoluble in liquid NH_3 at low temperature.
(D) Elemental sodium is easily oxidised.

5. Which of the following statements are true about the alkali metals ?
(1) All alkali-metal salts impart a characteristic colour to the Bunsen flame.
(2) The correct order of increasing thermal stability of the carbonates of alkali metals is $Li_2CO_3 < Na_2CO_3 < K_2CO_3 < Rb_2CO_3 < Cs_2CO_3$.
(3) Among the alkali metals, cesium is the most reactive.
(4) The reducing character of the alkali metal hydrides follow the order : LiH > NaH > KH > RbH > CsH.
(A) (1), (2) and (3) (B) (1), (3) and (4)
(C) (2), (3) and (4) (D) (1), (2), (3) and (4)

6. **Statement - 1 :** Solubilities of alkali metal fluorides and carbonates increase down the group.
Statement - 2 : Hydration energies of alkali metal halides decrease down the group with increase in size of cations.
(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
(C) Statement-1 is True, Statement-2 is False
(D) Statement-1 is False, Statement-2 is True

7. The melting point of lithium (180°C) is almost double the melting point of sodium (97°C) because :
(A) down the group, the hydration energy decreases
(B) down the group, the ionization energy decreases
(C) down the group, the cohesive energy decreases
(D) none of these

8. Which of the following statement (s) is/are true for the solutions of alkali metals and alkaline earth metals in ammonia (ℓ) ?
(A) Concentrated solutions of alkali metals in ammonia are copper - bronzed coloured and have a metallic lusture.
(B) Dilute solutions of alkaline earth metals are deep bule-black in colour due to the spectrum from the solvated electron.
(C) Concentrated solutions of the alkaline earth metals in ammonia are bronze coloured.
(D) Evaporation of the ammonia from solutions of alkali metals yields the metal, but with alkaline earth metals evaporation of ammonia gives hexammoniates of the metals.

9. **STATEMENT-1 :** Lithium is the most powerful reducing agent and sodium is the least powerful reducing agent amongst the alkali metals in aqueous solutions.
STATEMENT-2 : Lithium has the highest hydration enthalpy and the sodium the least value.
(A) Statement-1 is True, Statement-2 is True; Statement-2 is a correct explanation for Statement-1.
(B) Statement-1 is True, Statement-2 is True; Statement-2 is NOT a correct explanation for Statement-1
(C) Statement-1 is True, Statement-2 is False
(D) Statement-1 is False, Statement-2 is True

10. Which of the following statements is incorrrect ?
(A) The superoxide ion (i.e. O_2^-) is stable only in presence of larger cations such as K^+, Rb^+, Cs^+.
(B) Alkali metals are normally kept in kerosene oil.
(C) All the alkali metal hydrides are ionic solids with high melting points.
(D) The concentrated solution of alkali metals in liquid ammonia is paramagnetic in nature.

11. Property of the alkaline earth metals that increases with their atomic number is :
(A) Ionisation energy (B) solubility of their hydroxides
(C) solubility of their sulphates (D) Electronegativity

12. Why is sodium chloride added during electrolysis of fused anhydrous magnesium chloride ?

13. Explain the difference in the nature of bonding in LiF and LiI.

14. Arrange the following sulphates of alkaline earth metals in order of decreasing thermal stability :
$BeSO_4$, $MgSO_4$, $CaSO_4$, $SrSO_4$

15. Fill in the blanks :
(i) Ca^{2+} has a smaller ionic radius than K^+ because it has .....
(ii) A solution of sodium in liquid ammonia at – 33ºC conducts electricity. On cooling, the conductivity of this solution .....

16. **True/False :**
(a) The softness of group I metals increases down the group with increasing atomic number.
(b) Sodium when burnt in excess of oxygen mainly gives sodium monoxide.

17. Calcium is obtained by :
(A) electrolysis of molten $CaCl_2$ (B) electrolysis of solution of $CaCl_2$ in water
(C) chemical reduction of $CaCl_2$ (D) roasting of lime stone.

18. Read the following statement and explanation and answer as per the options given below :
Statement : The alkali metals can form ionic hydrides which contain the hydride ion H^-.
Explanation : The alkali metals have low electronegativity; their hydrides conduct electricity when fused and on electrolysis liberate hydrogen at the anode.
(A) Both S and E are true and E is the correct explanation of S.
(B) Both S and E are true but E is not correct explanation of S.
(C) S is true but E is false.
(D) S is false but E is true.

INORGANIC CHEMISTRY

DPP

DAILY PRACTICE PROBLEMS

DPP No. 26

Total Marks : 67

Max. Time : 75 min.

Topic : s-block Elements

Type of Questions		M.M., Min.
Single choice Objective ('–1' negative marking) Q.1,2,4, 5,6,8 to 10, 12	(3 marks, 3 min.)	[27, 27]
Fill in the Blanks ('–1' negative marking) Q.3, Q.7,	(3 marks, 3 min.)	[6, 6]
True or False (no negative marking) Q.11	(2 marks, 2 min.)	[2, 2]
Match the Following (no negative marking) Q. 13	(8 marks, 10 min.)	[8, 10]
Subjective Questions ('–1' negative marking) Q.14 to Q.19	(4 marks, 5 min.)	[24, 30]

1. Which of the following statements is true for all the alkali metals ?
(A) Their nitrates decompose on heating to give the corresponding nitrites and oxygen.
(B) Their chlorides are deliquescent and crystallise as hydrates.
(C) They react with water to form hydroxide and hydrogen.
(D) They readily react with halogens to form ionic halides, M^+X^-.

2. Which of the following gives propyne on hydrolysis ?
(A) Al_4C_3 (B) Mg_2C_3 (C) B_4C (D) La_4C_3

3. **COMPLETE THE FOLLOWING REACTIONS :**

(i) $Na_2S + Na_2O_2 \longrightarrow$ (ii) $Na + O_2(excess) \xrightarrow{350^\circ C}$

(iii) $Na_2O_2 + CO \longrightarrow$; $Na_2O_2 + CO_2 \longrightarrow$ (iv) $Cr(OH)_3 + Na_2O_2 \longrightarrow$

(v) $MnSO_4 + Na_2O_2 \longrightarrow$ (vi) $Na_2O + NH_3 \longrightarrow$

(vii) $Na_2O_2 + H_2O \xrightarrow{Cold}$

4. Which of the following has the highest solubility in water ?
(A) LiOH (B) KOH (C) CsOH (D) RbOH

5. Which of the following compounds on thermal decomposition yields a basic as well as an acidic oxide ?
(A) $KClO_3$ (B) $NaNO_3$ (C) K_2CO_3 (D) $MgCO_3$

6. Which of the following reactions of potassium superoxide supply oxygen gas in the breathing equipments used in space and submarines ?
(1) reaction of superoxide with nitrogen in the exhaled air
(2) reaction of superoxide with moisture in the exhaled air
(3) reaction of superoxide with carbon dioxide in the exhaled air
(A) (1), (2) and (3) (B) (2) and (3) only (C) (2) only (D) (1) and (2) only

7. **COMPLETE THE FOLLOWING REACTIONS :**

(i) $NaOH + NO_2 \longrightarrow$; $NaOH + SO_3 \longrightarrow$

(ii) $NaOH$ (hot & conc.) $+ Br_2 \longrightarrow$; $NaOH$ (hot & conc.) $+ F_2 \longrightarrow$

(iii) $NaOH + S \longrightarrow$ **(iv)** $B + NaOH \longrightarrow$ **(v)** $NaOH + Si + H_2O \longrightarrow$

(vi) Reaction of NaOH with amphoteric oxides :
$PbO + NaOH \longrightarrow$; $PbO_2 + NaOH \longrightarrow$

(vii) Reaction of NaOH with amphoteric metals (e.g. Al, Pb, Sn, Zn etc.) :
$NaOH + H_2O + Al \longrightarrow$

(viii) Reaction of NaOH with salts of Cr, Ni, Fe, Mn, Cu etc., :
$CrCl_3 + NaOH \longrightarrow$; $CuCl_2 + NaOH \longrightarrow$

(ix) Reaction of NaOH with salts of Hg and Ag :
$HgCl_2 + NaOH \longrightarrow$; $Hg(OH)_2 \longrightarrow$
$AgNO_3 + NaOH \longrightarrow$; $AgOH \longrightarrow$

(x) $NaOH + CO \xrightarrow[5-10\,atm]{150-200^\circ C}$

8. A substance absorbs CO_2 and violently reacts with water. The substance is :
(A) $CaCO_3$ (B) CaO (C) H_2SO_4 (D) ZnO

9. HCl is added to following oxides. Which one would give H_2O_2?
(A) MnO_2 (B) PbO_2 (C) $BaO_2.8H_2O$ (D) NO_2

10. The pair of compounds which cannot exist together in solution is :
(A) $NaHCO_3$ and NaOH (B) Na_2CO_3 and $NaHCO_3$
(C) Na_2CO_3 and NaOH (D) $NaHCO_3$ and NaCl

11. **S_1 :** Plaster of paris is a hemihydrate of calcium sulphate obtained by heating the gypsum above 393 K.
S_2 : Sodium carbonate is used in water softening.
S_3 : The order of mobilities of the alkali metal ions in aqueous solutions is $Li^+ > Na^+ > K^+ > Rb^+ > Cs^+$.
(A) T T F (B) T T T (C) F T F (D) F F F

12. Chemical A is used for water softening to remove temporary hardness. A reacts with Na_2CO_3 to generate caustic soda. When CO_2 is bubbled through A, it turns cloudly. What is the chemical formula of A?
(A) $CaCO_3$ (B) CaO (C) $Ca(OH)_2$ (D) $Ca(HCO_3)_2$

13.

Column I	**Column II**
(A) $Na_2SO_4 + C + CaCO_3 \xrightarrow{\Delta}$	(P) One of the products has sp^2 hybridisation of central atom.
(B) $NaCl + NH_4HCO_3 \longrightarrow$	(Q) One of the products has sp^3 hybridisation of central atom:
(C) $Na_2CO_3 + Ca(OH)_2 \longrightarrow$	(R) One of the products is insoluble as precipitate.
(D) KOH + NO (2 : 4 by mole ratio)	(S) One of the products is a neutral oxide.

14. When gas (A) is passed through dry KOH at low temperature, a deep red coloured compound (B) and a gas (C) are obtained. The gas (A) on reaction with but–2-ene followed by treatment with Zn/H_2O yields acetaldehyde. Identify (A), (B) and (C).

15. Write down the balanced equation for the reaction when :
Carbon dioxide is passed through a suspension of lime stone in water.

16. Give reasons for the following :
Magnesium oxide is used for the lining of steel making furnace.

17. Work out the following using chemical equations :
Chlorination of calcium hydroxide produces bleaching powder.

18. Complete and balance the following reaction :
$Ca_5(PO_4)_3\,F + H_2SO_4 + H_2O \xrightarrow{Heat}$ ..... + $5CaSO_4.2H_2O$ +.....

19. When zeolite, which is hydrated sodium aluminium silicate, is treated with hard water, the sodium ions are exchanged with
(A) H^+ ions (B) Ca^{2+} ions (C) SO_4^{2-} ions (D) Mg^{2+} ions (E) OH^- ions

INORGANIC CHEMISTRY

DPP

DAILY PRACTICE PROBLEMS

DPP No. 27

Total Marks : 59

Max. Time : 61 min.

Topic : p-Block Element (Boron & Carbon Family)

Type of Questions		**M.M., Min.**
Single choice Objective ('–1' negative marking) Q.1 to 3, 5 to 12, 14 to 17	**(3 marks, 3 min.)**	**[45, 45]**
Multiple choice objective ('–1' negative marking) Q.4	**(4 marks, 4 min.)**	**[4, 4]**
Match the Following (no negative marking) Q. 13	**(8 marks, 10 min.)**	**[8, 10]**
True or False (no negative marking) Q.18	**(2 marks, 2 min.)**	**[2, 2]**

1. Statement-1 : $T\ell^{3+}$ acts as an oxidising agent.

Statement-2 : $T\ell^{+}$ is more stable than $T\ell^{3+}$ due to inert pair effect.

(A) Statement : 1 is True, Statement-2 is True ; Statement -2 is a correct explanation for Statement-1

(B) Statement-1 is True, Statment-2 is True ; Statement-2 is NOT a correct explanation for Statement-1

(C) Statement-1 is True, Statement-2 is False

(D) Statement-1 is False, Statement-2 is True

2. How many (maximum) of the 8 atoms of B_2H_6 can be taken in a plane :

(A) 4 (B) 6 (C) 8 (D) None of these

3. The number of possible isomers for disubstituted borazine, $B_3N_3H_4X_2$ is :

(A) 3 (B) 4 (C) 6 (D) 2

4.* Which species exist :

(A) $[BF_6]^{3-}$ (B) $[AlF_6]^{3-}$ (C) $[GaF_6]^{3-}$ (D) $[InF_6]^{3-}$

5. Which of the following is only acidic in nature :

(A) $Be(OH)_2$ (B) $Mg(OH)_2$ (C) $B(OH)_3$ (D) $Al(OH)_3$

6. In the following reaction : $B(OH)_3 + H_2O \rightarrow [B(OH)_4]^- + H^+$:

(A) $B(OH)_3$ is a Lewis acid. (B) $B(OH)_3$ is a Lewis base.

(C) $B(OH)_3$ is amphoteric. (D) none is correct.

7. On the addition of mineral acid to an aqueous solution of borax, the compound formed is :

(A) borodihydride (B) orthoboric acid (C) metaboric acid (D) pyroboric acid

8. Aqueous solution containing 1 mole of borax reacts with 2 mole of acid. This is because of :

(A) formation of 2 mole of $B(OH)_3$ only.

(B) formation of 2 mole of $[B(OH)_4]^-$ only.

(C) formation of 1 mole each of $B(OH)_3$ and $[B(OH)_4]^-$.

(D) formation of 2 mole each of $[B(OH)_4]^-$ and $B(OH)_3$, of which only $[B(OH)_4]^-$ reacts with acid.

9. Pick up the wrong statement :

(A) Borax is used in the manufacture of optical glasses. (B) Borax is used as a flux.

(C) Borax is used as a water softener. (D) Borax is used as a fuel in rockets.

10. Which of the following statement is correct for diborane :

(A) Small amines like NH_3, CH_3NH_2 give unsymmetrical cleavage of diborane.

(B) Large amines such as $(CH_3)_3N$ and pyridine gives symmetrical cleavage of diborane.

(C) Small as well as large amines both gives symmetrical cleavage of diborane.

(D) (A) and (B) both

11. From B_2H_6, all the following can be prepared except :

(A) H_3BO_3 (B) $[BH_2(NH_3)_2]^+[BH_4]^-$ (C) $B_2(CH_3)_6$ (D) $NaBH_4$

12. The product obtained in the reaction of diborane with excess of ammonia at low temperature is :

(A) $B_2H_6.NH_3$ (B) $B_2H_6.2NH_3$ (C) $(BN)_x$ (D) Borazine

13. Match the reactions listed in column-**I** with the product(s) listed in column-**II** :

	Column – I		**Column – II**
(A)	$B_2O_3 + H_2O$	(p)	H_3BO_3
(B)	$B_2H_6 + H_2O$	(q)	H_2
(C)	$B_3N_3H_6 + H_2O$	(r)	HCl
(D)	$BCl_3 + H_2O$	(s)	NH_3
		(t)	N_2

14. Aluminium does not react with :

(A) NaOH (B) conc. HCl (C) N_2 (D) conc. HNO_3

15. Aluminium vessels should not be washed with materials containing washing soda because :

(A) washing soda is expensive.

(B) washing soda is easily decomposed.

(C) washing soda reacts with aluminium to form soluble aluminate.

(D) washing soda reacts with aluminium to form insoluble aluminium oxide.

16. **Statement-1 :** Al $(OH)_3$ is amphoteric in nature.

Statement-2 : Al–O and O–H bonds can be broken with equal ease in $Al(OH)_3$.

(A) Statement : 1 is True, Statement-2 is True ; Statement -2 is a correct explanation for Statement-1

(B) Statement-1 is True, Statment-2 is True ; Statement-2 is NOT a correct explanation for Statement-1

(C) Statement-1 is True, Statement-2 is False

(D) Statement-1 is False, Statement-2 is True

17. Aqueous solution of potash alum is :

(A) alkalline (B) acidic (C) neutral (D) soapy

18. **True / False**

(i) Ethyl borate, $B(OC_2H_5)_3$ burns with green edged flame.

(ii) In sodium peroxoborate, each boron is sp^3 hybridised.

(iii) H_3BO_3 does not dissolve in aqueous HF.

(iv) The basic nature of the hydroxides of Group 13 decreases progressively down the group.

(v) Elemental Boron cannot be obtained from Van Arkel method.

INORGANIC CHEMISTRY

DPP

DAILY PRACTICE PROBLEMS

DPP No. 28

Total Marks : 62

Max. Time : 67 min.

Topic : p-Block Element (Boron & Carbon Family)

Type of Questions		M.M., Min.
Single choice Objective ('–1' negative marking) Q.1 to 7, 9 to 12	(3 marks, 3 min.)	[33, 33]
Subjective Questions ('–1' negative marking) Q.13 to Q.15	(4 marks, 5 min.)	[12, 15]
Multiple choice objective ('–1' negative marking) Q.8	(4 marks, 4 min.)	[4, 4]
Match the Following (no negative marking) Q. 16	(8 marks, 10 min.)	[8, 10]
Fill in the Blanks ('–1' negative marking) Q.17	(3 marks, 3 min.)	[3, 3]
True or False (no negative marking) Q.18	(2 marks, 2 min.)	[2, 2]

1. Diamond and graphite are :
(A) isomers (B) isotopes (C) allotropes (D) none of the above

2. Thermodynamically, the most stable form of carbon is :
(A) diamond (B) graphite (C) fullerenes (D) coal

3. Moderate electrical conductivity is shown by :
(A) silica (B) graphite (C) diamond (D) carborundum

4. The oxide which is not a reducing agent is :
(A) CO_2 (B) CO (C) SO_2 (D) Both (A) & (C)

5. Which one of the following oxides is neutral :
(A) CO (B) SnO_2 (C) ZnO (D) SiO_2

6. A colourless gas which burns with blue flame and reduces CuO to Cu is :
(A) N_2 (B) CO (C) CO_2 (D) NO_2

7. An oxide of carbon (X) reacts with ammonia to produce urea, an important fertilizer. Which of the following combinations will not yield (X) :

(A) $CO_3^{2-} + HCl \xrightarrow{\Delta}$ (B) $CaO + C \xrightarrow{\Delta}$

(C) $C + \text{Excess } O_2 \xrightarrow{\Delta}$ (D) $HCO_3^- + HCl \xrightarrow{\Delta}$

8.* The compounds used as refrigerant are :
(A) NH_3 (B) CCl_4 (C) CF_4 (D) CF_2Cl_2 (E) CH_2F_2

9. The material used in the solar cells contains :
(A) Cs (B) Si (C) Sn (D) Ti

10. The butter of tin is represented by :
(A) $SnCl_2 . 5H_2O$ (B) $SnCl_2$ (C) $SnCl_4$ (D) $SnCl_4 . 5H_2O$

11. When PbO_2 reacts with concentrated HNO_3, the gas evolved is :
(A) NO_2 (B) O_2 (C) N_2 (D) N_2O

12. Red lead is :
(A) PbO (B) PbO_2 (C) Pb_3O_4 (D) Pb_2O_3

13. Give reasons for the following :
Carbon acts as an abrasive and also as a lubricant.

14. Draw the structure of a cyclic silicate, $(Si_3O_9)^{6-}$ with proper labelling.

15. What happens when Pb_3O_4 is treated with nitric acid ?

16.

Column – I	Column – II
(A) Cyclic silicates	(p) Tetrahedral hybridisation.
(B) Single chain silicates	(q) Si – O bonds are 50% ionic and 50% covalent.
(C) Pyro silicates	(r) General formula is $(SiO_3)_n^{2n-}$
(D) Sheet silicates (two dimensional)	(s) Two oxygen atoms per tetrahedron are shared.

17. Fill in the blanks :

(i) One recently discovered allotrope of carbon (e.g., C_{60}) is commonly known as.....

(ii) A liquid which is permanently supercooled is frequently called a.....

(iii) Compounds that formally contain Pb^{4+} are easily reduced to Pb^{2+}. The stability of the lower oxidation state is due to.....

(iv) Hydrogen gas is liberated by the action of aluminium with concentrated solution of.....

(v) The formula of litharge is _____ and that of red lead is _____ & both are used as _____ in paints.

(vi) Carbon monoxide is absorbed in a solution of _____ under pressure, while carbon dioxide is absorbed in a solution of ————.

(vii) In drinking soda, _____ gas is present under high pressure in water.

(viii) Glass is attacked by _____ acid.

(ix) Solid form of carbon dioxide is known as _____.

(x) Carbon monoxide combines with chlorine in the presence of sunlight to produce _____.

(xi). A mixture of _____ and CO_2 is obtained when oxalic acid is heated with concentrated H_2SO_4 .

18. True/False

(i) When PbO_2 reacts with a dilute acid, it gives hydrogen peroxide.

(ii) Graphite is better lubricant on the moon than on the earth.

(iii) The tendency for catenation is much higher for C, than for Si.

(iv) Aqueous solution of $AlCl_3$ is acidic due to hydrolysis.

(v) CO_2 can be prepared by dehydration of formic acid.

(vi) Carbon suboxide (C_3O_2) is produced by the reaction of P_4O_{10} with malonic acid.

(vii) Carbon monoxide reduces I_2O_5 to I_2.

(viii) Graphite is less denser than diamond

(ix) Silicones are strongly water repellent.

(x). Silicones are synthetic organosilicon compounds having repeated R_2SiO units held by Si-Si linkages.

ANSWER KEY
INORGANIC CHEMISTRY

INORGANIC CHEMISTRY

DPP No. # 1

1. (A) **2.** (B) **3.** (A) **4.** (D)

5.* (ABCD) **6.*** (ABC) **7.** **(a).** (B) **(b).** (C) **(c).** (B)

8. 3

DPP No. # 2

1. (C) **2.** (C) **3.** (C) **4.** (C)

5.* (A,B,C) **6.*** (A,D) **7.** **(a).** (A) **(b).** (A) **(c).** (C)

8. (a) $Li^+ < Na^+ < K^+$ (b) $Mg^{2+} < Mg^+ < Mg$ (c) $F^- < O^{2-} < N^{3-}$ (d) $O < O^- < O^{2-}$
(e) $Mg^{2+} < Ca^{2+}$ (f) $N^{3-} < P^{3-}$ (g) $Ca^{2+} < K^+$ (h) $I^+ < I^-$

DPP No. # 3

1. (A) **2.** (C) **3.** (C) **4.** (B)

5.* (A,B,C,D) **6.*** (B,C) **7.** **(a).** (D) **(b).** (C) **(c).** (B)

8. (a) $_{9}F$ (b) $_{36}Kr$ (c) $_{12}Mg$

DPP No. # 4

1. (C) **2.** (C) **3.** (A) **4.** (A) **5.** (C)

6. (A) **7.*** (A,B,D) **8.** $d_{C-O} < d_{N-O}$

DPP No. # 5

1. (i) Sodium meta aluminate (ii) Sodium metaborate (iii) Potassium pyrophosphate (iv) Sodium zincate
(v) Mercurous metaborate (vi) Potassium dichromate
(vii) Sodium dihydrogen phosphate (ortho) (viii) Sodium monohydrogen phosphate (ortho)
(ix) Sodium phosphate (ortho) (x) Calcium dihydrogen phosphate (ortho) (xi) Calcium monohydrogen phosphate (ortho) (xii) Calcium phosphate (ortho) (xiii) Magneisum chlorate (xiv) Sodium hypobromite
(xv) Calcium chlorite (xvi) Cupric plumbite
(xvii) Potassium chlorate (xviii) Ammonium molybdate
(xix) Barium chromate (xx) Sodium stannate
(xxi) Ferrous tungstate (xxii) Potassium manganate
(xxiii) Potassium hypophosphite

2. (i) $Mg_3(PO_4)_2$ (ii) $Ca(NO_2)_2$ (iii) $Ca(BO_2)_2$ (iv) $FePO_4$ (v) $Ca(ClO)_2$ (vi) PO_3^-
(vii) $(NH_4)_4Sb_2O_7$ (viii) As_2O_3 (ix) $Na_2S_2O_7$ (x) $KClO_4$ (xi) Ag_2SO_3
(xii) Ag_3AsO_3 (xiii) $PbCr_2O_7$ (xiv) $Zn(NO_3)_2$ (xv) Ag_2PbO_3 (xvi) $NaNH_4HPO_4$

3. Carbonate : CO_3^{2-} ; Sulphite : SO_3^{2-} ; Sulphide : S^{2-}
Nitrite : NO_2^- ; Acetate : CH_3COO^- ; Chloride : Cl^-
Brominde : Br^- ; Iodide : I^- ; Nitrate : NO_3^-
Oxalate : $C_2O_4^{2-}$; Orthoborate : BO_3^{3-} ; (ortho) Phosphate : PO_4^{3-}
Sulphate : SO_4^{2-}

4. $MgHPO_4 \longrightarrow Mg_2P_2O_7 + H_2O$

5. CuBr and Br_2, Cupric bromide , Cuprous bromide.

6. $MgCO_3$, Magnesium carbonate.

7. (A) : As/Sb ; (B) : Na_3As/Na_3Sb ; (C) : $AsCl_3/SbCl_3$; (D) : $AsCl_5/SbCl_5$

8. (a) $SOCl_2$ (b) XeO_2F_2, $XeOF_4$ (c) SO_2F_2, SOF_4 (d) VO_2Cl,$VOCl_3$ (e) NOCl

DPP No. # 6

1. (a) Calcium phosphide (b) Barium cyanide (c) Sodium sulphide
(d) Chlorine trifluoride (e) Sulphur tetrafluoride (f) Cobalt (II) metaborate
(g) Scandium pyrosilicate (h) Sodium pyrosulphate (i) Barium nitrate
(j) Sodium metasilicate (k) Sodium pyrophosphite (l) Aluminium sulphate

2. (a) SF_6 (b) Li_3N (c) $SrCl_2$ (d) O_2F_2 (e) $Ba(N_3)_2$ (f) $Ba(ClO_4)_2$
(g) NaOCl (h) $Ca_3(PO_4)_2$ (i) $Mg_2P_2O_7$ (j) $Cu(BO_2)_2$ (k) $Na_2S_2O_5$ (l) $Fe(NO_3)_3$

3. (a) Ortho boric acid (b) Ortho silicic acid (c) Chromic acid
(d) Perxenic acid (e) Phosphorus acid (f) Metaphosphoric acid
(g) Sulphurous acid (h) Dithionous acid (i) Thiosulphuric acid
(j) Peroxymonosulphuric acid (k) Chloric acid (l) Hyponitrous acid
(m) Hydrobromic acid (n) Hydrazoic acid

4. (a) H_2CO_3 (b) $H_6Si_2O_7$ (c) HBO_2 (d) H_2MnO_4 (e) H_2XeO_4 (f) H_3PO_2
(g) H_3PO_4 (h) $H_2S_2O_5$ (i) $H_2S_2O_6$ (j) $HClO_2$ (k) HNO_2 (l) HNO_4
(m) HI (n) HCN

DPP No. # 7

1. (A) **2.** (C) **3.** (C) **4.** (B) **5.** (D)

6.* (A,B,C,D) **7.*** (A,B)

8. A = 3.84 ; B = 3.08 Therefore A has higher electronegativity.

DPP No. # 8

1. (A) **2.** (B) **3.** (B) **4.** (D) **5.** (D)

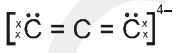
6. (B) **7.** (B) **8.** (i) four (ii) three covalent and one coordinate.

DPP No. # 9

1. (C) **2.** (B) **3.** (A) **4.** (B) **5.** (B)

6.* (A,B,C)

7. (a) All zero
(b) All have zero except single bonded oxygen (–1)
(c) All have zero except nitrogen (+1)
(d) Both single bonded O-atoms have (–1), N-atom has (+1) and double bonded O-atom has zero.

8. 

DPP No. # 10

1. (B) **2.** (B) **3.** (C) **4.** (A) **5.** (A)

6. (B) **7.*** (ABD) **8.*** (BD)

DPP No. # 11

1. (A) **2.** (D) **3.** (B) **4.** (A) **5.** (B)

6.* (ABD) **7.** 5 **8.** (A – t) ; (B – s) ; (C – p) ; (D – r).

DPP No. # 12

1. (A) **2.** (A) **3.** (D) **4.** (A) **5.** (A)

6. (B) **7.*** (ABCD)

DPP No. # 13

1. (A) **2.** (A) **3.** (D). **4.** (D) **5.** (A)

6.* (ABC) **7.*** (ACD) **8.** (a-ii) (b-iii) (c- iv) (d-v) (e-vi) (f-i).

DPP No. # 14

1. (D) 2. (C) 3. (B) 4. (B) 5.* (AD)
6.* (AC) 7. (A – p, B – q, C – p, D – s) 8. **228 pm , 536 pm**

DPP No. # 15

1. (A) 2. (A) 3. (A) 4. (B) 5. (B)
6.* (ABD) 7.* (BCD)
8. (a) $F_2O < H_2O$ (b) $NH_3 > PH_3$ (c) $SO_2 < SO_3$ (d) $NO_2^+ > NO_2^-$

DPP No. # 16

1. (C) 2. (C) 3. (D) 4. (D) 5. (B)
6. (B) 7. (A) 8.* (BC)

DPP No. # 17

1. (C) 2. (C) 3. (A) 4. (C) 5. (B)
6. (C) 7. (ABCD) 8. **(i)** sp^2 **(ii)** 4 **(iii)** 3 **(iv)** 6

DPP No. # 18

1. (C) 2. (C) 3. (D) 4. (D) 5. (D)
6. (A)
7. (i) Nitrogen $\rightarrow p\pi - p\pi$ multiple bond (very high bond enthalpy). (ii) In phosphorus their atomic orbitals are so large and diffuse that they cannot have effective over lapping. 8. 8

DPP No. # 19

1. (B) 2. (D) 3. (B) 4.* (A) 5. (A)
6. (C) 7. (B)

DPP No. # 20

1. (B) 2. (B) 3. (A) 4. (B) 5. (B)
6.* (CD) 7. NO^+.
8. NO has lost an antibonding electron to form NO^+. So NO^+ is more stable.
CO has lost a bonding electron to form CO^+. So CO^+ is less stable.

DPP No. # 21

1. (B) 2. (D) 3. (A) 4. (C) 5. (D)
6. (C) 7. (B)
8. (a) Electronegativity difference Li and iodine is less than Li and F. Thus, LiI is more covalent.
(b) Although Li^+ is same in both the compounds yet difference in the size of F^- and I^- is not same. Since F^- is smaller than I^- hence lattice energy of LiF is more than that of LiI. Similarly heat of hydration of F^- is more than that of I^-. But the decrease of L.E. from LiF to LiI is much more than the decrease in heat of hydration from LiF to LiI. Hence solubility increases from LiF to LiI.

DPP No. # 22

1. (D) 2. (C) 3. (A) 4.* (BCD)
5. (a)True (b) False
6. $BF_3 < H_2S < H_2O$. BF_3 has a zero dipole moment because of its symmetry. H_2S has a lower dipole moment than H_2O because of the much lower bond polarity of H–S bond compared to H–O bond.

7. 75%. **8.** (A – q, r) ; (B – p, s) ; (C – p, s) ; (D – q, r).

DPP No. # 23

1. (D) **2.** (D) **3.** (B) **4.*** (AB) **5.** (C)
6. (C) **7.** (D)

8.
(i) dipole-dipole attraction. (ii) H – bonding (iii) H – bonding (iv) dipole-dipole attraction.
(v) H–bonding (vi) dipole-dipole attraction. (vii) metallic bonding (viii) H–bonding.
(ix) dipole-dipole attraction. (x) ion-dipole attraction. (xi) dispersion forces (xii) covalent bond.
(xiii) disperison forces (xiv) ionic bond (xv) dipole - induced dipole attraction.

DPP No. # 24

1. (D) **2.** (A) **3.** (D) **4.** (C)
5.* (ABCD) **6.*** (AB) **7.** 8 **8.** 9

DPP No. # 25

1. (C) **2.** (C) **3.** (B) **4.** (D) **5.** (A)
6. (B) **7.** (C) **8.*** (ABCD) **9.** (C) **10.** (D)
11. (B)

12. The anhydrous magnesium chloride is fused with NaCl to provide conductivity to the electrolyte and to lower the fusion temperature of anhydrous $MgCl_2$.

13. LiF has more ionic character while LiI has more covalent character. The latter is due to the greater polarizability of larger iodide ion than the lithium ion.

14. $SrSO_4 > CaSO_4 > MgSO_4 > BeSO_4$ **15.** **(i)** higher effective nuclear charge **(ii)** decreases

16. **(a)** T **(b)** F **17.** (A) **18.** (A)

DPP No. # 26

1. (C) **2.** (B)

3. (i) $Na_2S + 4Na_2O_2 \longrightarrow Na_2SO_4 + 4Na_2O$. (ii) $2Na + O_2(excess) \xrightarrow{350^\circ C} Na_2O_2$.
(iii) $Na_2O_2 + CO \longrightarrow Na_2CO_3$; $2Na_2O_2 + 2CO_2 \longrightarrow 2Na_2CO_3 + O_2$.
(iv) $2Cr(OH)_3 + 3Na_2O_2 \longrightarrow 2Na_2CrO_4 + 2NaOH + 2H_2O$.
(v) $MnSO_4 + 2Na_2O_2 \longrightarrow Na_2MnO_4 + Na_2SO_4$.
(vi) $Na_2O + NH_3 \longrightarrow NaNH_2 + NaOH$ (vii) $Na_2O_2 + 2H_2O \xrightarrow{Cold} 2NaOH + H_2O_2$.

4. (C) **5.** (D) **6.** (B)

7. (i) $2NaOH + 2NO_2 \longrightarrow NaNO_2 + NaNO_3 + H_2O$; $2NaOH + SO_3 \longrightarrow Na_2SO_4 + H_2O$.
(ii) $6NaOH + 3Br_2 \longrightarrow 5NaBr + NaBrO_3 + 3H_2O$. ; $4NaOH + 2F_2 \longrightarrow 4NaF + O_2 + 2H_2O$.
(iii) $6NaOH + 4S \longrightarrow 2Na_2S + Na_2S_2O_3 + 3H_2O$. (iv) $2B + 6NaOH \longrightarrow 2Na_3BO_3 + 3H_2$
(v) $2NaOH + Si + H_2O \longrightarrow Na_2SiO_3 + 2H_2$.
(vi) $PbO + 2NaOH \longrightarrow Na_2PbO_2 + H_2O$; $PbO_2 + NaOH \longrightarrow Na_2PbO_3 + H_2O$.
(vii) $4NaOH + 2H_2O + 2Al \longrightarrow 2NaAlO_2 + 3H_2$.
(viii) Form insoluble hydroxides.

$CrCl_3 + 3NaOH \longrightarrow Cr(OH)_3\downarrow$ (Green) + 3NaCl. ; $CuCl_2 + 2NaOH \longrightarrow Cu(OH)_2\downarrow$ (blue) + 2NaCl.

(ix) $HgCl_2 + 2NaOH \longrightarrow Hg(OH)_2\downarrow + 2NaCl$; $Hg(OH)_2 \longrightarrow HgO\downarrow$ (yellow or brown) + H_2O.

$2AgNO_3 + 2NaOH \longrightarrow 2AgOH\downarrow + 2NaNO_3$; $2AgOH \longrightarrow Ag_2O\downarrow$ (black) + H_2O.

(x) $NaOH + CO \xrightarrow[5-10\,atm]{150-200^\circ C} HCOONa$.

8. (B) **9.** (C) **10.** (A) **11.** (C) **12.** (C)

13. (A→P,Q,R) ; (B→P,Q,R) ; (C→P,Q) ; (D→P,Q,S) **14.** (A) = O_3, (B) = KO_3, (C) = O_2

15. $CaCO_3 + CO_2 + H_2O \rightarrow Ca(HCO_3)_2$ (calcium bicarbonate).

18. $Ca_5(PO_4)_3F + 5H_2SO_4 + 10H_2O \xrightarrow{\Delta} 3H_3PO_4 + 5CaSO_4.2H_2O + HF$ **19.** (B, D)

DPP No. # 27

1. (A) **2.** (B) **3.** (B) **4.*** (BCD) **5.** (C)

6. (A) **7.** (B) **8.** (D) **9.** (D) **10.** (D)

11. (C) **12.** (B)

13. (A – p) ; (B – p, q) ; (C – p, q, s) ; (D – p, r). **14.** (D) **15.** (C)

16. (A) **17.** (B)

18. **(i)** True **(ii)** True **(iii)** False **(iv)** False **(v)** **False**

DPP No. # 28

1. (C) **2.** (B) **3.** (B) **4.** (A) **5.** (A)

6. (B) **7.** (B) **8.*** (AD) **9.** (B) **10.** (D)

11. (B) **12.** (C)

16.(A → p, q, r, s) ; (B → P , Q , R , S) ; (C → P , Q) ; (D → P , Q)

17. **(i)** Fullerene **(ii)** Glass **(iii)** Inert pair effect.

(iv) NaOH. **(v)** PbO, Pb_3O_4, pigments

(vi) ammonical copper (I) chloride, KOH or NaOH **(vii)** CO_2

(viii) hydrofluoric **(ix)** dry ice

(x) carbonyl chloride (phosgene) **(xi).** carbon monoxide

18. **(i)** False **(ii)** True **(iii)** True **(iv)** True **(v)** False

(vi) True. **(vii)** True **(viii)** True **(ix)** True **(x).** False

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अभ्यास ही सबसे बड़ा गुरू है।

CLASS : XI (INORGANIC CHEMISTRY)

DPP

DAILY PRACTICE PROBLEM

Solutions

DPP-1 to 28

INORGANIC CHEMISTRY

DPP No. # 1

1. On descending a group, the atoms and ions increase in size. On moving from left to right the size decreases. Thus on moving diagonally the size remains nearly the same. They also have nearly same polarising powers on account of nearly same charge to size ratio.

2. $Z = 15 = 1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^3$; so element belongs to p-block. Thus its group number will be 10 + 2 + 3 = 15.
$Z = 33 = 1s^2\ 2s^2\ 2p^6\ 3s^2\ 3p^6\ 3d^{10}\ 4s^2\ 4p^3$; so element belongs to p-block. Thus its group number will be 10 + 2 + 3 = 15.
$Z = 51 = [Kr]^{36}\ 4d^{10}\ 5s^2\ 5p^3$; so element belongs to p-block. Thus its group number will be 10 + 2 + 3 = 15.
Hence, all these elements belongs to 15^{th} group i.e. nitrogen family.

3. $Z = 118\ [Rn]^{86}\ 5f^{14}\ 6d^{10}\ 7s^2\ 7p^6$; as last electron enters in p-subshell, it belongs to p-block. Thus its group number will be 10 + 2 + 6 = 18. Hence the element is a noble gas.

4. When n = 4, the configuration will be$[Ar]^{18}\ 3d^1\ 4s^2$ and thus period is fourth and group no is third.

5.* (A) ns^2np^3, (B) and (C) are correct statements (D) All are non-metals like $\underbrace{F_2, Cl_2}_{\text{gases}}$, $\underbrace{Br_2}_{\text{liquid}}$, $\underbrace{I_2}_{\text{solid}}$

6.* All statements are correct.

7. Na, Mg, Ar

DPP No. # 2

1. Al^{3+}
K^+ has more number of shells than Mg^{2+} and Al^{3+}. Al^{3+} and Mg^{2+} are isoelectronic but Al^{3+} has higher nuclear charge so $Al^{3+} < Mg^{2+}$. Mg^{2+} and Li^+ has diagonal relationship. But due to +2 charge in Mg^{2+}, the Mg^{2+} is smaller than Li^+. Hence Al^{3+} is the smallest one.
K^+ = 1.38 Å, Li^+ = 0.76 Å, Mg^{2+} = 0.72 Å and Al^{3+} = 0.535 Å.

2. On moving along the period ionic radii decreases.

3. Penetration of p-subshell electron is less than s-subshell electrons. In case of Mg, the first electron is to be removed from completely filled $3s^2$ valence shell configuration as compared to partially filled $3p^1$ of Al. These two factors collectively accounts for the higher ionisation energy of Mg than that of Al. Therefor, (C) option is correct.

4. O (oxygen) have half filled outer orbitals.

5.* The number of electrons present are not same in (D) options N^{3-} = 10 electrons, S^{2-} = 18 electrons, Cl^- = 18 electrons. So this group does not represent the isoelectronic species.

6.* IE_1 values in $KJmol^{-1}$ (IE_1 eku $KJmol^{-1}$ esa)
(A) N = 1402 ; O = 1314 ; (B) Be = 899 ; B = 801
(C) Al = 577 ; Ga = 579 ; (D) Cl = 1255 ; F = 1681

7. **(a).** Since I. E_3 >> $I.E_2$ > $I.E_1$ for X.
(b). Since, for Y, IE_2 >> IE_1 and also for Z, IE_2 >> $I.E_1$ ∴ These belongs to 1st group.
(c). Energy required = 118 + 1220 = 1338.

8. (a) $Li^+ < Na^+ < K^+$ (b) $Mg^{2+} < Mg^+ < Mg$
(c) $F^- < O^{2-} < N^{3-}$ (d) $O < O^- < O^{2-}$
(e) $Mg^{2+} < Ca^{2+}$ (f) $N^{3-} < P^{3-}$
(g) $Ca^{2+} < K^+$ (h) $I^+ < I^-$

DPP No. # 3

1. $A \underset{E.A=I.E}{\overset{I.E}{\rightleftharpoons}} A^{\oplus}$

2. $EN = \frac{I.P. + E.A.}{2}$

3. ∵ Here $I.E._4 >> IE_3$ ∴ After removed of $3e^{\ominus}$ element obtain noble gas configuration.

4. Li, B, P, H

6.* Electron affinity is the measure of the ease with which an atom receives the additional electron in its valence shell in gaseous phase.
Generally down the group, the electron affinity decreases due to increase in atomic size.

7. **(a).** Z_{eff} for $S^{2\ominus}$ is least. **(b).** $F \rightarrow 1s^2\ 2s^2\ 2p^5$

8. (a) $_9F$ (b) $_{36}Kr$ (c) $_{12}Mg$

DPP No. # 4

4. % ionic character = $16(X_A - X_B) + 3.5\ (X_A - X_B)^2$
$= 17.235 = 17\%$

5. Down the group non-metalic character decreases & by increase of oxidation number acidic charaeter of oxide increases.

6. As non-metallic character of element attached to oxygen atom increases, the difference between the electronegativity values of element and oxygen decreases and the acid character of oxides increases and vice-versa.

8. As bond polarity ↑, % ionic character ↑, % ionic character = $16(X_A - X_B) + 3.5\ (X_A - X_B)^2$

As bond polarity ↑, Bond Length ↓, $d = r_A + r_B - 0.09\ (X_A - X_B)$

$d_{N-O} \simeq 1.445$ Å
$d_{C-O} \simeq 1.42$ Å

As polarity ↑ B. Str. ↑ B. Length ↓

∴ $d_{C-O} < d_{N-O}$

DPP No. # 5

1. (i) Sodium meta aluminate (ii) Sodium metaborate (iii) Potassium pyrophosphate (iv) Sodium zincate
(v) Mercurous metaborate (vi) Potassium dichromate
(vii) Sodium dihydrogen phosphate (ortho) (viii) Sodium monohydrogen phosphate (ortho)
(ix) Sodium phosphate (ortho) (x) Calcium dihydrogen phosphate (ortho) (xi) Calcium monohydrogen phosphate (ortho) (xii) Calcium phosphate (ortho) (xiii) Magneisum chlorate (xiv) Sodium hypobromite
(xv) Calcium chlorite (xvi) Cupric plumbite
(xvii) Potassium chlorate (xviii) Ammonium molybdate
(xix) Barium chromate (xx) Sodium stannate
(xxi) Ferrous tungstate (xxii) Potassium manganate
(xxiii) Potassium hypophosphite

2. (i) $Mg_3(PO_4)_2$ (ii) $Ca(NO_2)_2$ (iii) $Ca(BO_2)_2$ (iv) $FePO_4$
(v) $Ca(ClO)_2$ (vi) PO_3^- (vii) $(NH_4)_4Sb_2O_7$ (viii) As_2O_3
(ix) $Na_2S_2O_7$ (x) $KClO_4$ (xi) Ag_2SO_3 (xii) Ag_3AsO_3
(xiii) $PbCr_2O_7$ (xiv) $Zn(NO_3)_2$ (xv) Ag_2PbO_3 (xvi) $NaNH_4HPO_4$

3. Carbonate : CO_3^{2-} ; Sulphite : SO_3^{2-} ; Sulphide : S^{2-}
Nitrite : NO_2^- ; Acetate : CH_3COO^- ; Chloride : Cl^-
Brominde : Br^- ; Iodide : I^- ; Nitrate : NO_3^-
Oxalate : $C_2O_4^{2-}$; Orthoborate : BO_3^{3-} ; (ortho) Phosphate : PO_4^{3-} Sulphate : SO_4^{2-}

4. $MgHPO_4 \longrightarrow Mg_2P_2O_7 + H_2O$

5. CuBr and Br_2, Cupric bromide , Cuprous bromide.

6. $MgCO_3$, Magnesium carbonate

7. (A) : As/Sb ; (B) : Na_3As/Na_3Sb ; (C) : $AsCl_3/SbCl_3$; (D) : $AsCl_5/SbCl_5$

8. (a) $SOCl_2$ (b) $XeO_2F_2, XeOF_4$ (c) SO_2F_2, SOF_4 (d) $VO_2Cl, VOCl_3$ (e) NOCl

DPP No. # 6

1. (a) Calcium phosphide (b) Barium cyanide (c) Sodium sulphide

(d) Chlorine trifluoride (e) Sulphur tetrafluoride (f) Cobalt (II) metaborate
(g) Scandium pyrosilicate (h) Sodium pyrosulphate (i) Barium nitrate
(j) Sodium metasilicate (k) Sodium pyrophosphite (l) Aluminium sulphate

2. (a) SF_6 (b) Li_3N (c) $SrCl_2$ (d) O_2F_2 (e) $Ba(N_3)_2$ (f) $Ba(ClO_4)_2$
(g) NaOCl (h) $Ca_3(PO_4)_2$ (i) $Mg_2P_2O_7$ (j) $Cu(BO_2)_2$ (k) $Na_2S_2O_5$ (l) $Fe(NO_3)_3$

3. (a) Ortho boric acid (b) Ortho silicic acid (c) Chromic acid
(d) Perxenic acid (e) Phosphorus acid (f) Metaphosphoric acid
(g) Sulphurous acid (h) Dithionous acid (i) Thiosulphuric acid
(j) Peroxymonosulphuric acid (k) Chloric acid (l) Hyponitrous acid
(m) Hydrobromic acid (n) Hydrazoic acid

4. (a) H_2CO_3 (b) $H_6Si_2O_7$ (c) HBO_2 (d) H_2MnO_4 (e) H_2XeO_4 (f) H_3PO_2
(g) H_3PO_4 (h) $H_2S_2O_5$ (i) $H_2S_2O_6$ (j) $HClO_2$ (k) HNO_2 (l) HNO_4
(m) HI (n) HCN

DPP No. # 7

1. $E_{required} = IE_1 + IE_2 = 24.6 + 13.6\,(2)^2 = 79$ eV
After removal of one electron , He atom follows Bohr model.So, $IE_2 = 13.6\,Z^2$ eV

2. Order of acidic strength : $H_2SiO_3 < H_3PO_4 < H_2SO_4 < HClO_4$
On moving L $\rightarrow$ R in a period, EN $\uparrow$. So, acidic strength increases.

3. $2HNO_3 \longrightarrow N_2O_5 + H_2O$
So, N_2O_5 is the anhydride of HNO_3.

4. (B) $\overset{+7}{Cl_2O_7}$ having higher oxidation state is more acidic than $\overset{+5}{N_2O_5}$ having lower oxidation state.

5. (D) HI > HBr > HCl > HF

6.* (A) $S^-(g) \longrightarrow S^{2-}(g)$; $\Delta H_{e.g.}$ = (+) ve because of electrostatic repulsion.
(B) Ne (g) + e^- (g) $\longrightarrow Ne^-$ (g); $\Delta H_{e.g.}$ = (+) ve because of stable completely filled electron configuration.
(C) N(g) $\longrightarrow N^-$ (g) ; $\Delta H_{e.g.}$ = (+) ve because of stable half filled electron configuration.
(D) $Al^{2+}(g) \longrightarrow Al^{3+}(g)$; $\Delta H_{I.E.}$ = (+) ve because of the removal of electron from cation.

7.* (C) C < N < O< F (Non-metallic character)
(D) Correct order is Li < Na < K < Rb < Cs. The chemical reactivity increases down the group with decreasing ionisation energy. Although Li has highest negative reduction potential but it's reactivity with water is lowest on account of its higher ionisation energy

8. Electronegativity of A = $\frac{400+80}{62.5\times2} = 3.84$

Electronegativity of B = $\frac{300+85}{62.5\times2} = 3.08$

Ans. Electronegativity of A = 3.84 ; electronegativity of B = 3.08. Therefore A has higher electronegativity.

DPP No. # 8

5. C* $\rightarrow$ $1s^2\ 2s^1\ 2p^3$ 4 unpaired electron $\therefore$ 4 bonds
B* $\rightarrow$ $1s^2\ 2s^1\ 2p^2$ 3 unpaired electron $\therefore$ 3 bonds
I* $\rightarrow$ $5s^1\ 5p^3\ 5d^3$ 7 unpaired electron $\therefore$ 7 bonds
P $\rightarrow$ $3s^2\ 3p^3$ 3 unpaired electron $\therefore$ 3 bonds
* represent excited state

8. (i) four (ii) three covalent and one coordinate.

DPP No. # 9

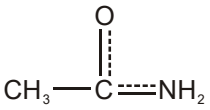
1. N–atom can't form hypervalent compound.

7. (a) All zero
(b) All have zero except single bonded oxygen (–1)
(c) All have zero except nitrogen (+1)
(d) Both single bonded O-atoms have (–1), N-atom has (+1) and double bonded O-atom has zero.

8. $\left[\overset{\times}{\underset{\times}{\ddot{C}}} = C = \ddot{\underset{\times}{\overset{\times}{C}}}\right]^{4-}$

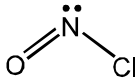
DPP No. # 10

3. P : $CH_3 - C \equiv N$
Q : H -- N = C = O

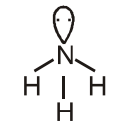
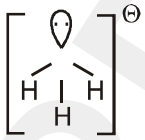
R : 

4. CO_3^{2-} : bond length between C–O and C=O (due to resonance) bond length Maximum
CO_2 : bond length shorter than C=O.
CO : bond order = 3 $\Rightarrow$ Triple bond $\Rightarrow$ bond length Minimum.

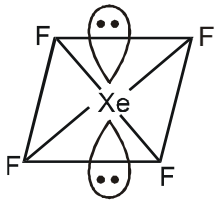
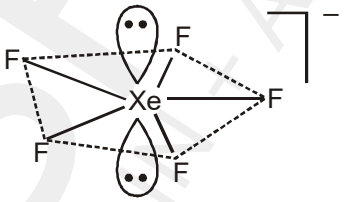
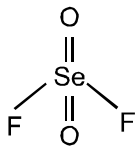
DPP No. # 11

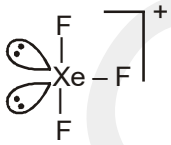
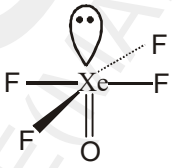
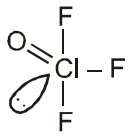
2.  'N' atom is sp^2.

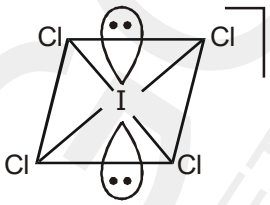
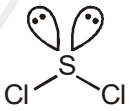
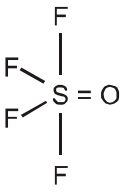
4. O = C = C = C = O

5. $NH_3 \equiv$  Pyramidal & $CH_3^{\ominus} \equiv$  Pyramidal

6.* Hybridisation of C in CH_3^- is sp^3.

7. XeF_4  XeF_5^-  F_2SeO_2 

XeF_3^+  $XeOF_4$  $ClOF_3$ 

ICl_4^-  SCl_2  OSF_4 

8. (A – t) ; (B – s) ; (C – p) ; (D – r).

DPP No. # 12

1. $N \equiv C - C \equiv C - C \equiv N$

3. Both $PO_4^{3\ominus}$ & $SO_3^{2\ominus}$ have hybridisation sp^3

4. $N_3^{\ominus} \equiv [\overset{\ominus}{N} = \overset{\oplus}{N} = N^-]$; NOCl $\equiv$ O = N – Cl & $N_2O \equiv \overset{-}{N} = \overset{+}{N} = O$

5.

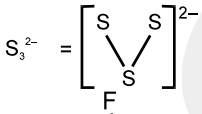
Species	Hybridisation
$CO_3^{2\ominus}$	sp^2
XeF_4	sp^3d^2
$I_3^{\ominus}$	sp^3d
NCl_3	sp^3
$BeCl_2$	sp

8.

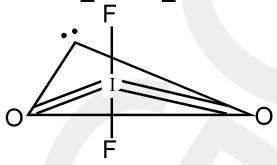
1.	BeH_2	sp	2.	BeF_2	sp
3.	CO_2	sp	4.	$HC \equiv CH$	sp, sp
5.	O_3	sp^2	6.	BF_3	sp^2
7.	$CH_2=CH_2$	sp^2	8.	CH_3^+	sp^2
9.	HNO_3	sp^2	10.	HNO_2	sp^2
11.	SO_2	sp^2	12.	SO_3	sp^2
13.	HCO_3^-	sp^2	14.	$HCOO^-$	sp^2
15.	$SnCl_2$	sp^2	16.	$AlCl_3$	sp^2
17.	AlH_4^-	sp^3	18.	NF_3	sp^3
19.	PF_3	sp^3	20.	$AsCl_3$	sp^3
21.	CH_3^-	sp^3	22.	OF_2	sp^3
23.	SCl_2	sp^3	24.	SF_4	sp^3d
25.	$[SiF_6]^{2-}$	sp^3d^2	26.	PCl_6^-	sp^3d^2
27.	ICl_2^-	sp^3d	28.	ICl_5	sp^3d^2
29.	ICl_4^-	sp^3d^2	30.	XeF_6	sp^3d^3

DPP No. # 13

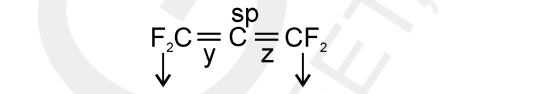
1.



3.



5.



These flourine atoms will be in xz plane

These flourine atoms will be in xy plane

8. (a-ii) (b-iii) (c- iv) (d-v) (e-vi) (f-i).

DPP No. # 14

1. All are ionic solids

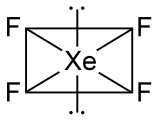
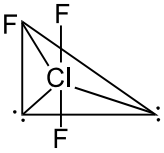
XeF_6 (S) consists XeF_5^+ & F^-

PBr_5 (s)..... PBr_4^+ & Br^-

CaC_2(s) ..... Ca^{++} & C_2^{--}

2. (1) Number of sigma bonds is 7.

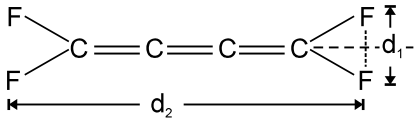
(2) Odd number of consecutive double bonds. So, all the hydrogen atoms lie in same plane.

5.*  

6.* The compound containing same type of ions having same hybridization & sape is isomorphous to each other.

Species	Hybridisation	Shape
CO_3^{2-}	sp^2	Trigonal planar
NO_3	sp^2	Trigonal planar
SO_3^{2-}	sp^2	Pyramidal
SO_4^{2-}	sp^3	Tetrahedral
MnO_4^-	sp^3	Tetrahedral
ClO_4^-	sp^3	Tetrahedral

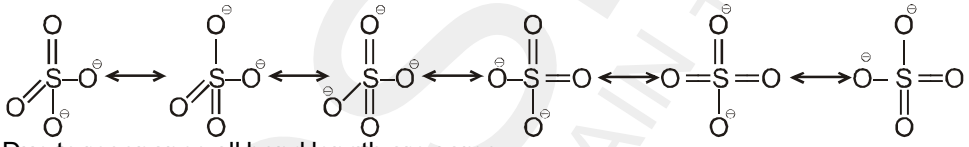
7. (A – p, B – q, C – p, D – s)

8. 

$d_1 = 2 \times 134 \times \sin 60°$ pm = 227.8 pm = 228 pm

$d_2 = 134 \times 3 + 2 \times 134 \cos 60°$ pm = 536 pm

DPP No. # 15

3. 

Due to resonance all bond length are same.

4. (A) NH_3 (106.6º) > PH_3 (93.8º) > AsH_3 (91.83º) > SbH_3 (91.3º) – bond angle
(B) Cl_2O (110.9º) > H_2O (104.5°) > F_2O (103.3º)
(C) SbI_3 (99°) > $SbBr_3$ (98.2°) > $SbCl_3$ (97.1°)
(D) All are trigonal planar (bond angle 120º).

5. Bond angle x size of central atom (if all other factors are same.

6.* All given order are correct

OF_2 < H_2O < Cl_2O < ClO_2
sp^3 sp^3 sp^3 sp^3
low bp-bp larger
repulsion size of Cl

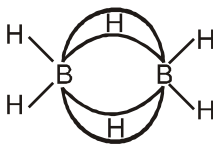
$COF_2 < COCl_2 < COBr_2 < COI_2$ ($\hat{xCx}$ bond angle)

$PH_3 < PF_3$
92º 97.7º

KrF_4 > SF_2 < N_2H_2
sp^3d^2 Sp^3 sp^2 (< 120º)
(90ºC) (< 109º28') sp^2(< 120º)

8. (a) $F_2O < H_2O$ (b) $NH_3 > PH_3$ (c) $SO_2 < SO_3$ (d) $NO_2^+ > NO_2^-$

DPP No. # 16

1. 

Diborane

3. $H_3Si \leftarrow N = C = O$

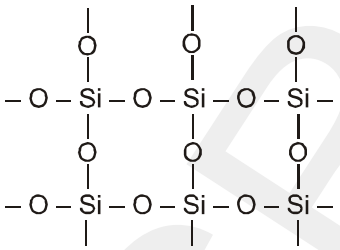
6. In $(CH_3)_3\dot{N}$, N is sp^3 hybridized, having pyramidal structure because of absence of vacant orbital on carbon atom therefore no back bonding is possible.
In $(SiH_3)_3N$, N is sp^2 hybridized, on the basis of $p\pi$-$d\pi$ back bonding $(SiH_3)_3N$ resulting into triangular planar structure.

DPP No. # 17

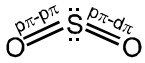
4. diamond (1.54 Å)
graphite (1.42 Å) . ($\perp^r$ to the sheets there is no covalent bonding)
C_{60} (1.45 Å and 1.38 Å)
benzene (1.36 Å).

DPP No. # 18

1. Structure of SiO_2 :

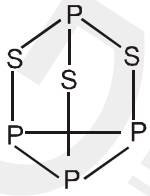


2. **(Moderate)**



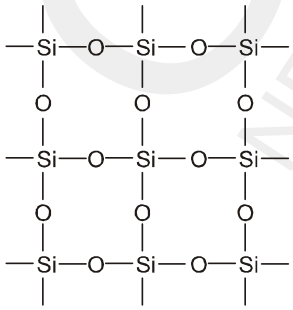
4. ClO_2 does not dimerise because odd electron is present in 'd' orbital and is declocalised not localised as in NO_2.

6. The structure of P_4S_3 is



7. (i) Nitrogen $\rightarrow p\pi - p\pi$ multiple bond (very high bond enthalpy).
(ii) In phosphorus their atomic orbitals are so large and diffuse that they cannot have effective over lapping.

8.



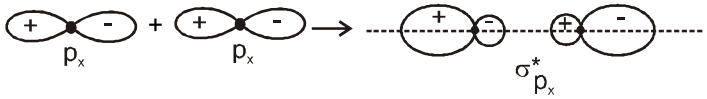
DPP No. # 19

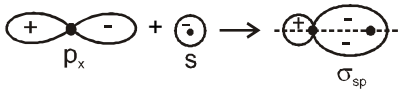
1. C_2 :KK $(\sigma\ 2s)^2\ (\sigma^*\ 2s)^2\ \underbrace{(\pi 2p_x^2 = \pi 2p_y^2)}_{2\pi-\text{bonds}}$.

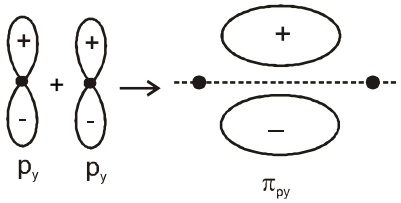
2. (A) Be_2 : BO = 0 (zero) $\therefore$ unstable molecule.
(B) He_2 : BO = 0 (not stable) , He_2^+ : BO = 0.5 (expected to exist).
(C) N_2 : BO = 3 , maximum bond order means maximum bond strength.

(D) For F_2 molecule, $E(\sigma 2p_z) < E(\pi 2p_x) = E(\pi 2p_y)$.

3. From the graph
B.E. of H_2 > B.E. of H_2^+ > B.E of He_2^+ > BE of He_2 where BE = bond energy or bond dissociation energy
and B.L. of H_2 < B.L. of H_2^+ < B.L. of He_2^+ < B.L. of He_2
where B.L. = bond length
so stability order = $H_2 > H_2^+ > He_2^+ > He_2$

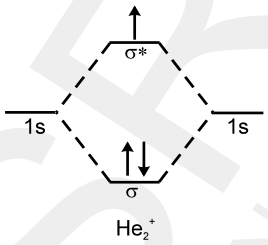
6. (A) 

(B) 

(D) 

7. Bonding M.O. has maximum electron density between two nuclei

8. It should be stable because it has one more bonding electron than antibonding



DPP No. # 20

1. O_2 = 2 unpaired e^-
O_2^+ = 1 unpaired e^-
O_2^- = 1 unpaired e^-
O_2^{2-} = 0 unpaired e^-
O_2 and O_2^{2-} have largest difference in no. of unpaired electrons.So, they have largest difference in magnetic moment.

2. O_2^- :KK $(\sigma 2s)^2 (\sigma^* 2s)^2 (\sigma 2p_z)^2 (\pi 2p_x^2 = \pi 2p_y^2) \underbrace{(\pi^* 2p_x^1 = \pi^* 2p_y^1)}_{\text{HOMO}}$

3. Bond order of N_2 = 3
Bond order of N_2^+ = 2.5
Bond order of N_2^- = 2.5
But N_2^+ consist of lesser electrons in anti bonding molecular orbital. So it is more stable than N_2^-.

as $N_2^+ = \sigma_{1s}^2 < \sigma_{1s}^{*\,2} < \sigma_{2s}^2 < \sigma_{2s}^{*\,2} < \pi_x 2p^2 = \pi_y 2p^2 < \sigma_{2p_z}^1$

$N_2^- = \sigma_{1s}^2 < \sigma_{1s}^{*\,2} < \sigma_{2s}^2 < \sigma_{2s}^{*\,2} < \pi_x 2p^2 = \pi_y 2p^2 < \sigma_{2p_z}^2 < \pi_x 2p^{*1} = \pi_y 2p^{*0}$

4. Greater bond order $\Rightarrow$ Lesser bond length.

5. O_2^+ = BO = 2.5 > BO_{O_2}
15 electron $\therefore$ paramagnetic.

6.* In CaC_2 there is C $\equiv$ C , while in CH_2CCH_2, there is only C = C.
$KO_2 = K^+ + O_2^-$
Bond order = 1.5
$Na_2O_2 = 2Na^+ + O_2^{2-}$
Bond order = 1.0
$O_2 (Pt F_6] = O_2^+ + [Pt F_6]^-$
Bond order = 2.5
NO Bond order = 2.5

while in NOCl, bond order = 2.

7.

Species	No. of electrons	Bond order	Magnetic nature
NO	15	1/2 (10 – 5) = 2.5	Paramagnetic
NO^+	14	1/2 (10 – 4) = 3.0	Diamagnetic
NO^{2+}	13	1/2 (9 – 4) = 2.5	Paramagnetic
NO^-	16	1/2 (10 – 6) = 2.0	Diamagnetic

Highest bond order $\Rightarrow$ shortest bondlength (NO^+).

8. NO has lost an antibonding electron to form NO^+. So NO^+ is more stable.
CO has lost a bonding electron to form CO^+. So CO^+ is less stable.

DPP No. # 21

5. $BeCl_2$, $MgCl_2$, $CaCl_2$, $BaCl_2$

$\longrightarrow$ cationic size $\uparrow$ $\therefore$ covalent character $\downarrow$ $\therefore$ mp $\uparrow$

6. Greater the charge on cation and smaller the size of cation, more will be the covalent character in ionic compound.

7. (B) For this comparison, larger the size difference between cation and anion, greater will be the water solubility.

8. (a) Electronegativity difference Li and iodine is less than Li and F. Thus, LiI is more covalent.
(b) Although Li^+ is same in both the compounds yet difference in the size of F^- and I^- is not same. Since F^- is smaller than I^- hence lattice energy of LiF is more than that of LiI. Similarly heat of hydration of F^- is more than that of I^-. But the decrease of L.E. from LiF to LiI is much more than the decrease in heat of hydration from LiF to LiI. Hence solubility increases from LiF to LiI.

DPP No. # 22

1. All are symmetrical molecules. $\therefore$ $\mu = 0$ (Non polar compounds).

2. The dipole moment of BF_3 , NF_3 and NH_3 respectively is zero, 0.24D and 1.46D.

3. $AB_2L_2 \rightarrow$ Bent ($\mu \neq 0$), $AB_2L_3 \rightarrow$ Linear ($\mu = 0$), $AB_4L_2 \rightarrow$ Square planar ($\mu = 0$), $AB_4 \rightarrow$ Tetrahedral ($\mu = 0$).

4.* Correct orders of dipole moment are
HF > HCl > HBr > HI (decreasing bond polarity)
CD_3F > CH_3F (D is more electro +ve than hydrogen)
SO_2 > SO_3 (SO_3 is symmetircal so dipole moment - 0)

5. (a) 1.07×10^{-8} esu –cm = $\delta \times 1.2738 \times 10^{-8}$
$\Rightarrow$ 8.4×10^{-11} esu

Fraction = $\frac{\delta}{e} = \frac{8.4 \times 10^{-11}}{4.8 \times 10^{-10}} = \frac{7}{40}$ or 0.175.

(b) All N – N bond length are same in azide ion but not in hydrazoic acid.

6. $BF_3 < H_2S < H_2O$. BF_3 has a zero dipole moment because of its symmetry. H_2S has a lower dipole moment than H_2O because of the much lower bond polarity of H–S bond compared to H–O bond.

7. Dipole moment of compound if it would have been completely ionic
= (4.8×10^{-10} esu) (2.67×10^{-8} cm) = 12.8 D

so % ionic character = $\frac{9.6}{12.8} \times 100\% = 75\%$

8. (A) NH_3 : $\mu \neq 0$ (polar molecule). 3 unpaired electron and 3 bonds.
$\therefore$ Bonding takes place in ground state.
(B) PF_2Cl_3 : $\mu = 0$ (Non-polar molecule) 3 unpaired electron and 5 bonds.
$\therefore$ Bonding takes place in excited state.

(C) XeF_2 : $\mu = 0$ (Non-polar molecule) 0 unpaired electron and 2 bonds.
$\therefore$ Bonding takes place in excited state.
(D) H_2S : $\mu \neq 0$ (Polar molecule) 2 unpaired electron and 2 bonds.
$\therefore$ Bonding takes place in ground state.

DPP No. # 23

1. Bond polarity is a more dominating factor for strength of H–bond than lone pair availability.

2. **[D]**
Benzene has hydrogens connected to carbons and the bonds are almost non polar. Hence no question of hydrogen bonding. It is a liquid owing to vander waal forces.

3. Two ice cubes unite due to H–bond developed between water molecules of two cubes.

4.* (A) H–bonding exists in $CH_3 - CH_2 -$ OH due to polar O – H bond.
(B) I_2 has maximum moecular mass, thus stronger vander waal forces and higher b.p.
(C) H–bonding exists in HF, so it has highest b.p.
(D) H–bonding exists in NH_3, so it has highest b.p.

5. No polar bond of H–atom (N – H or O – H) is present in $CH_3 - CH_2 - CH_3$, but in all other compound, it is present.

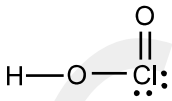
6. I – density of water increases up to 4°C
II – in case of ice each water molecule is attached with four other molecules tetrahedrally forming a cage like structure.

7. Conditions for H–bonding :
(A) Positive charge density on H–atom should be high.
(B) Availability of lone pair of EN atom should be high.
(C) Size of EN atom should be small.

8.

(i) dipole-dipole attraction.	(ii) H – bonding	(iii) H – bonding
(iv) dipole-dipole attraction.	(v) H–bonding	(vi) dipole-dipole attraction.
(vii) metallic bonding	(viii) H–bonding.	(ix) dipole-dipole attraction.
(x) ion-dipole attraction.	(xi) dispersion forces	(xii) covalent bond.
(xiii) disperison forces	(xiv) ionic bond	(xv) dipole - induced dipole attraction.
(xvi) disperison forces.		

DPP No. # 24

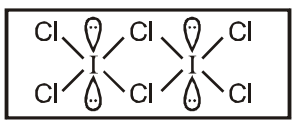
1.  ; Cl is sp^3 and molecule is polar Cl , sp^3 ladzfjr gS vkSj v.kq /kzqoh; gS

6.* Electronic configuration of C_2 molecule will be

$$\sigma_{1s^2}\ ,\ \sigma^*_{1s^2}\ ,\ \sigma_{2s^2}\ ,\ \sigma^*_{2s^2}\ ,\ \pi_{2P_x^2}\ ,\ \pi_{2P_y^2}\ ,\ \sigma_{2P_z}\ ,$$

so, B.O. = 2 (both bonds are π bonds)
LUMO = σ_{2P}
HOMO = π_{2P}

7. **08**
I_2Cl_6 is a planar molecule.



8.

Species		**Number of π^* electrons**
O_2		2
O_2^-		3
O_2^{2-}		4
Total	**=**	**9 electrons**

DPP No. # 25

1. When sodium and potassium react with water, the heat evolved causes them to melt, giving a larger area of contact with water, lithium on the other hand, does not melt under these condition and thus reacts more slowly.

	Li	Na	K
Melting point (ºC)	180	98	64.

2. $M + (x + y)NH_3 \longrightarrow [M(NH_3)_x]^+ + [e(NH_3)_y]^-$
It is paramagnetic due to the presence of the unpaired electrons

3. As the size of cation decreases, the extent of polarisation increases so covalent character ↑ and stability ↓

5. (4) Reducing nature increases down the group as their stability decreases down the group
CsH > RbH > KH > NaH > LiH

6. Both statements are correct but S_2 is not correct explanation of S_1 .
Statement - 1 : The reason for this is that their lattice energies change is more than the hydration energies on descending the group.

Statement - 2 : Hydration energy $\propto \frac{1}{\text{size of cation}}$.

7. **(C)**
The atom becomes larger on descending the group, so the bonds are weaker (metallic bond), the cohesive force/ energy decreases and accordingly melting point also decreases.

8. **(A,B,C,D)**
(A) Due to the formation of metal ion clusters
(B) $M + (x + y)\ NH_3 \longrightarrow M^+(NH_3)_X + e^-(NH_3)_y$
(C) due to the formation of metal clusters.
(D) $M(NH_3)_6 \longrightarrow$ true statement

9. **(C)**
(i) $E^0\ Li^+/Li = -3.04$; $Na^+/Na = -2.71$ which is least among the alkali metals.
(ii) Hydration enthalpy / KJ mol^{-1}
Li = – 506 ; Na = – 406 ; Cs has the least $\Delta H_{hyd} = -276$

10. (A) Bigger anion is stabilised by bigger cation through lattice energy effect.
(B) Because of their high reactivity towards air and water.
(C) True Statement
(D) In concentrated solution, unpaired electrons with opposite spins paired up – forming the solution diamagnetic.

11. **(B)**
Solubility of alkaline earth metal hydroxide increases as the solubility product increases.

	$Be(OH)_2$	< – – – – – – <	$Ba(OH)_2$
K_{SP}	1.6×10^{-26}		5.4×10^{-3}

12. The anhydrous magnesium chloride is fused with NaCl to provide conductivity to the electrolyte and to lower the fusion temperature of anhydrous $MgCl_2$.

13. LiF has more ionic character while LiI has more covalent character. The latter is due to the greater polarizability of larger iodide ion than the lithium ion.

14. As metallic character i.e. electropositive character of cations increases thermal stability of their sulphates increases and thus the correct order is $SrSO_4 > CaSO_4 > MgSO_4 > BeSO_4$.

15. **(i)** higher effective nuclear charge
(ii) Decreases; as mobility of free electron decreases on cooling.

16. **(a)** **True :** The metallic bonding decreases with increase in atomic size and thus close packing of atoms in crystal lattice decreases from Li to Cs resulting in an increase in softness.

(b) **False :** Sodium when burnt in excess of oxygen gives monoxide and sodium peroxide (Na_2O_2)

and not sodium oxide.

$4Na + O_2 \rightarrow 2Na_2O$; $2Na + O_2 \rightarrow Na_2O_2$

17. Ca is obtained by electrolysis of molten mixture of $CaCl_2$ mixed with CaF_2.

18. Both S & E are true and E is the correct explanation of S. So (a)

DPP No. # 26

1. (A) $4\,LiNO_3 \longrightarrow 2Li_2O + 4NO_2 + O_2$

$2NaNO_3 \longrightarrow 2NaNO_2 + O_2$ (similar decomposition with the nitrates of K, Rb and Cs)

(B) Only LiCl is deliquescent and crystallises as a hydrate $LiCl.2H_2O$

(C) $2M + 2H_2O \longrightarrow 2M^+ + 2OH^- + H_2$ (M = an alkali metal)

(D) Halides of Li are covalent in nature.

3. (i) $Na_2S + 4Na_2O_2 \longrightarrow Na_2SO_4 + 4Na_2O$.

(ii) $2Na + O_2(excess)$ ¼vkf/kD;½ $\xrightarrow{350^\circ C}$ Na_2O_2.

(iii) $Na_2O_2 + CO \longrightarrow Na_2CO_3$; $2Na_2O_2 + 2CO_2 \longrightarrow 2Na_2CO_3 + O_2$.

(iv) $2Cr(OH)_3 + 3Na_2O_2 \longrightarrow 2Na_2CrO_4 + 2NaOH + 2H_2O$.

(v) $MnSO_4 + 2Na_2O_2 \longrightarrow Na_2MnO_4 + Na_2SO_4$.

(vi) $Na_2O + NH_3 \longrightarrow NaNH_2 + NaOH$

(vii) $Na_2O_2 + 2H_2O \xrightarrow{Cold} 2NaOH + H_2O_2$

5. $MgCO_3 \xrightarrow{\Delta} MgO + CO_2$
(Basic) (Acidic)

6. (2) $KO_2 + 2H_2O \longrightarrow KOH + H_2O_2 + 1/2O_2$

(3) $4KO_2 + 2CO_2 \longrightarrow 2K_2CO_3 + 3O_2$

7. **(i)** $2NaOH + 2NO_2 \longrightarrow NaNO_2 + NaNO_3 + H_2O$; $2NaOH + SO_3 \longrightarrow Na_2SO_4 + H_2O$.

(ii) $6NaOH + 3Br_2 \longrightarrow 5NaBr + NaBrO_3 + 3H_2O$.

$4NaOH + 2F_2 \longrightarrow 4NaF + O_2 + 2H_2O$.

(iii) $6NaOH + 4S \longrightarrow 2Na_2S + Na_2S_2O_3 + 3H_2O$.

(iv) $2B + 6NaOH \longrightarrow 2Na_3BO_3 + 3H_2$

(v) $2NaOH + Si + H_2O \longrightarrow Na_2SiO_3 + 2H_2$.

(vi) $PbO + 2NaOH \longrightarrow Na_2PbO_2 + H_2O$; $PbO_2 + NaOH \longrightarrow Na_2PbO_3 + H_2O$.

(vii) $4NaOH + 2H_2O + 2Al \longrightarrow 2NaAlO_2 + 3H_2$.

(viii) Form insoluble hydroxides.

$CrCl_3 + 3NaOH \longrightarrow Cr(OH)_3 \downarrow$ (Green) $+ 3NaCl$.

$CuCl_2 + 2NaOH \longrightarrow Cu(OH)_2 \downarrow$ (bule) $+ 2NaCl$.

(ix) $HgCl_2 + 2NaOH \longrightarrow Hg(OH)_2 \downarrow + 2NaCl$; $Hg(OH)_2 \longrightarrow HgO \downarrow$ (yellow or brown) $+ H_2O$.

$2AgNO_3 + 2NaOH \longrightarrow 2AgOH \downarrow + 2NaNO_3$; $2AgOH \longrightarrow Ag_2O \downarrow$ (black) $+ H_2O$.

(x) $NaOH + CO \xrightarrow[5-10\,atm]{150-200^\circ C} HCOONa$.

8. $CaO + H_2O \xrightarrow{\text{Hissing sound}} Ca(OH)_2 + Heat$

$CaO + CO_2 \longrightarrow CaCO_3$

9. $BaO_2.8H_2O + 2HCl \longrightarrow BaCl_2 + H_2O_2 + 8H_2O$.

10. Since $NaHCO_3$ is an acid salt of H_2CO_3. it reacts with NaOH to form Na_2CO_3 and H_2O.

$Na_2CO_3 + NaOH \rightarrow Na_2CO_3 + H_2O$.

11. **S_1 :** $(2\,CaSO_4.2H_2O) \xrightarrow{393K} 2\,(CaSO_4).H_2O + 3H_2O$; above 393 K dead burnt plaster is obtained.

S_2 : $Ca^{2+} + Na_2CO_3 \longrightarrow CaCO_3 \downarrow + 2Na^+$

S_3 : $Li^+ < Na^+ < K^+ < Kb^+ < Cs^+$
Bigger hydrated ion moves slower in aqueous solution.

13. **(A → P, Q, R) ; (B → P,Q,R) ; (C → P,Q) ; (D → P,Q,S)**

(A) $NaSO_4 + C + CaCO_3 \longrightarrow Na_2CO_3(sp^2) + CaSO_4(sp^3)\downarrow$ (White)

(B) $NaCl + NH_4.HCO_3 \longrightarrow NaHCO_3(sp^2)\downarrow$ (White) $+ NH_4Cl(sp^3)$

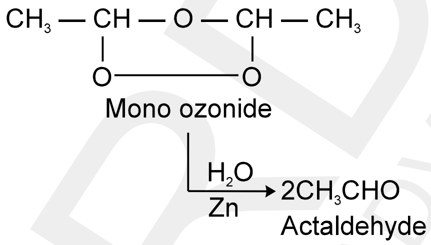
(C) $Na_2CO_3 + Ca(OH)_2 \longrightarrow CaCO_3(sp^2)\downarrow$ (White) $+ NaOH$

(D) $2KOH + 4NO \longrightarrow 2KNO_2(sp^2) + N_2O + H_2O(sp^3)$

If $4KOH + 6NO \longrightarrow 4KNO_2 + N_2 + 2H_2O$

14. The gas (A) on treatment with but 2–ene followed by treatment with Zn /H_2O yields acetaldehyde and thus (A) is ozone

(i) $O_3 + CH_3 - CH = CH - CH_3 \longrightarrow$



(ii) $5O_3 + 2KOH \longrightarrow 2KO_3$(Deep red) $+ H_2O_{(g)} + 5O_2$
(A) Potassium ozonide (B) (C)

15. $CaCO_3 + CO_2 + H_2O \rightarrow Ca(HCO_3)_2$ (calcium bicarbonate).

16. MgO is used for the lining of steel making furnace because it acts as basic flux and facilitates the removal of acidic impurities of Si, P and S from steel through slag formation.

17. $3Ca(OH)_2 + 2Cl_2 \rightarrow Ca(OCl)_2.Ca(OH)_2.CaCl_2.2H_2O$
Bleaching powder
(a mixture of $Ca(OCl)_2$ and basic chloride)

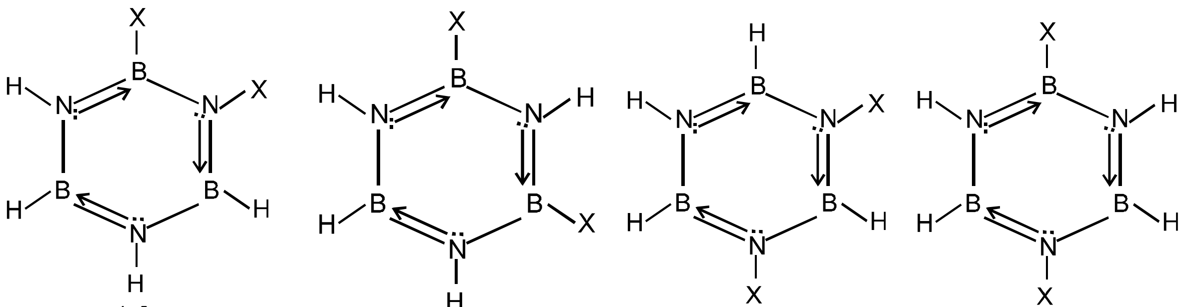
18. $Ca_5(PO_4)_3F + 5H_2SO_4 + 10H_2O \xrightarrow{\Delta} 3H_3PO_4 + 5CaSO_4.2H_2O + HF$

19. $Na_2Al_2Si_2O_8 . xH_2O + Ca^{2+} \rightarrow CaAl_2Si_2O_8 . xH_2O + 2Na^+$
$Na_2Al_2Si_2O_8 . xH_2O + Mg^{2+} \rightarrow MgAl_2Si_2O_8 . xH_2O + 2Na^+$

DPP No. # 27

1. $T\ell^{3+}$ acts as an oxidising agent because it has tendency to reduce to $T\ell^+$ as +1 oxidation state of $T\ell$ is more stable on account inert pair effect.

3.



1, 2– 1, 3– 1, 3– 1, 4–

4.* Boron does not increase its covalence beyond four as it does not have d-orbital.

5. $B(OH)_3 + 2HOH \rightleftharpoons [B(OH)_4]^- + H_3O^+$.
In aqueous solution the boron completes its octet by accepting OH^- from water molecules. It therefore function as a weak monobasic lewis acid.

6. As boron completes it octet by accepting OH^- from water molecule. Hence it acts as a Lewis acid.

7. $Na_2B_4O_7 + H_2SO_4 + 5H_2O \longrightarrow Na_2SO_4 + 4H_3BO_3$

8. $[B_4O_5(OH)_4]^{2-} + 5H_2O \rightleftharpoons 2B(OH)_3$ (weak acid) + $2[B(OH_4)]^-$ (salt)

9. Borax is not used as fuel in rockets.

10. $B_2H_6 + 2NH_3 \longrightarrow [H_2B(NH_3)_2]^+ + [BH_4]^-$

$B_2H_6 + 2N(CH_3)_3 \longrightarrow 2H_3B \longleftarrow N(CH_3)_3$

11. (C) CH_3 group being larger can not form a bridge between two small sized boron atoms.

12. $B_2H_6 + NH_3 \xrightarrow[\text{low temperature}]{\text{Excess } NH_3} B_2H_6.2NH_3$ or $[H_2B(NH_3)_2]^+ [BH_4]^-$ (ionic compound).

13. (A) $B_2O_3 + 3H_2O \longrightarrow 2H_3BO_3$

(B) $B_2H_6 + 6H_2O \longrightarrow 2H_3BO_3 + 6H_2$

(C) $B_3N_3H_6 + 9H_2O \longrightarrow 3B(OH)_3 + 3NH_3 + 2H_2$

(D) $BCl_3 + 3H_2O \longrightarrow B(OH)_3 + 3HCl$.

14. As it becomes passive by the action of conc. HNO_3 forming a protective oxide layer on the surface.

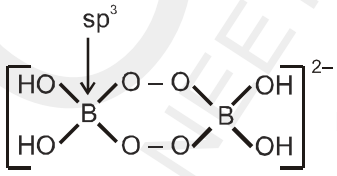
15. $Na_2CO_3 + H_2O \longrightarrow 2NaOH + CO_2$; $4OH^- + Al \longrightarrow [Al(OH)_4]^-$ (soluble complex)

16. A (both assertion & reason are correct and explanation also correct)

17. It is acidic because of the hydrolysis of $Al_2(SO_4)_3$ according to the following reaction.
$Al_2(SO_4)_3 + 6H_2O \longrightarrow 2Al(OH)_3 + 3H_2SO_4$.

18. **(i)** This is the test of borate.

(ii)



Peroxoborate ion.

(iii) $H_3BO_3 + 4HF \longrightarrow H^+ + [BF_4]^- + 3H_2O$

(iv) False

(v) Elemental Boron can be obtained from Van Arkel method.

$2BI_3 \xrightarrow[\text{or Tantalum}]{\text{red hot W}} 2B\uparrow + 3I_2\uparrow$ (Van Arkel method).

DPP No. # 28

2. As differ in their crystal structures and physical properties.

4. CO_2 can not act as reducing agent because carbon is in its highest oxidation state, i.e., +4.

6. CO burns with blue flame and also acts as reducing agent ; used in the extraction of various metal from their oxide

ores.

7. (X) is CO_2 because $CO_2 + NH_3$ under pressure gives urea, in reaction (B) does not produce CO_2

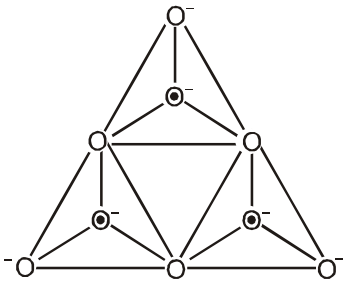
$$CaO + C \xrightarrow{\Delta} CaC_2 + CO.$$

10. Hydrated chloride of tin(IV) is white in colour and is known by the name 'butter of tin' ore oxymercurate of tin".

11. $2PbO_2 + 4HNO_3 \longrightarrow 2Pb(NO_3)_2 + 2H_2O + O_2$

12. Red lead pigment contains Pb_3O_4.

14.



$Si_3O_9^{6-}$ • Silicon
O Oxygen

15. $Pb_3O_4 + 4HNO_3 \longrightarrow 2Pb(NO_3)_2 + 2H_2O + PbO_2$

16. (A) Two oxygen atoms per tetrahedron are shared forming rings. $(SiO_3)_n^{2n-}$. Hybridisation of each Si is sp^3.
(B) Two oxygen atoms per tetrahedran are shared forming a chain of tetrahedron , $(SiO_3)_n^{2n-}$. Hybridisation of each Si atom is sp^3.
(C) One oxygen atom per tetrahedron is shared. $Si_2O_7^{2-}$. Hybridisation of each Si atom is sp^3.
(D) Three oxygen atoms per tetrahedron are shared. $(Si_2O_5)_n^{2-}$, sp^3 hybridisation.

Note : EN difference between Si – O is 1.7. ∴ 50% ionic and 50% covalent.

17. **(i)** Fullerene
(ii) Glass
(iii) Inert pair effect.
(iv) NaOH
(v) Litharge = PbO and red lead = Pb_3O_4 are used as pigments in paints.
(vi) CO is readily absorbed by an ammonical solution of copper (I) chloride to give $CuCl.CO.2H_2O$.

$$2NaOH + CO_2 \longrightarrow Na_2CO_3$$

(vii) It is fact.
(viii) $SiO_2 + 6HF \longrightarrow H_2SiF_6 + 2H_2O$
(ix) CO_2 (s) is know as dry ice.
CO_2 (s) dks 'kq"d cQZ dgk tkrk gSA
(x) $CO + Cl_2 \xrightarrow{\text{sun light}} COCl_2$

(xi). $H_2C_2O_4 \xrightarrow[-H_2O]{\text{conc. } H_2SO_4, \Delta} CO + CO_2$

18. **(i)** False
(ii) True
(iii) True
(iv) $AlCl_3 + 3H_2O \longrightarrow Al(OH)_3 + 3HCl$
(v) $HCOOH \xrightarrow[\Delta]{P_4O_{10}} CO + H_2O$
(vi) True.
(vii) $I_2O_5 + 5CO \longrightarrow 5CO_2 + I_2$
(viii) Graphite has layered structure. Layers are held by van der Waal's forces and distance between two layers

is 340 pm and therefore, graphite is less denser than diamond.

(ix) In silicones the silicon atoms are surrounded by non-polar alkyl or aryl groups.

(x). Having repeated R_2SiO units held by Si—O—Si linkage.

7. (X) is CO_2 because $CO_2 + NH_3$ under pressure gives urea, in reaction (B) does not produce CO_2

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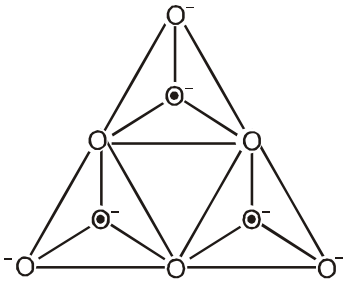

$Si_3O_9^{6-}$ • Silicon O Oxygen

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18.

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