3 ADVANCE CHEMICAL BONDING

[JEE MAIN]

Q.1 The reason for double helical structure of DNA is operation of: **[AIEEE 2003]**
(1) dipole-dipole interaction (2) hydrogen bonding
(3) electrostatic attraction (4) vander Wall's forces

Q.2 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? **[AIEEE 2004]**
(1) Bond length in NO^+ is equal to that in NO (2) Bond length in NO is greater than in NO^+
(3) Bond length in NO^+ is greater than in NO (4) Bond length is unpredictable

Q.3 The states of hybridization of boron and oxygen atoms in boric acid (H_3BO_3) are respectively:
(1) sp^3 and sp^2 (2) sp^2 and sp^3 **[AIEEE 2004]**
(3) sp^2 and sp^2 (4) sp^3 and sp^3

Q.4 Beryllium and aluminium exhibit many properties which are similar. But, the two elements differ in :
(1) Forming covalent halides **[AIEEE 2004]**
(2) Forming polymeric hydrides
(3) Exhibiting maximum covalency in compound
(4) Exhibiting amphoteric nature in their oxides

Q.5 Which one of the following species is diamagnetic in nature? **[AIEEE 2005]**
(1) He_2^+ (2) H_2 (3) H_2^+ (4) H_2^-

Q.6 The number and type of bond between two carbon atom in calcium carbide are : **[AIEEE 2005]**
(1) One sigma, one pi bond (2) One sigma, two pi bond
(3) Two sigma, one pi bond (4) Two sigma, two pi bond

Q.7 Which of the following molecules\ions does not contain unpaired electrons? **[AIEEE 2006]**
(1) N_2^+ (2) O_2 (3) O_2^{2-} (4) B_2

Q.8 Among the following mixtures, dipole-dipole as the major interaction, is present in : **[AIEEE 2006]**
(1) KCI and water (2) benzene and carbon tetrachloride
(3) benzene and ethanol (4) acetonitrile and acetone

Q.9 A metal, M foms chlorides in its +2 and +4 oxidation states. Which of the following statements about these chlorides is correct? **[AIEEE 2006]**
(1) MCl_2 is more ionic than MCl_4
(2) MCl_2 is more easily hydrolysed than MCl_4
(3) MCl_2 is more volatile than MCl_4
(4) MCl_2 is more soluble in anhydrous ethanol than MCl_4

Q.10 In which of the following ionizion processes, the bond order has increased and the magnetic behaviour has changed **[AIEEE 2007]**

(1) $NO \rightarrow NO^+$ (2) $O_2 \rightarrow O_2^+$ (3) $N_2 \rightarrow N_2^+$ (4) $C_2 \rightarrow C_2^+$

Q.11 Which of the following hydrogen bonds is the strongest **[AIEEE 2007]**

(1) F – H .... F (2) O – H ..... O (3) O – H .... F (4) O – H .... N

Q.12 Which of the following species exhibits the diamagnetic behaviour: **[AIEEE 2007]**

(1) O_2^+ (2) O_2 (3) NO (4) O_2^{2-}

Q.13 The charge/size ratio of a cation determines its polarzing power. Which one of the following sequences represents the increasing order of the polarizing power of the cationic species, K^+, Ca^{+2}, Mg^{+2}, Be^{+2}

(1) $Be^{+2} < K^+ < Ca^{+2} < Mg^{+2}$ (2) $K^+ < Ca^{+2} < Mg^{+2} < Be^{+2}$ **[AIEEE 2007]**

(3) $Ca^{+2} < Mg^{+2} < Be^{+2} < K^+$ (4) $Mg^{+2} < Be^{+2} < K^+ < Ca^{+2}$

Q.14 Which one of the following pairs of species have the same bond order : **[AIEEE 2008]**

(1) CN^- and NO^+ (2) CN^- and CN^+

(3) O_2^- and CN^- (4) NO^+ and CN^+

Q.15 Using molecule orbital theory predict which of the following species has the shortest bond length-

(1) O_2^{2+} (2) O_2^+ (3) O_2^- (4) O_2^{2-} **[AIEEE 2009]**

Q.16 Ortho-Nitrophenol is less soluble in water than p- and m-Nitrophenols because : **[AIEEE 2012]**

(1) o-Nitrophenol shows intermolecular H-bonding

(2) Melting point of o-Nitrophenol is lower than those of m-and p-isomers.

(3) o-Nitrophenol is more volatile in steam than those of m-and p-isomers.

(4) o-Nitrophenol shows intramolecular H-bonding

Q.17 Stability of the species Li_2, Li_2^- and Li_2^+ increases in the order of: **[JEE (Main-Offline) 2013]**

(1) $Li_2^- < Li_2^+ < Li_2$ (2) $Li_2 < Li_2^- < Li_2^+$ (3) $Li_2^- < Li_2 < Li_2^+$ (4) $Li_2 < Li_2^+ < Li_2^-$

Q.18 Which one of the following molecules is expected to exhibit diamagnetic behaviour? **[JEE (Main-Offline) 2013]**

(1) N_2 (2) O_2 (3) S_2 (4) C_2

Q.19 In which of the following pairs of molecules / ions, both the species are not likely to exist? **[JEE (Main-Offline) 2013]**

(1) H_2^-, He_2^{2-} (2) H_2^{2+}, He_2 (3) H_2^-, He_2^{2+} (4) H_2^+, He_2^{2-}

Q.20 The solubility order for alkali metal fluoride in water is :

(1) RbF < KF < NaF < LiF (2) LiF < RbF < KF < NaF

(3) LiF > NaF > KF > RbF (4) LiF < NaF < KF < RbF

[JEE (Main-Online) 2013]

Q.21 Bond order normally gives idea of stability of a molecular species. All the molecules viz. H_2, Li_2 and B_2 have the same bond order yet they are not equally stable. Their stability order is :

(1) $Li_2 > H_2 > Br_2$ (2) $Li_2 > B_2 > H_2$ (3) $H_2 > B_2 > Li_2$ (4) $B_2 > H_2 > Li_2$

[JEE (Main-Online) 2013]

Q.22 The internuclear distances in O–O bonds for O_2^+, O_2, O_2^- and O_2^{2-} respectively are :

(1) 1.30 Å, 1.49 Å, 1.12 Å, 1.21 Å (2) 1.12 Å, 1.21 Å, 1.30Å, 1.49Å

(3) 1.21Å, 1.12Å, 1.49Å, 1.30 Å (4) 1.49Å, 1.21Å, 1.12Å, 1.30Å

[JEE (Main-Online) 2013]

Q.23 Which one of the following properties is not shown by NO? **[JEE (Main-Offline) 2014]**

(1) It is a neutral oxide

(2) It combines with oxygen to form nitrogen dioxide

(3) It's bond order is 2.5

(4) It is diamagnetic in gaseous state

Q.24 The number and type of bonds in C_2^{2-} ion in CaC_2 are :

(1) Two σ bonds and one π-bond (2) Two σ bonds and two π-bonds

(3) One σ bond and one π-bond (4) One σ bond and two π-bonds

[JEE (Main-Online) 2014]

Q.25 Which of the following has unpaired electron(s) ?

(1) N_2 (2) O_2^- (3) O_2^{2-} (4) N_2^{2+}

[JEE (Main-Online) 2014]

Q.26 Which one of the following does not have a pyramidal shape ?

(1) $P(CH_3)_3$ (2) $(SiH_3)_3N$ (3) $P(SiH_3)_3$ (4) $(CH_3)_3N$

[JEE (Main-Online) 2014]

Q.27 The correct order of bond dissociation energy among N_2, O_2, O_2^- is shown in which of the following arrangements ?

(1) $O_2^- > O_2 > N_2$ (2) $N_2 > O_2 > O_2^-$ (3) $N_2 > O_2^- > O_2$ (4) $O_2 > O_2^- > N_2$

[JEE (Main-Online) 2014]

Q.28 Amongst LiCl, RbCl, $BeCl_2$ and $MgCl_2$ the compounds with the greatest and the least ionic character, respectively are :

(1) $MgCl_2$ and $BeCl_2$ (2) LiCl and RbCl (3) RbCl and $MgCl_2$ (4) RbCl and $BeCl_2$

[JEE (Main-Online) 2014]

Q.29 The reason for double helical structure of DNA is the operation of :

(1) Hydrogen bonding (2) Electrostatic attractions

(3) Dipole-Dipole interactions (4) van der Waals forces

[JEE (Main-Online) 2014]

Q.30 Which one of the following molecules is paramagnetic ?

(1) CO (2) N_2 (3) O_3 (4) NO

[JEE (Main-Online) 2014]

Q.31 The intermolecular interaction that is dependent on the inverse cube of distance between the molecules is :

(1) London force (2) Hydrogen bond

(3) Ion -ion interaction (4) Ion -dipole interaction

[JEE (Main-Offline) 2015]

Q.32 After understanding the assertion and reason, choose the correct option.

Assertion : In the bonding molecular orbital (MO) of H_2, electron density is increased between the nuclei.

Reason : The bonding MO is $\Psi_A + \Psi_B$, which shows destructive interference of the combining electron waves.

(1) Assertion is correct, reason is incorrect.

(2) Assertion and reason are correct, but reason is not the correct explanation for the assertion.

(3) Assertion and reason are correct and reason is the correct explanation for the assertion.

(4) Assertion is incorrect, reason is correct.

[JEE (Main-Online) 2015]

Q.33 Which of the alkaline earth metal halides given below is essentially covalent in nature ?

(1) $CaCl_2$ (2) $BeCl_2$ (3) $SrCl_2$ (4) $MgCl_2$

[JEE (Main-Online) 2015]

Q.34 Which of the following compounds has a P–P bond ?

(1) $H_4P_2O_7$ (2) $H_4P_2O_7$ (3) $(HPO_3)_3$ (4) $H_4P_2O_6$

[JEE (Main-Online) 2015]

Q.35 Which intermolecular force is most responsible in allowing xenon gas to liquefy?

(1) Dipole - dipole (2) Ion - dipole

(3) Instantaneous dipole - induced dipole (4) Ionic

[JEE (Main-Online) 2016]

Q.36 The correct order of the solubility of alkaline-earth metal sulphates in water is:

(1) Mg < Ca < Sr < Ba (2) Mg < Sr < Ca < Ba

(3) Mg > Sr > Ca > Ba (4) Mg > Ca > Sr > Ba

[JEE (Main-Online) 2016]

Q.37 Which of the following species is not paramagnetic ? **[JEE (Main-Offline) 2017]**

(1) CO (B) O_2 (C) B_2 (D) NO

Q.38 Which of the following is paramagnetic ?

(1) NO^+ (2) CO (3) O_2^{2-} (4) B_2

[JEE (Main-Online) 2017]

Q.39 The number of S = O and S – OH bonds present in peroxodisulphuric acid and pyrosulphuric acid respectively are :

(1) (2 and 2) and (2 and 2) (2) (2 and 4) and (2 and 4)

(3) (4 and 2) and (2 and 4) (4) (4 and 2) and (4 and 2)

[JEE (Main-Online) 2017]

Q.40 Which of the following salts is the most basic in aqueous solution? **[JEE (Main-Offline) 2018]**

(1) $FeCl_3$ (2) $Pb(CH_3COO)_2$ (3) $Al(CN)_3$ (4) CH_3COOK

Q.41 Which of the following are Lewis acids? **[JEE (Main-Offline) 2018]**

(1) PH_3 and $SiCl_4$ (2) BCl_3 and $AlCl_3$ (3) PH_3 and BCl_3 (4) $AlCl_3$ and $SiCl_4$

Q.42 According to molecular orbital theory, which of the following will **not** be a viable molecule?

(1) H_2^- (2) H_2^{2-} (3) He_2^{2+} (4) He_2^+

[JEE (Main-Offline) 2018]

Q.43 Which of the following best describes the diagram below of a molecular orbital ?

(1) An antibonding σ orbital (2) A non-bonding orbital

(3) A bonding π orbital (4) An antibonding π orbital

[JEE (Main-Online) 2018]

Q.44 The number of P – O bonds in P_4O_6 is :

(1) 12 (2) 6 (3) 9 (4) 18

[JEE (Main-Online) 2018]

Q.45 In graphite and diamond, the percentage of p-characters of the hybrid orbitals in hybridisation are respectively:

(1) 50 and 75 (2) 33 and 25 (3) 67 and 75 (4) 3 and 75

[JEE (Main-Online) 2018]

Q.46 In the molecular orbital diagram for the molecular ion, N_2^+, the number of electrons in the σ_{2p} molecular orbital is :

(1) 2 (2) 3 (3) 1 (4) 0

[JEE (Main-Online) 2018]

Q.47 Among the oxides of nitrogen :

N_2O_3, N_2O_4 and N_2O_5 ; the molecule(s) having nitrogen-nitrogen bond is / are :

(1) Only N_2O_5 (2) N_2O_3 and N_2O_5 (3) N_2O_4 and N_2O_5 (4) N_2O_3 and N_2O_4

[JEE (Main-Online) 2018]

Q.48 According to molecular orbital theory, which of the following is true with respect to Li_2^+ and Li_2^-?
(1) Both are stable
(2) Li_2^+ is unstable and Li_2^- is stable
(3) Both are unstable
(4) Li_2^+ is stable and Li_2^- is unstable
[JEE (Main-Online) 2019]

Q.49 Which amongst the following is the strongest acid ?
(1) CHI_3 (2) $CH(CN)_3$ (3) $CHCl_3$ (4) $CHBr_3$
[JEE (Main-Online) 2019]

Q.50 Good reducing nature of H_3PO_2 is attributed to the presence of :
(1) Two P–OH bonds (2) Two P–H bonds (3) One P–OH bond (4) One P–H bond
[JEE (Main-Online) 2019]

Q.51 In which of the following processes, the bond order has increased and paramagnetic character has changed to diamagnetic?
(1) $O_2 \rightarrow O_2^{2-}$ (2) $O_2 \rightarrow O_2^+$ (3) $N_2 \rightarrow N_2^+$ (4) $NO \rightarrow NO^+$
[JEE (Main-Online) 2019]

Q.52 Two pi and half sigma bonds are present in :
(1) N_2^+ (2) O_2^+ (3) O_2 (4) N_2
[JEE (Main-Online) 2019]

Q.53 The number of 2-centre-2-electron and 3-centre-2-electron bonds in B_2H_6, respectively, are :
(1) 2 and 2 (2) 4 and 2 (3) 2 and 4 (4) 2 and 1
[JEE (Main-Online) 2019]

Q.54 The hydride that is NOT electron deficient is:
(1) SiH_4 (2) B_2H_6 (3) GaH_3 (4) AlH_3
[JEE (Main-Online) 2019]

Q.55 Each of the following options contains a set of four molecules. Identify the option(s) where all four molecules possess permanent dipole moment at room temperature. **[JEE (Main-Offline) 2019]**
(1) BF_3, O_3, SF_6, XeF_6
(2) $BeCl_2$, CO_2, BCl_3, $CHCl_3$
(3) NO_2, NH_3, $POCl_3$, CH_3Cl
(4) SO_2, C_6H_5Cl, H_2Se, BrF_5

Q.56 Among B_2H_6, $B_3N_3H_6$, N_2O, N_2O_4, $H_2S_2O_3$ and $H_2S_2O_8$, the total number of molecules containing covalent bond between two atoms of the same kind is_____ **[JEE (Main-Offline) 2019]**

Q.57 According to molecular orbital theory, which of the following is true with respect to Li_2^+ and Li_2^-?
(1) Both are stable
(2) Li_2^+ is unstable and Li_2^- is stable
(3) Both are unstable
(4) Li_2^+ is stable and Li_2^- is unstable
[JEE (Main-Online) 2019]

Q.58 Which amongst the following is the strongest acid ?
(1) CHI_3 (2) $CH(CN)_3$ (3) $CHCl_3$ (4) $CHBr_3$
[JEE (Main-Online) 2019]

Q.59 Good reducing nature of H_3PO_2 is attributed to the presence of :
(1) Two P–OH bonds (2) Two P–H bonds (3) One P–OH bond (4) One P–H bond
[JEE (Main-Online) 2019]

Q.60 In which of the following processes, the bond order has increased and paramagnetic character has changed to diamagnetic?
(1) $O_2 \rightarrow O_2^{2-}$ (2) $O_2 \rightarrow O_2^{+}$ (3) $N_2 \rightarrow N_2^{+}$ (4) $NO \rightarrow NO^{+}$
[JEE (Main-Online) 2019]

Q.61 Two pi and half sigma bonds are present in :
(1) N_2^{+} (2) O_2^{+} (3) O_2 (4) N_2
[JEE (Main-Online) 2019]

Q.62 The number of 2-centre-2-electron and 3-centre-2-electron bonds in B_2H_6, respectively, are :
(1) 2 and 2 (2) 4 and 2 (3) 2 and 4 (4) 2 and 1
[JEE (Main-Online) 2019]

Q.63 The hydride that is NOT electron deficient is:
(1) SiH_4 (2) B_2H_6 (3) GaH_3 (4) AlH_3
[JEE (Main-Online) 2019]

Q.64 Each of the following options contains a set of four molecules. Identify the option(s) where all four molecules possess permanent dipole moment at room temperature. **[JEE (Main-Offline) 2019]**
(1) BF_3, O_3, SF_6, XeF_6 (2) $BeCl_2$, CO_2, BCl_3, $CHCl_3$
(3) NO_2, NH_3, $POCl_3$, CH_3Cl (4) SO_2, C_6H_5Cl, H_2Se, BrF_5

Q.65 Among B_2H_6, $B_3N_3H_6$, N_2O, N_2O_4, $H_2S_2O_3$ and $H_2S_2O_8$, the total number of molecules containing covalent bond between two atoms of the same kind is_____ **[JEE (Main-Offline) 2019]**

Q.66 Match the type of interaction in Column A with the distance dependence of their interaction energy in Column B :

	A		**B**
(I)	iron - ion	(a)	$\frac{1}{r}$
(II)	dipole - dipole	(b)	$\frac{1}{r^2}$
(III)	London dispersion	(c)	$\frac{1}{r^3}$
		(d)	$\frac{1}{r^6}$

(1) (I)-(a), (II)-(b), (III)-(c) (2) (I)-(a), (II)-(c), (III)-(d)
(3) (I)-(a), (II)-(b), (III)-(d) (4) (I)-(b), (II)-(d), (III)-(c)
[JEE (Main-Online) 2020]

Q.67 If the boiling point of H_2O is 373 K, the boiling point of H_2S will be :

(1) greater than 300 K but less than 373 K (2) less than 300 K

(3) equal to 373 K (4) more than 373 K

[JEE (Main-Online) 2020]

Q.68 In a molecule of pyrophosphoric acid, the number of P–OH, P = O and P–O–P bonds/moiety(ies) respectively are :

(1) 3, 3 and 3 (2) 2, 4 and 1 (3) 4, 2 and 0 (4) 4, 2 and 1

[JEE (Main-Online) 2020]

Q.69 Of the species, NO, NO^+, NO^{2+} and NO^-, the one with minimum bond strength is :

(1) $NO2^+$ (2) NO^+ (3) NO (4) NO^-

[JEE (Main-Online) 2020]

Q.70 An alkaline earth metal 'M' readily forms water soluble sulphate and water insoluble hydroxide. Its oxide MO is very stable to heat and does not have rock-salt structure. M is :-

(1) Ca (2) Be (3) Mg (4) Sr

[JEE (Main-Online) 2020]

Q.71 Among the sulphates of alkaline earth metals, the solubilities of $BeSO_4$ and $MgSO_4$ in water, respectively, are:

(1) high and high (2) poor and poor (3) high and poor (4) poor and high

[JEE (Main-Online) 2020]

Q.72 The number of CI = O bonds in perchloric acid is, "_____"

[JEE (Main-Online) 2020]

Q.73 The relative strength of interionic/intermolecular forces in decreasing order is

(1) ion-dipole > ion-ion > dipole-dipole (2) ion-dipole > dipole-dipole > ion-ion

(3) ion-ion > ion-dipole > dipole-dipole (4) dipole-dipole > ion-dipole >ion-ion

[JEE (Main-Online) 2020]

Q.74 The bond order and the magnetic characteristics and CN^- are

(1) 3, paramagnetic (2) $2\frac{1}{2}$, diamagnetic

(3) 3, diamagnetic (4) $2\frac{1}{2}$, paramagnetic

[JEE (Main-Online) 2020]

Q.75 The predominant intermolecular forces present in ethyl acetate, a liquid, are
(1) London dispersion, dipole-dipole and hydrogen bonding
(2) hydrogen bonding and London dispersion
(3) dipole-dipole and hydrogen bonding
(4) London dispersion and dipole-dipole

[JEE (Main-Online) 2020]

Q.76 If the magnetic moment of a dioxygen species is 1.73 B.M, it may be
(1) O_2 or O_2^+ (2) O_2^- or O_2^+ (3) O_2 or O_2^- (4) O_2, O_2^-, O_2^+

[JEE (Main-Online) 2020]

[JEE ADVANCED]

Q.1 In the dichromate anion **[JEE 1999]**

(A) 4 Cr - O bonds are equivalent (B) 6 Cr - O bonds are equivalent

(C) all Cr - O bonds are equivalent (D) all Cr - O bonds are non equivalent

Q.2 Amongst H_2O, H_2S, H_2Se and H_2Te, the one with the highest boiling point is **[JEE 2000]**

(A) H_2O because of hydrogen bonding (B) H_2Te because of higher molecular weight

(C) H_2S because of hydrogen bonding (D) H_2Se because of lower molecular weight

Q.3 The common features among the species CN^-, CO and NO^+ are **[JEE 2001]**

(A) Bond order three and isoelectronic (B) Bond other three and weak field ligands

(C) Bond order two and π – acceptors (D) Isoelectronic and weak field ligands

Q.4 Which of the following molecular species has unpaired electron(s)? **[JEE 2002]**

(A) N_2 (B) F_2 (C) O_2^- (D) O_2^{2-}

Q.5 According to molecular orbital theory which of the following statement about the magnetic character and bond order is correct regarding O_2^+ **[JEE 2004]**

(A) Paramagnetic and Bond order < O_2 (B) Paramagnetic and Bond order > O_2

(C) Diamagnetic and Bond order < O_2 (D) Diamagnetic and Bond order > O_2

Q.6 Decreasing order of the O–O bond length present in them

O_2, KO_2 and O_2 [AsF_4] **[JEE 2004]**

Q.7 Among the following, the paramagnetic compound is **[JEE 2007]**

(A) Na_2O_2 (B) O_3 (C) N_2O (D) KO_2

Q.8 The species having bond order different from that in CO is **[JEE 2007]**

(A) NO^- (B) NO^+ (C) CN^- (D) N_2

Q.9 **Statement-1** : p-Hydroxybenzoic acid has a lower boiling point than o-hydroxybenzoic acid.

because

Statement-2 : o-Hydroxybenzoic acid has intramolecular hydrogen bonding. **[JEE 2007]**

(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.

Q.10 The number of water molecule(s) directly bonded to the metal centre in $CuSO_4 . 5H_2O$ is **[JEE 2009]**

Q.11 Match each of the diatomic molecules in Column I with its property / properties in Column II. **[JEE 2009]**

	Column I		**Column II**
(A)	B_2	(P)	Paramagnetic
(B)	N_2	(Q)	undergoes oxidation
(C)	O_2^-	(R)	Undergoes reduction
(D)	O_2	(S)	Bond order ≥ 2
		(T)	Mixing of 's' and 'p' orbitals

Q.12 The nitrogen oxide(s) that contain(s) N–N bond(s) is (are) **[JEE 2009]**

(A) N_2O (B) N_2O_3 (C) N_2O_4 (D) N_2O_5

Q.13 Assuming that Hund's rule is violated, the bond order and magnetic nature of the diatomic molecule B_2 is **[JEE 2010]**

(A) 1 and diamagnetic (B) 0 and diamagnetic
(C) 1 and paramagnetic (D) 0 and paramagnetic

Q.14 The total number of diprotic acids among the following is **[JEE 2010]**

H_3PO_4 H_2SO_4 H_3PO_3 H_2CO_3 $H_2S_2O_7$
H_3BO_3 H_3PO_2 H_2CrO_4 H_2SO_3

Q.15 The difference in the oxidation numbers of the two types of sulphur atoms in $Na_2S_4O_6$ is **[JEE 2011]**

Q.16 With respect to graphite and diamond, which of the statement(s) given below is (are) correct?

(A) Graphite is harder than diamond **[JEE (Advanced) 2012]**
(B) Graphite has higher electrical conductivity than diamond.
(C) Graphite has higher thermal conductivity than diamond.
(D) Graphite has higher C–C bond order than diamond.

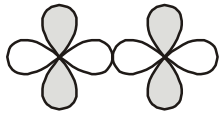
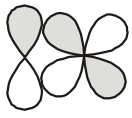
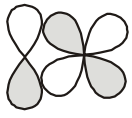
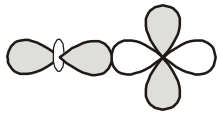
Q.17 Hydrogen bonding plays a central role in the following phenomena : **[JEE (Advanced) 2014]**

(A) Ice floats in water.
(B) Higher Lewis basicity of primary amines than tertiary amines in aqueous solutions
(C) Formic acid is more acidic than acetic acid.
(D) Dimerisation of acetic acid in benzene.

Q.18 Assuming 2s-2p mixing in NOT operative, the paramagnetic species among the following is **[JEE (Advanced) 2014]**

(A) Be_2 (B) B_2 (C) C_2 (D) N_2

Q.19 Match the orbital overlap figures shown in List-I with the description given in List-II and select the correct answer using the code given below the lists. **[JEE (Advanced) 2014]**

List-I		List-II	
P.		**1.**	p – d π antibonding
Q.		**2.**	d – d σ bonding
R.		**3.**	p – d π bonding
S.		**4.**	d – d σ antibonding

Code:

	P	**Q**	**R**	**S**
(A)	2	1	3	4
(B)	4	3	1	2
(C)	2	3	1	4
(D)	4	1	3	2

Q.20 The correct statement(s) regarding, (i) HClO, (ii) $HClO_2$, (iii) $HClO_3$ and (iv) $HClO_4$, is(are)
(A) The number of Cl = O bonds in (ii) and (iii) together is two
(B) The number of lone pairs of electrons on Cl in (ii) and (iii) together is three
(C) The hybridization of Cl in (iv) is sp^3
(D) Amongst (i) to (iv), the strongest acid is (i) **[JEE (Advanced) 2015]**

Q.21 The total number of lone pairs of electrons in N_2O_3 is : **[JEE (Advanced) 2015]**

Q.22 According to Molecular Orbital Theory, **[JEE (Advanced) 2016]**
(A) C_2^{2-} is expected to be diamagnetic
(B) O_2^{2+} is expected to have a longer bond length than O_2
(C) N_2^+ and N_2^- have the same bond order
(D) He_2^+ has the same energy as two isolated He atoms

Q.23 The colour of the X_2 molecules of group 17 elements changes gradually from yellow to violet down the group. This is due to **[JEE (Advanced) 2017]**
(A) the physical state of X_2 at room temperature changes from gas to solid down the group
(B) decrease in HOMO-LUMO gap down the group
(C) decrease in $\pi^*-\sigma^*$ gap down the group
(D) decrease in ionization energy down the group

Q.24 Among H_2, He_2^+, Li_2, Be_2, B_2, C_2, N_2, O_2^-, and F_2, the number of diamagnetic species is (Atomic numbers : H = 1, He = 2, Li = 3, Be = 4, B = 5, C = 6, N = 7, O = 8, F = 9) **[JEE (Advanced) 2017]**

Q.25 The order of the oxidation state of the phosphorus atom in H_3PO_2, H_3PO_4, H_3PO_3 and $H_4P_2O_6$ is **[JEE (Advanced) 2017]**

(A) $H_3PO_4 > H_3PO_2 > H_3PO_3 > H_4P_2O_6$ (B) $H_3PO_3 > H_3PO_2 > H_3PO_4 > H_4P_2O_6$
(C) $H_3PO_2 > H_3PO_3 > H_4P_2O_6 > H_3PO_4$ (D) $H_3PO_4 > H_4P_2O_6 > H_3PO_3 > H_3PO_2$

Q.26 Based on the compounds of group 15 elements, the correct statement(s) is (are)
(A) Bi_2O_5 is more basic than N_2O_5
(B) NF_3 is more covalent than BiF_3
(C) PH_3 boils at lower temperature than NH_3
(D) The N-N single bond is stronger than the P-P single bond **[JEE (Advanced) 2018]**

Q.27 The total number of compounds having at least one bridging oxo group among the molecules given below is ____.
N_2O_3, N_2O_5, P_4O_6, P_4O_7, $H_4P_2O_5$, $H_5P_3O_{10}$, $H_2S_2O_3$, $H_2S_2O_5$ **[JEE (Advanced) 2018]**

Q.28 Among B_2H_6, $B_3N_3H_6$, N_2O, N_2O_4, $H_2S_2O_3$ and $H_2S_2O_8$, the total number of molecules containing covalent bond between two atoms of the same kind is_____

[JEE (Advanced) 2019]

ADVANCE CHEMICAL BONDING

[JEE MAIN]

Q.1	2	Q.2	2	Q.3	3	Q.4	3	Q.5	2
Q.6	2	Q.7	3	Q.8	4	Q.9	1	Q.10	1
Q.11	1	Q.12	4	Q.13	2	Q.14	1	Q.15	1
Q.16	4	Q.17	1	Q.18	1,4	Q.19	2	Q.20	4
Q.21	3	Q.22	2	Q.23	4	Q.24	4	Q.25	2
Q.26	2	Q.27	2	Q.28	4	Q.29	1	Q.30	4
Q.31	2	Q.32	1	Q.33	2	Q.34	4	Q.35	3
Q.36	4	Q.37	1	Q.38	4	Q.39	4	Q.40	4
Q.41	2,4	Q.42	2	Q.43	4	Q.44	1	Q.45	3
Q.46	3	Q.47	4	Q.48	1	Q.49	2	Q.50	2
Q.51	4	Q.52	1	Q.53	2	Q.54	4	Q.55	3,4
Q.56	4.00	Q.57	1	Q.58	2	Q.59	2	Q.60	4
Q.61	1	Q.62	2	Q.63	4	Q.64	3,4	Q.65	4.00
Q.66	3	Q.67	2	Q.68	4	Q.69	4	Q.70	2
Q.71	1	Q.72	3.00	Q.73	3	Q.74	3	Q.75	4
Q.76	2								

[JEE ADVANCED]

Q.1	B	Q.2	A	Q.3	A	Q.4	C	Q.5	B
Q.7	D	Q.8	A	Q.9	D	Q.10	4		
Q.11	(A) P,Q,R, T (B) Q, R , S ,T (C) P, Q, R (D) P,Q,R, S					Q.12	ABC	Q.13	A
Q.14	6	Q.15	5	Q.16	BD	Q.17	ABD	Q.18	C
Q.19	C	Q.20	BC	Q.21	8	Q.22	AC	Q.23	BC
Q.24	Bonus	Q.25	D	Q.26	ABC	Q.27	6	Q.28	4.00