CHEMISTRY

BOOKS - DISHA PUBLICATION

CHEMISTRY (HINGLISH)

CHEMICAL BONDING AND MOLECULAR STRUCTURE

Jee Main 5 Years At Glance

1. Which of the following conversions involves change in both shape and hybridization?

A. $H_2O \rightarrow H_3O^+$

B. $BF_3 \rightarrow BF_4^-$

C. $CH_4C_2H_6$

D. $NH_3 \rightarrow NH_4^+$

Answer: B

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2. The incorrect geometry is represented by :

A. NF_3 trigonal planar

B. BF_3- trigonal planar

C. AsF_5- trigonal bipyramidal

D. H_2O – bent

Answer: A

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3. Which of the following compounds contain(s) no covalent bond(s)?

$KCl, PH_3, O_2, B_2H_6, H_2SO_4$

A. KCl, B_2H_6, PH_3

B. KCl, H_2SO_4

C. KCl

D. $KCl. B_2H_6$

Answer: C

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4. Total number of lone pair of electrons in I_3^- , ion is:

A. 3

B. 6

C. 9

D. 12

Answer: C

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5. sp^3d^2 hybridization is not displayed by :

A. BrF_5

B. SF_6

C. $[CrF_6]^{3-}$

D. PF_5

Answer: D

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6. Which of the following is paramagnetic?

A. NO^-

B. CO

C. O_2^{2-}

D. B_2

Answer: D

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7. Which of the following species is not paramagnetic?

A. NO

B. CO

C. O_2

D. B_2

Answer: B

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8. The group of molecules having identical shape is:

A. PCl_5IF_5, XeO_2F_2

B. BF_3, PCl_3, XeO_3

C. SF_4, XeF_4, CCl_4

D. $CIF_3, XeOF_2, XeF_3^+$

Answer: D

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9. The species in which the N-atom is in a state of sp hybridisation is

A. NO_3^-

B. NO_2

C. NO_3^+

D. NO_2^-

Answer: C

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10. The intermolecular interaction that is dependent on the inverse cube of distance between the molecules is

A. London force

B. hydrogen bond

C. ion-ion interaction

D. ion-dipole interaction

Answer: B

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

A. N_2

B. NO_2^-

C. N_2^{2+}

D. O_2^{2-}

Answer: B

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12. Which one of the following properties is not shown by NO ? .

A. It is diamagnetic in gaseous state

B. It is neutral oxide

C. It combines with oxygen to form nitrogen dioxide

D. It's bond order is 2.5

Answer: A

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Exercise 1 Concept Builder Topicwise Topic 1 Electrovalent Covalent And Coordinate Bonding

1. Out of the following which compound will have electrovalent bonding

A. P and CI

B. NH_3 and BF_3

C. H and Ca

D. H and S

Answer: C

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2. Which of the following has a giant covalent structure?

A. PbO_2

B. SiO_2

C. $NaCl$

D. $AlCl_3$

Answer: C

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3. Which one of the following contains a co-ordinate covalent bond?

A. H_2O

B. HCl

C. $BaCl_2$

D. $\overset{+}{N}_2H_5$

Answer: D

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4. The number of dative bonds in sulphuric acid molecule is

A. 0

B. 1

C. 2

D. 4

Answer: C

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5. Which of the following statements is not true about covalent compounds ?

A. They may exhibit space isomerism

B. They have low melting and boiling points

C. They show ionic reactions

D. They show molecular reactions

Answer: C

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6. Indicate the nature of bonding in CCl_4 and CaH_2

A. Covalent in CCI_4 and electrovalent in CaH_2

B. Electrovalent in both CCI_4 and CaH_2

C. Covalent in both CCI_4 and CaH_2

D. Electrovalent in CCI_4 and covalent in CaH_2

Answer: A

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7. Lattice energy of an ionic compound depedns upon :

A. charge on the ion and size of the ion

B. packing of ions only

C. size of the ion only

D. charge on the ion only

Answer: A

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8. Which compound will show the highest lattice energy ?

A. KF

B. NaF

C. CsF

D. RbF

Answer: B

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9. The compound that has the higest ionic character associated with the X-Cl bond is :

A. PCl_5

B. BCl_3

C. CCl_4

D. $SiCl_4$

Answer: D

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10. Which combination of atoms can form a polar covalent bond?

A. H and H

B. H and F

C. N and N

D. Na and F

Answer: B

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11. Which of the following pairs will form the most stable ionic bond ?

A. Na and Cl

B. Mg and F

C. Li and F

D. Na and F

Answer: B

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12. In which of the following species central atom is NOT surrounded by exactly 8 valence electrons ?

A. BF_4^-

B. NCl_4

C. PCl_4^+

D. SF_4

Answer: D

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13. Which of the following does not apply to metallic bond ?

A. Overlapping valence orbitals

B. Mobile valency electrons

C. Delocalized electrons

D. Highly directed bonds

Answer: D

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14. Which set contains only covalently bonded molecules ?

A. $BCl_3, SiCl_4PCl_3$

B. NH_4, Br, N_2H_4HBr

C. I_2, H_2S, NaI

D. Al, O_3As_4

Answer: A

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15. Among $LiCI$, $RbCI$, $BeCI_2$ and $MgCI_2$ the compound with the greatest and least ionic character respectively are

A. $LiCI$ and $RbCl$

B. $RbCl$ and $BeCl_2$

C. $MgCl_2$ and $BeCl_2$

D. $RbCl$ and $MgCl_2$

Answer: B

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16. The correct sequence of increasing covalent character is represented by

A. $LiCl < NaCl < BeCl_2$

B. $BeCl_2 < LiCl < NaCl$

C. $NaCl < LiCl < BeCl_2$

D. $BeCl_2 < NaCl < LiCl$

Answer: C

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17. Which of the following statement is correct?

A. $FeCl_2$ is more covalent than $FeCl_3$

B. $FeCl_3$ is more covalent than $FeCl_2$

C. Both $FeCl_2$ and $FeCl_3$ are equally covalent.

D. $FeCl_2$ and $FeCl_3$ do not have any covalent character.

Answer: B

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Exercise 1 Concept Builder Topicwise Topic 2 Octet Rule Resonance Dipole Moment And Bond Polarity

1. A pair of compounds which has odd electrons in the group NO, CO, CIO, N_2, SO_2 and O_3 are

A. No and CIO_2

B. CO and SO_2

C. CIO_2 and CO

D. SO_2 and O_3

Answer: A

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2. Point out incorrect statement about resonance

A. Resonance structures should have equal energy

B. In resonance structures, the constituent atoms should be in the same position

C. In resonance structures, there should not be the same number of electron pairs

D. Resonance structures should differ only in the location of electrons around the constituent atoms

Answer: C

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3. In the cyanide ion, the formal negative charge is on :

A. C

B. N

C. Both C and N

D. resonate between C and N

Answer: B

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4. Among the following, the species having the smallest bond is

A. NO^-

B. NO^+

C. O_2

D. NO

Answer: B

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5. The bond length of $C = O$ bond in CO is 1.20Å and in CO_2 it is 1.34Å Then $C = O$ bond length in CO_3^{2-} will be .

A. 1.50Å

B. 1.34Å

C. 1.29Å

D. 0.95Å

Answer: C

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6. Which of the following would have a permanent dipole moment ?

A. SiF_4

B. SF_4

C. XeF_4

D. BF_3

Answer: B

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7. Dipole moment is shown by

A. cis-1, 2-dichloroethene

B. trans-1, 2-dichloroethene

C. trans-2, 3-dichloro-2 pentene

D. Both (a) and (c)

Answer: D

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8. Which of the following salt shows maximum covalent character?

A. $AlCl_3$

B. $MgCl_3$

C. $CsCl$

D. $LaCl_3$

Answer: A

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9. Pauling's electronegativity values for elements are useful in predicting

A. polarity of bonds in molecules

B. ionic and covalent nature of bonds

C. coordination number

D. both (a) and (b)

Answer: D

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10. Which of the following substances has the greatest ionic character ?

A. Cl_2O

B. NCl_3

C. $PbCl_2$

D. $BaCl_2$

Answer: D

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11. Which bond angle, θ would result in the maximum dipole moment for the triatomic molecule XY_2 ?

A. $\theta = 90^\circ$

B. $\theta = 120^\circ$

C. $\theta = 150^\circ$

D. $\theta = 180^\circ$

Answer: A

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12. polarisibility of halide ions increasing in the order

A. F^-, I^-, Br^-, Cl^-

B. Cl^-, Br^-, I^-, F^-

C. I^-, Br^-, Cl^-, F^-

D. F^-, Cl^-, Br^-, I^-

Answer: D

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13. If one assume linear structure instead of bent structure for water then which on of the following properties cannot be explained ? .

A. The formation of intermolecular hydrogen bond in water.

B. The high boiling point of water

C. Solubility of polar compounds in water

D. Ability of water to form coordinate covalent bond.

Answer: C

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Exercise 1 Concept Builder Topicwise Topic 3 Vsepr Theory Vbt Theory And Hybridization

1. The angle between the overlapping of one s-orbital and one p-orbital is

A. 180°

B. 120°

C. $109^\circ 28^\circ$

D. $120^\circ 60'$

Answer: A

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2. The equilateral shape has

A. sp hybridisation

B. sp^2 hybridisation

C. sp^3 hybridisation

D. None of these

Answer: B

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3. Which one of the following has the shortest carbon-carbon bond length ?

A. Benzene

B. Ethene

C. Ethyne

D. Ethane

Answer: C

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4. Which of the following does not have a tetrahedral structure ?

A. BH_4

B. BH_3

C. NH_4^+

D. CH_4

Answer: B

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5. In which one of the following molecules , the central atom said to adopt sp^2 hybridisation ?

A. BeF_2

B. BF_2

C. C_2H_2

D. NH_2

Answer: B

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6. Which of the following two are isostructural?

A. NH_3BF_3

B. PCl_3, ICl_5

C. XeF_2, IF_2^-

D. CO_3^{-2}, SO_3^{-2}

Answer: C

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7. The decreasing valuse of bond angles from $NH_3(106^\circ)$ to $SbH_3(101^\circ)$ down group -15 of the periodic table is due to .

A. decreasing bp-bp repulsion

B. decreasing electronegativity

C. increasing bp-bp repulsion

D. increasing lp-bp repulsion

Answer: A

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

A. SiF_4 and SF_4

B. IO_3^- and XeO_3

C. BH_4^- and NH_4^+

D. PF_6^- and SF_6

Answer: A

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9. Which of the following molecules has trigonal planar geometry ?

A. BF_3

B. NH_3

C. PCl_3

D. IF_3

Answer: A

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10. Linear combination of two hybridised orbitals belonging to the two atoms , each having one electron leads to a

A. sigma bond

B. double bond

C. co-ordinate covalent bond

D. pi bond.

Answer: A

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11. Which of the following statement is not correct for sigma and pi- bonds formed between two carbon atoms ?

A. Sigma-bond determines the direction between carbon atoms but a pi-bond has no primary effect in this regard

B. Sigma-bond is stronger than a pi-bond

C. Bond energies of sigma- and pi-bonds are of the order of 264 kJ/mol and 347 kJ/mol, respectively

D. Free rotation of atoms about a sigma-bond is allowed but not in case of a pi-bond

Answer: C

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12. How many sigma and pi bonds are present in toluene ?

A. $3\pi + 8\sigma$

B. $3\pi + 8\sigma$

C. $3\pi + 15\sigma$

D. $6\pi + 3\sigma$

Answer: C

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13. The type of bonds present in sulphuric anhydride

A. 3σ and there $p\pi - d\pi$

B. 3σ one $p\pi - p\pi$ and two $p\pi - d\pi$

C. 2σ and three $p\pi - d\pi$

D. 2σ and two $p\pi - d\pi$

Answer: B

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14. How many sigma bonds are in a molecule of diethyl ether, $C_2H_5OC_2H_5$?

A. 14

B. 12

C. 8

D. 16

Answer: A

15. Which of the following statements is not correct?

A. Hybridisation is the mixing of atomic orbitals prior to their combining into molecular orbitals

B. sp^2 hybrid orbitals are formed from two p-atomic orbitals and one s-orbital

C. d^2sp^3 hybrid orbitals are directed towards the corners of a regular octahedron

D. dsp^3 hybrid orbitals are all at 90° to one another

Answer: D

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16. Which of the following species has a linear shape ?

A. SO_2

B. NO_2^+

C. CH_4

D. NO_2^-

Answer: B

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17. Which molecule is planar?

A. SF_4

B. XeF_4

C. NF_3

D. SiF_4

Answer: B

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18. Amongst the following, the molecule/ion that is linear is:

A. SO_2

B. CO_2

C. CkO_2^-

D. NO_2^-

Answer: B

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19. The trigonal bipyramidal geometry results from the hybridisation

A. dsp^3 or sp^3d

B. dsp^2 or sp^2d

C. d^2sp^3 or sp^3d^2

D. None of these

Answer: A

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20. The true statements from the following are

1. PH_5 and $BiCl_5$ do not exist

2.$\pi\pi - d\pi$ bond is present in SO_2

3. Electrons travel with the speed of light

4. SeF_4 and CH_4 have same shape

5. I_4^+ has bent geometry

A. 1,3

B. 1,2,5

C. 1,3,5

D. 1,2,4

Answer: B

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21. The hybrid state of S in SO_2, is similar to that of

A. C in C_2H_2

B. C in C_2H_4

C. C in CH_4

D. C in CO_2

Answer: B

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22. Match List I with List II and select the correct answer:

	List I(ion)	1	List II (Shapes)
A	ICl_2^-	1	Linear
B	BrF_2^+	2	Pyramidal
C	CIF_4^-	3	Tetrahedral
D	$AICl_4^-$	4	Square planar
		5	Angular

A.

A	B	C	D
1	2	4	5

B.

A	B	C	D
4	5	2	3

C.

A	B	C	D
1	2	4	3

D.

A	B	C	D
5	1	3	4

Answer: C

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23. All bond angles are exactly equal to $109^\circ 28'$ in:

A. methyl chloride

B. iodoform

C. chloroform

D. carbon tetrachloride

Answer: D

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24. Which of the least bond angle ?

A. NH_3

B. BeF_2

C. H_2O

D. CH_4

Answer: C

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25. The shape of IF_6^- is :

A. Trigonally distorted octahedron

B. Pyramidal

C. Octahedral

D. Square antiprism

Answer: A

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26. Which of the following has the square planar structure?

A. XeF_4

B. NH_4^+

C. BF_4^-

D. CCl_4

Answer: A

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27. In which of the following pair both the species have sp^3 hybridization?

A. H_2S, BF_3

B. SiF_4, BeH_2

C. NF_3, H_2O

D. NF_3, BF_3

Answer: C

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28. In which of the following pairs, the two species are isostructural :

A. SO_3^{2-} and NO_3^-

B. BF_3 and NF_3

C. BrO_3^- and XeO_3

D. SF_4 and XeF_4

Answer: C

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29. The structure of the noble gas compound XeF_4 is :

A. square planar

B. distorted tetrahedral

C. tetrahedral

D. octahedral

Answer: A

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30. Which is the following pairs of species have identical shapes ?

A. NO_2^+ and NO_2^-

B. PCl_5 and BrF_5

C. XeF_4 and ICl_4^-

D. $TeCl_4$ and XeO_4

Answer: C

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31. Amongst NO_3^-, AsO_3^{3-}, CO_3^{2-}, ClO_3^-, SO_3^{2-} and BO_3^{2-}, the non-planar species are :

A. $CO_3^2, SO_3^{2-}, BO_3^{-3}$

B. $AsO_3^{-3-}, ClO_3^-, SO_3^{2-}$

C. $NO_3^-, CO_3^{2-}, BO_3^{3-}$

D. $SO_3^2 - NO_3^-, BO_3^{3-}$

Answer: B

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32. What is the shape of the IBr_2^- ion ?

A. Linear

B. Bent shape with bond angle of about 90°

C. Bent shape with bond angle of about 109°

D. Bent shape with bond angle of about 120°

Answer: A

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33. According to VSEPR theory, in which species do all the atoms lie in the same plane?

1 CH_3^+ 2 CH_3^-

A. 1 only

B. 2 only

C. both 1 and 2

D. neither 1 or 2

Answer: A

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34. Which bonds are formed by a carbon atom with sp^2-hybridisation ?

A. 4π bonds

B. 2π- bonds and 2σ bonds

C. 1π bond and 3σ bonds

D. 4σ bonds

Answer: C

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35. SF_2, SF_4 and SF_6 have the hybridisation at sulphur atom respectively as .

A. sp^2, sp^3, sp^2d^2

B. sp^3, sp^3, sp^3d^2

C. sp^3, sp^3d, sp^3d^2

D. sp^3, spd^2, d^2sp^3

Answer: C

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36. A sigma-bonded molecule MX_3 is T-shaped. The number of non-bonding pairs of electrons is

A. 2

B. 1

C. 0

D. Can be predicted only if atomic number of M is known

Answer: A

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Exercise 1 Concept Builder Topicwise Topic 4 Mot And Hydrogen Bonding

1. The bond order in N_2^+ ion is _____.

A. 1.5

B. 3.0

C. 2.5

D. 2.0

Answer: C

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2. The molecular electronic configuration of H_2^+ ion is?

A. $\left(\sigma 1s^2\right)$

B. $\left(\sigma 1s^2\right)\left(\sigma^* 1s^2\right)$

C. $\left(\sigma 1s^2\right)\left(\sigma^* 1s^1\right)$

D. $\left(\sigma 1s^1\right)$

Answer: C

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3. During change of $NO^+ \rightarrow NO$, the electron is added to

A. σ-orbital

B. π-orbital

C. σ^*- orbital

D. $\pi^* -$ orbital

Answer: D

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4. The correct statement with regard to H_2^+ and H_2^- is

A. Both H_2^+ and H_2^- do not exist

B. H_2^- is more stable than H_2^+

C. H_2^+ is more stable than H_2^-

D. Both H_2^+ and H_2^- are equally stable

Answer: C

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5. Which of the following molecules/ins does not contain unpaired electrons?

A. N_2^+

B. O_2

C. O_2^{2-}

D. B_2

Answer: C

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6. Which of the following MO's has two nodal planes?

A. $\pi 2p_y$

B. $\sigma 2s$

C. $\pi^* 2p_y$

D. $\sigma^* 2p_z$

Answer: C

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7. Which of the following combination is not allowed in the $LCAO$ method for the

formation of molecular orbital (consider Z-axis as the molecular axis) ? .

A. $s + p_x$

B. $s + p_z$

C. $p_x + p_x$

D. $p_z + p_z$

Answer: A

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8. Of the following hydrides which one has the lowest boiling point ?

A. AsH_3

B. SbH_3

C. PH_3

D. NH_3

Answer: C

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9. Which one of the following is the correct order of interactions ?

A. covalent $<$ hydrogen bonding van der Waals $<$ dipole- dipole

B. van der Waals $<$ hydrogen bonding $<$ dipole-dipole $<$ covalent

C. van der Waals $<$ dipole-dipole $<$ hydrogen bonding $<$ covalent

D. dipole-dipole $<$ van der Waals $<$ hydrogen bonding $<$ covalent

Answer: C

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10. An ether is more volatile than an alcohol having the same molecualr formula. This is due to -

A. alcohols having resonance structures

B. intermolecular hydrogen bonding in ethers

C. intermolecular hydrogen bonding in alcohols

D. dipolar character of ethers

Answer: C

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11. Which one of the following molecules will form a linear polymeric structure due to hydrogen bonding?

A. NH_3

B. H_2O

C. HCl

D. HF

Answer: D

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12. Hydrogen bonding is maximum in:

A. C_2H_5OH

B. CH_3OCH_3

C. $(CH_3)_2C=O$

D. CH_3CHO

Answer: A

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13. What is the dominant intermolecular forces or bond that must be overcome in converting liquid CH_3OH to gas ?

A. Dipole-dipole interaction

B. Covalent bonds

C. London dispersion force

D. Hydrogen bonding

Answer: D

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14. Which of the following is not true about H_2O molecule ?

A. The molecule has $\mu = 0$

B. The molecule can act as a base

C. Shows abnormally high boiling point in comparison to the hydrides of other elements of oxygen group

D. The molecule has a bent shape

Answer: A

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Exercise 2 Concept Applicator

1. Correct set of species with zero dipole moment is :

(i)

$CO_2 \quad (ii) COCl_2 \quad (iii) CH_2Cl_2 \quad (iv) BCl_3$

A. (i) and (iv)

B. (ii) and (iv)

C. (iii) and (iv)

D. (i), (iii) and (iv)

Answer: A

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2. Match List I and List II and pick out correct matching codes from the given choices :

List I Compound	List II Structure
A. ClF_3	1. Square planar
B. PCl_5	2. Tetrahedral
C. IF_5	3. Trigonal bipyramidal
D. CCl_4	4. Square pyramidal
E. XeF_4	5. *T*-shaped

A. A-5, B-4, C-3, D-2, E-1

B. A-5, B-3, C-4, D-2, E-1

C. A-5, B-3, C-4, D-1, E-2

D. A-4, B-3, C-5, D-2, E-1

Answer: B

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3. Which of the following is correct order of σ - bond strength ?

I. 2s-2s

II. 2s-2p

III. 2p-2p

IV. 3s-3s

A. $I > II > III > IV$

B. $III > II > I > IV$

C. $IV > I > II > III$

D. $III > I > II > IV$

Answer: B

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4. In pyrophosphoric acid, $H_4P_2O_7$, number of σ and $d\pi - p\pi$

A. 8 and 2

B. 6 and 2

C. 12 and zero

D. 12 and 2

Answer: D

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5. Arrange the following ions in the order of decreasing $X - O$ bond length where X is the central atom:

A. ClO_4^-, SO_4^{2-}, PO_4^{2-}, SiO_4^-

B. $SiO_4^{4-}, PO_4^{3-}, SO_4^{2-}, ClO_4^-$

C. $SiO_4^{4-}, PO_4^{3-}, ClO_4^-, SO_4^{2-}$

D. $SiO_4^{4-}, SO_4^{2-}, PO_4^{3-}, ClO_4^-$

Answer: B

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6. Which of the following statements is correct in the context of the allene molecule, C_3H_4 ?

A. The central carbon is sp hybridized

B. The terminal carbon atoms are sp^2 hybridized

C. The planes containing the CH_2 groups are mutually perpendicular to permit the formations two separate $\pi -$ bonds

D. All are correct

Answer: D

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7. Which of the following set contains species having same angle around the central atom?

A. SF_4, CH_4, NH_3

B. NF_3, BCl_3, NH_3

C. $BF_3, NF_3, AlCl_3$

D. BF_3, BCl_3, BBr_3

Answer: D

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8. Bond angle between two hybrid orbitals is 105° Percentage of s-orbital character of hybrid orbital is between

A. 50-55%

B. 9-12%

C. 22-23%

D. 11-12%

Answer: C

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9. The group of molecules having identical shape is:

A. PCl_5, IF_5, XeO_2F_2

B. BF_3, PCl_3, XeO_3

C. $SF_4XeF_4CCl_4$

D. $ClF_3, XeOF_2, XeF_3^+$

Answer: D

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10. The shapes of XeF_4, XeF_5^- and $SnCl_2$ are :

A. octahedral, trigonal bipyramidal and bent

B. square pyramidal, pentagonal planar and linear

C. square planar, pentagonal planar and angular

D. see-saw, T-shaped and linear

Answer: C

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11. Which of these statements is not true?

A. NO^+ is isoelectronic with O_2

B. B is always covalent in its compounds

C. In aqueous solution, the Tl^+ ion is much more stable than Tl (III)

D. $LiAlH_4$ is a versatile reducing agent in organic synthesis.

Answer: A

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12. The statement true for N_3^- is

A. It has a non-linear structure

B. It is called pseudo halogens

C. The formal oxidation state of N in this anion is -1

D. It is isoelectronic with NO_2

Answer: C

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13. The dipole moments of diatomic molecules AB and CD are 10.41D and 10.27 D, respectively while their bond distances are 2.82 and 2.67Å respectively. This indicates that

A. bonding is 100% ionic in both the molecules

B. AB has more ionic bond character than CD

C. AB has lesser ionic bond character than CD

D. bonding is nearly covalent in both the molecules

Answer: C

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14. The electronegaivity difference between N and F is greater than that between N and H yet the dipole moment of NH_2 (1 .5 D) is larger than that of $NF_3(0.\ 2D)$. This is because :

A. in NH_3, the atomic dipole and bond dipole are in the same direction, whereas in NF_3 these are in opposite directions

B. in NH_3 as well as NF_3, the atomic dipole and bond dipole are in opposite directions

C. in NH_3 the atomic dipole and bond dipole are in the opposite directions, whereas in NF_3 these are in the same direction

D. in NH_3 as well as in NF_3, the atomic dipole and bond dipole are in the same direction

Answer: A

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15. The charge/size ratio of a cation determines its polarizing power. Which one of the following sequences represents the increasing order of

the polarizing power of the cationic species, $K^+, Ca^{2+}, Mg^{2+}, Be^{2+}$

A. $Ca^{2+} < Mg^{2+} < Be^{+} < K^{+}$

B. $Mg^{2+} < Be^{2+}, < K^{+}Ca^{2+}$

C. $Be^{2+} < K^{+} < Ca^{2+} < Mg^{2+}$

D. $K^{+} < Ca^{2+} < Mg^{2+} < Be^{2+}$

Answer: D

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16. The resultant dipole moment (μ) of two compounds NOF and NO_2F is $1.81D$ and $0.47D$ respectively Which dipole momnet do you predict ? .

A. 1.81 D for NO_2F and 0.47 D for NOF

B. 0.47 D for NO_2F and 1.81 D for NOF

C. For both NO_2F and NOF, dipole moment (μ) is 1.81 D

D. For both NO_2F and NOF, dipole moment (μ) is 0.47 D

Answer: B

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17. The BCl_3 is a planar molecule whereas NCI_3 is pyramidal because

A. B-Cl bond is more polar than N-Cl bond

B. N-Cl bond is more covalent than B-Cl bond

C. nitrogen atom is smaller than boron atom

D. BCI_3 has no lone pair but NCI_3 has a lone pair of electrons

Answer: D

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18. The cylindrical shape of alkynes is due to

A. three sigma C-C bonds

B. two sigma C-C and one $'\pi' C-C$ bonds

C. three $'\pi' C-C$ bonds

D. one sigma C-C and two $'\pi' C-C$ bonds

Answer: D

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19. The AsF_5 molecule is trigonal bipyramidal. The orbitals used by As for hybridisation are

A. $d_{x^2-y^2}, d_z, s, p_x, p_y$

B. d_{xy}, s, p_x, p_y, p_z

C. $p, p_x, p_y, p_z, d_{z^2}$

D. $d_{x^2-y^2}, s, p_x, p_y, p_z$

Answer: C

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20. The correct order of O - O bond length in $O_2H_2O_2$ and O_3 is

A. $O_2 > O_3 > H_2O_2$

B. $O_3 > H_2O_2 > O_2$

C. $O_2 > H_2O_2 > O_3$

D. $H_2O_2 > O_3 > O_2$

Answer: D

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21. The number and type of bonds in c_2^{2-} ion in CaC_2 are

A. One σ bond and one π-bond

B. One σ bond and two π-bond

C. Twoσ bond and two π-bond

D. Twoσ bond and one π-bond

Answer: D

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22. In which of the following sets, all the given species are isostructural ?

A. CO_2, NO_2, ClO_2, SiO_2

B. $PCl_3, Al, Cl_3, BCl_3, SbCl_3$

C. BF_3, NF_3, PF_3, AlF_3

D. $BF_4^-, CCl_4, NH_4^+, PCl_4^+$

Answer: D

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23. Correct statement about VBT is .

A. Each bond is formed by maximum overlap for its maximum stability

B. It represents localised electron modal of bonding.

C. Most of the electrons retain the same orbital localisation as in a separate atom,

D. All are correct.

Answer: D

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24. Which of the following species used both axial set of d-orbitals in hybridisation of central atom ?

A. PBr_4^+

B. PCl_4^-

C. ICl_4^-

D. None of these

Answer: C

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25. The relationship between the dissociation energy of N_2 and N_2^+ is

A. Dissociation energy of $N_2^+ =$ dissociation energy of N_2

B. Dissociation energy of $N_2 =$ dissociation energy of N_2^+

C. Dissociation energy of $N_2 >$ dissociation energy of N_2^+

D. Dissociation energy of N_2 can either be lower or higher than the dissociation energy of N_2^+

Answer: C

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26. 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

A. $H_2 > B_2 > Li_2$

B. $H_2 > Li_2 > B_2$

C. $Li_2 > B_2 > H_2$

D. $B_2 > H_2 > Li_2$

Answer: B

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

A. $1.30\text{Å}, 1.49\text{Å}, 1.12\text{Å}, 1.21\text{Å}$

B. $1.49\text{Å}, 1.21\text{Å}, 1.12\text{Å}, 1.30\text{Å}$

C. $1.21\text{Å}, 1.12\text{Å}, 1.49\text{Å}, 1.30\text{Å}$

D. $1.12\text{Å}, 1.21\text{Å}, 1.30\text{Å}, 1.49\text{Å}$

Answer: D

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28. In forming $(i) N_2 \rightarrow N_2^{\oplus}$ and $O_2 \rightarrow O_2^{\oplus}$ the electrons respectively removed from .

A.

$(\pi * 2p_y \text{ or } \pi^* 2p_x)$ and $(\pi^* 2p_y \text{ or } p^* 2p_x)$

B. $(\pi 2p_y \text{ or } \pi 2p_x)$ and $(\pi 2p_y \text{ or } \pi 2p_x)$

C. $(\pi 2p_y \text{ or } \pi 2p_x)$ and $(\pi^* 2p_y \text{ or } \pi^* 2p_x)$

D. $(\pi^* 2p_y \text{ or } \pi^* 2p_x)$ and $(\pi 2p_y \text{ or } \pi 2p_x)$

Answer: C

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29. The energy of σ_{2s}, is greater than that of σ_{1s}^{*} orbital because

A. $2\sigma s$ is bigger than$\sigma^{*}1sMO$

B. $\sigma 2s$ is bonding whereas $\sigma^{*}1s$ is an ABMO

C. $\sigma 2s$ orbital has a greater value of n than $\sigma^{*}1sMO$

D. $\sigma 2s$ orbital is formed only after $\sigma 1s$

Answer: C

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30. Which statement is correct?

A. m.p of H_2O, NH_3 are maximum in their respective group due to intermolecular H-bonding

B. b.p. of CH_4 our ot CH_4, SiH_4, GeH_4 and SnH_4 is least due to weak intermolecular force of attraction

C. formic acid forms dimer by H-bonding

D. all are correct

Answer: D

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