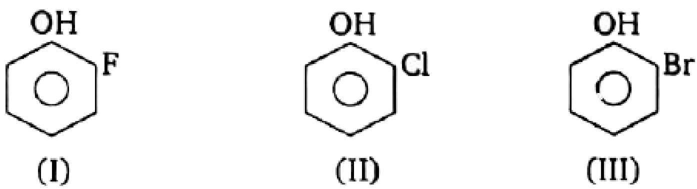
CHEMISTRY

BOOKS - VK JAISWAL CHEMISTRY (HINGLISH)

CHEMICAL BONDING (BASIC)

Level 1

1. The correct order of boiling point is :



A. $I > II > III$

B. $III > II > I$

C. $II > I > III$

D. $III > I > II$

Answer: B

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2. 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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3. The boiling points at atmospheric pressure of HF, H_2S, NH_3 can be arranged in the following order :

A. $HF > NH_3 > H_2S$

B. $HF > H_2S > NH_3$

C. $HF < H_2S < NH_3$

D. $HF < NH_3 < H_2S$

Answer: A

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4. The correct order of strength of $H -$ bond in the following compound :

A. $H_2O > H_2O_2 > HF > H_2S$

B. $HF > H_2O_2 > H_2O_2 > H_2S$

C. $HF > H_2O > H_2S > H_2O_2$

D. $HF > H_2O > H_2O_2 > H_2S$

Answer: D

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5. Which compound has electrovalent, covalent, co-ordinate as well as hydrogen bond ?

A. $\left[Cu(H_2O)_4\right]SO_4.\ H_2O$

B. $\left[Zn(H_2O)_6\right]SO_4.\ H_2O$

C. $\left[Fe(H_2O)_6\right]SO_4.\ H_2O$

D. $\left[Fe(H_2O)_6\right]Cl_3$

Answer: A

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6. 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 out of 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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7. Which of the following molecules are expected to exhibit intermolecular H-bonding ?

(I) Acetic acid ((II) o-nitrophenol (III) m-nitrophenol (IV)o-boric acid

Select correct alternate :

A. I, II, III

B. I,II,IV

C. I,III,IV

D. II,III,IV

Answer: C

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8. Which of the following compounds can form H-bonding with each other ?

A. CH_3COOH and H_2O

B. Phenol and CH_4

C. CHF_3 and acetone

D. PH_3 and HF

Answer: A

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9. BF_3 and NF_3 both are covalent compounds but NF_3 is polar whereas BF_3 is non-polar. This is because :

A. Nitrogen atom is smaller than boron atom

B. N-F bond is more polar than B-F bond

C. NF_3 is pyramidal whereas BF_3 is planar triangular

D. BF_3 is electron deficient whereas NF_3 is not

Answer: C

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10. Dipole moment of NF_3 is smaller than :

A. NH_3

B. CO_2

C. BF_3

D. CCl_4

Answer: A

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11. Which of the following molecules will have polar bonds but zero dipole moment?

A. O_2

B. $CHCl_3$

C. CF_4

D. none of these

Answer: C

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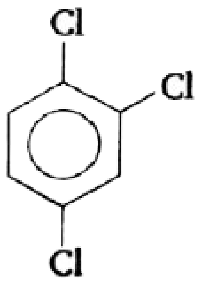
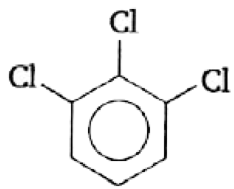
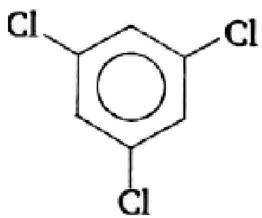
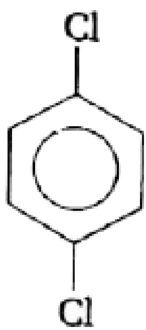
12. Which has maximum dipole moment?

A. 

B. 

C. 

D. 

Answer: B

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13. Which of the following compound is planar and non-polar ?

A. XeO_4

B. SF_4

C. XeF_4

D. CF_4

Answer: C

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14. H_2O has a net dipole moment while BeF_2 has zero dipole moment because :

A. F is more electronegativity than oxygen

B. Be is more electronegativity than oxygen

C. H_2O molecule is linear and BeF_2 is bent

D. BeF_2 molecule is linear and H_2O is bent

Answer: D

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

(i) CO_2 $(ii) COCl_2$ $(iii) CH_2Cl_2$ $(iv) BCl_3$

A. I and iv

B. ii and iv

C. iii and iv

D. I, iii and iv

Answer: A

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16. Which pair of molecules are polar species ?

A. CO_2 and H_2O

B. BF_3 and PCl_3

C. SO_2 and SCl_2

D. CS_2 and SO_3

Answer: C

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17. In which molecule does the chlorine have the most positive partial charge?

A. HCl

B. BrCl

C. Ocl_2

D. SCl_2

Answer: C

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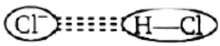
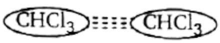
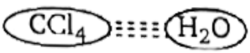
18. Which of the following attraction is strongest ?

A. 

B. 

C. 

D. 

Answer: D

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19. Which is distilled first ?

A. Liquid H_2

B. Liquid CO_2

C. Liquid O_2

D. Liquid N_2

Answer: A

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20. Molecular size of ICI and Br_2 is nearly same but $b.pt.$ of ICI is about 40° higher than BR_2 . This is due to :

A. Icl bond is stronger than Br-Br bond

B. IE of iodine $<$ IE of bromine

C. Icl is polar while Br_2 is nonpolar

D. I has larger size than Br

Answer: C

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21. Which of the following order of molecular force of attraction among given species is incorect ?

A. $HI > HBr > Cl_2$

B. $CH_3Cl > CCl_4 > CH_4$

C. n-pentane $>$ iso-pentane $>$ neo-pentane

D. $OH_2 > O(CH_3)_2 > OBr_2$

Answer: D

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22. Which gas should not be collected over water because of its high solubility in water ?

A. H_2

B. N_2

C. CH_4

D. HCl

Answer: D

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23. Low melting point is expected for a solid :

A. Ionic solid

B. Metallic solid

C. Molecular solid

D. Covalent solid

Answer: C

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24. Which substance has the strongest London dispersion forces ?

A. SiH_4

B. CH_4

C. SnH_4

D. GeH_4

Answer: C

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25. Which of the following compounds has the lowest boiling point ?

A. HF

B. HCl

C. HBr

D. HI

Answer: B

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26. When the substances Si, KCl, CH_3OH and C_2H_6 are arranged in order of increasing melting point, what is the correct order ?

A. Si, KCl, CH_3OH, C_2H_6

B. CH_3OH, C_2H_6, Si, KCl

C. KCl, Si, C_2H_6, CH_3OH

D. C_2H_6, CH_3OH, KCl, Si

Answer: D

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27. Which substance has the highest melting point ?

A. CO

B. CO_2

C. SiO_2

D. P_2O_5

Answer: C

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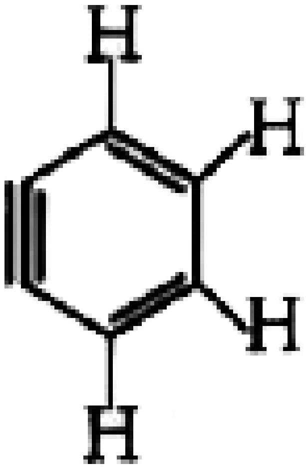
28. How many sp^2 and sp-hybridised carbon atoms are present respectively in the following compound ?



A. 4,2

B. 6,0

C. 3,3

D. 5,1

Answer: B

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29. Which of the following is a correct set with respect to molecule, hybridization, and shape?

A. $BeCl_2$, sp^2, linear

B. $BeCl_2$, sp^2, triangular planar

C. BCl_3, sp^2, triangular planar

D. BCl_3, sp^3, tetrahedral

Answer: C

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30. Hybridisation of central atom in ICl_2^+ is

A. dsp^2

B. sp

C. sp^2

D. sp^3

Answer: D

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31. The state of hybridization of the central atom is not the same as in the others :

A. B in BF_3

B. O in H_3O^+

C. N in NH_3

D. P in PCl_3

Answer: A

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32. The number of $sp^2 - s$ sigma bonds in benzene are

A. 3

B. 6

C. 12

D. none of these

Answer: B

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33. The hybridization of the central atom will change when :

A. NH_3 combines with H^+

B. H_3BO_3 combines withOH^-

C. NH_3 forms NH_2^-

D. H_2O combines with H^+

Answer: B

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34. $CH_3 - CH_2 - CH = CH_2$ has hybridisation :

A. sp, sp, sp^2, sp^2

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

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

D. sp^3, sp^2, sp^2, sp

Answer: C

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35. The state of hybridization of xenon of XeF_6 is

A. sp^3d^3

B. sp^3d^2

C. sp^3d

D. sp^3

Answer: A

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36. During the complete combustion of methane CH_4, what change in hybridisation does the carbon atom undergo ?

A. sp^3 to sp

B. $sp^3 \text{ to } sp^2$

C. sp^2 to sp

D. $sp^2 \text{ to } sp^3$

Answer: A

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37. The hybridisation of central iodine atom in IF_5, I_3^- and I_3^+ are respectively :

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

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

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

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

Answer: A

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38. In which of the following combination hybridisation of central atom ($*$) does not change ?

A. $H_2O + \overset{*}{C}O_2$

B. $H_3\overset{*}{B}O_3 + OH^-$

C. $BF_3 + \overset{*}{N}H_3$

D. none of these

Answer: C

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39. Which of the following species has 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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40. Which bonds are formed by a carbon atom with sp^2-hybridisation ?

A. 4π-bonds

B. 2π-bonds and 2σ-bonds

C. 1π-bonds and 3σ-bonds

D. 4σ-bonds

Answer: C

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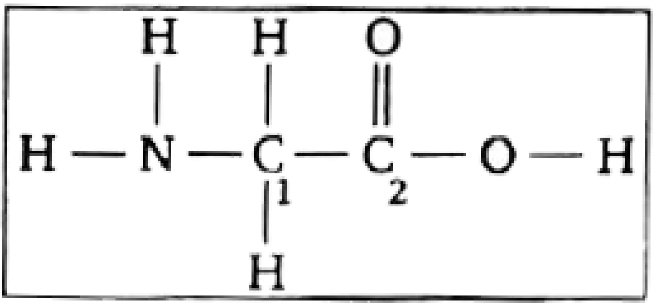
41. What are the hybridisation of the carbon atoms labeled C_1 and C_2, respectively in glycine ?



A. $\begin{matrix} C_1 & C_2 \\ sp^2 & sp^2 \end{matrix}$

B. $\begin{matrix} C_1 & C_2 \\ sp^2 & sp^3 \end{matrix}$

C. $\begin{matrix} C_1 & C_2 \\ sp^3 & sp^2 \end{matrix}$

D. $\begin{matrix} C_1 & C_2 \\ sp^3 & sp^3 \end{matrix}$

Answer: C

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42. The H-O-H bond angles in H_3O^+ are approximately 107°. The orbitals used by oxygen in these bonds are best described as :

A. p-orbitals

B. sp-hybrid orbitals

C. sp^2-hybrid orbital

D. sp^3-hybrid orbital

Answer: D

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43. Which pair of elements can form multiple bond with itself and oxygen ?

A. F,N

B. N, Cl

C. N,P

D. N,C

Answer: D

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44. Which of the following is a covalent compound ?

A. Al_2O_3

B. AlF_3

C. $AlCl_3$

D. $Al_2(SO_4)_3$

Answer: C

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45. Which of the following is an example of super octet molecule ?

A. ClF_3

B. PCl_5

C. IF_7

D. All the three

Answer: D

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46. Which of the following molecule is theoretically not possible ?

A. SF_4

B. OF_2

C. OF_4

D. O_2F_2

Answer: C

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47. The phosphate of a metal has the formula $MHPO_4$. The formula of its chloride would be

A. MCl

B. MCl_2

C. MCl_3

D. M_2Cl_3

Answer: B

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48. 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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49. The bond having the highest bond energy is :

A. $C = C$

B. $C = S$

C. $C = O$

D. $P = N$

Answer: C

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50. Which of the following species in neither hypervalent nor hypovalent ?

A. ClO_4^{-}

B. BF_3

C. SO_4^{2-}

D. CO_3^{2-}

Answer: D

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

A. BF_4^-

B. NCl_3

C. PCl_4^+

D. SF_4

Answer: D

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52. Which atom can have more than eight valence electrons when it is forming covalent bonds ?

A. H

B. N

C. F

D. Cl

Answer: D

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53. Which bond is expected to be the least polar?

A. O-F

B. P-F

C. Si-N

D. B-F

Answer: A

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54. Which set contains only covalently bonded molecules ?

A. $BCl_3, SiCl_4, PCl_3$

B. NH_4Br, N_2H_4, HBr

C. I_2, H_2S, NaI

D. Al, O_3, As_4

Answer: A

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55. Which molecule does not exist ?

A. OF_2

B. OF_4

C. SF_2

D. SF_4

Answer: B

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56. Solid NaCl is a bad conductor of electricity because

A. in solid NaCl there are no ions

B. solid NaCl is covalent

C. in solid NaCl there is no mobility of ions

D. in solid NaCl there are no electrons

Answer: C

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57. An ionic compound $A^{+}B^{-}$ is most likely to be formed when :

A. the ionization energy of A is high and electron affinity of B is low

B. the ionization energy of A is low and electron affinity of B is high

C. both, the ionization energy of A and electron affinity of B are high

D. both, the ionization energy of A and electron affinity of B are low

Answer: B

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58. A compound contains three elements A, B and C, if the oxidation number of $A = +2 \quad B = +5$ and $C = -2$ then possible formula of the compound is

A. $A_3(B_4C)_2$

B. $A_3(BC_4)_2$

C. $A_2(BC_3)_2$

D. ABC_2

Answer: B

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59. Which pair of atoms form strongest ionic bond ?

A. Al and As

B. Al and N

C. Al and Se

D. Al and O

Answer: D

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60. The correct order of increasig $C-O$ bond length of CO, CO_3^{2-}, CO_2 is

A. $CO_3^{2-} < CO_2 < CO$

B. $CO_2 < CO_3^{2-} < CO$

C. $CO < CO_3^{2-} < CO_2$

D. $CO < CO_2 < CO_3^{2-}$

Answer: A

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61. Resonance structures can be written for.

A. O_3

B. NH_3

C. CH_4

D. H_2O

Answer: A

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62. The correct order of Cl-O bond order is :

A. $ClO_3^- < ClO_4^- < ClO_2^- < ClO^-$

B. $ClO^- < ClO_4^- < ClO_3^- < ClO_2^-$

C. $ClO^- < ClO_2^- < ClO_3^- < ClO_4^-$

D. $ClO_4^- < ClO_3^- < ClO_3^- < ClO^-$

Answer: C

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63. How many resonance structures can be drawn for the nitrate ion, NO_3^-?

A. 1

B. 2

C. 3

D. 4

Answer: C

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64. Among given species identify the isostructural pairs :

A. $[NF_3 \text{ and } BF_3]$

B. $\left[BF_4^- \text{ and } NH_4^+\right]$

C. $[BCl_3 \text{ and } BrCl_3]$

D. $\left[NH_3 \text{ and } NO_3^-\right]$

Answer: B

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65. 0.01 mole H_3PO_x is completely neutralised by 0.56 gram of KOH hence :

A. x=3 and given acid is dibasic

B. x=2 and given acid is monobasic

C. x=3 and given acid is monobasic

D. x=4 and given acid forms three series of salt

Answer: B

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66. The solid PCl_5 exists as

A. PCl_5

B. $PCl_4^+ Cl^-$

C. $PCl_4^+ PCl_6^-$

D. $PCl_5 . Cl_2$

Answer: C

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67. The ratio of $\sigma -$ bond and $\pi -$ bond in tetracryano ethylene is :

A. $2:1$

B. $1:1$

C. $1:2$

D. none of these

Answer: B

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68. The bonds present in N_2O_5 are .

A. only ionic

B. only covalent

C. covalent and co-ordinate

D. covalent and ionic

Answer: C

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69. The pair of species with similar shape is

A. PCl_3, NH_3

B. CF_4, SF_4

C. $PbCl_2, CO_2$

D. PF_5, IF_5

Answer: A

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70. 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 π-bonds

D. all are correct

Answer: D

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71. Number of S-S bond is $H_2S_nO_6$:

A. n

B. (n-1)

C. (n-2)

D. (n+1)

Answer: B

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72. How many S-S bonds, S-O-S bonds, σ-bonds, π-bonds are present in trimer of sulphur trioxide ?

A. 0,3,16,2

B. 0,3,12,6

C. 0,6,12,16

D. 0,4,12,6

Answer: B

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73. Number of identical Cr-O bonds in dichromate ion $Cr_2O_7^{2-}$ is :

A. 4

B. 6

C. 7

D. 8

Answer: B

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74. The nodal plane in the π-bond of ethene is located in:

A. the molecular plane

B. a plane parallel to the molecular plane

C. a plane perpendicular to the molecular plane which bisects the carbon-carbon σ bond at right angle

D. a plane perpendicular to the molecular plane which contains the carbon-carbon bond

Answer: A

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75. Which of the following are isoelectronic and isostructural ?

$NO_3^-, CO_3^{2-}, ClO_3^-, SO_3$

A. NO_3^-, CO_3^{2-}

B. SO_3, NO_3^-

C. ClO_3^-, CO_3^{2-}

D. CO_3^{2-}, ClO_3^-

Answer: A

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76. In the electronic structure of H_2SO_4, the total number of unshared electrons is

A. 20

B. 16

C. 12

D. 8

Answer: B

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77. Which of the following xenon compound has the same number of lone pairs as in I_3^-? (near central atom)

A. XeO_4

B. XeF_4

C. XeF_2

D. XeO_3

Answer: C

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78. The geometry of XeF_3^+ is

A. Trigonal planar

B. Pyramidal

C. Bent T-shpae

D. See-saw

Answer: C

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79. Which of the following shape are not possible for possible value of n in XeF_n molecule ?

A. Linear

B. Square planar

C. Trigonal planar

D. Capped octahedral

Answer: C

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80. $BeCl_2$ is not isostructural with

A. ICl_2^-

B. C_2H_2

C. XeF_2

D. $GeCl_2$

Answer: D

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81. Which statement is true about the most stable Lewis structure for CS_2 ?

A. There are no lone pairs in molecule

B. All bonds are double bonds

C. The central atom does not have an octet of electrons

D. A sulfur atom must be the central atom for the structure to be stable

Answer: B

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82. Shape of the compounds XeF_3^+ and XeF_5^+ are respectively

A. Square pyramidal, T-shpaed

B. Bent-T-shape, square pyramidal

C. See-saw, square pyramidal

D. Square pyramidal, see -saw

Answer: B

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83. In which of the following species maximum atom can lie in same plane ?

A. XeF_2O_2

B. PCl_5

C. AsH_4^+

D. XeF_4

Answer: D

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84. Correct statement regarding molecules SF_4, CF_4 and XeF_4 are :

A. 2,0 and 1 lone pairs of central atom respectively

B. 1,0 and 1 lone pairs of central atom respectively

C. 0,0 and 2 lone pairs of central atom respectively

D. 1,0 and 2 lone pairs of central atom respectively

Answer: D

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85. The geometrical arrangement and shape of I_3^- are respectively

A. trigonal bipyramidal geometry, linear shape

B. hexagonal geometry, T-shape

C. triangular planar geometry, triangular shape

D. tetrahedral geometry, pyramidal shape

Answer: A

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86. Which of the following statements is incorrect for PCl_5 ?

A. Its three P-Cl bond lengths are equal

B. It involves sp^3 d hybridization

C. It has an regular geometry

D. Its shape is trigonal bipyramidal

Answer: C

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87. Molecular shape of SF_4, CF_4 and XeF_4 are

A. the same with 2,0 and 1 lone pair of electrons respectively

B. the same with 1,1 and 1 lone pair of electrons respectively

C. the same with 0m1 and 2 lone pair of electrons respectively

D. the same with 1,0 and 2 lone pair of electrons respectively

Answer: D

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88. 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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89. The molecule exhibiting maximum number of non-bonding electron pairs (l.p.) around the central atom is :

A. $XeOF_4$

B. XeO_2F_2

C. XeF_3^-

D. XeO_3

Answer: C

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90. 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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91. 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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92. Which is not correctly matched ?

A. XeO_3 -Trigonal bipyramidal

B. ClF_3- bent T-shape

C. $XeOF_4$- Square pyramidal

D. XeF_2- Linear shape

Answer: A

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93. 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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94. The geometry of ammonia molecule can be best described as :

A. Nitrogen at one vetex of a regular tetrahedron, the other three vertices being occupied by three hydrogens

B. Nitrogen at the centre of the tetrahedron, three of the vertices being occupied by three hydrogens

C. Nitrogen at the centre of an equilateral triangle, three corners being occupied by three hydrogens

D. Nitrogen at the junction of a T, three open ends being occupied by three hydrogens

Answer: B

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95. Which molecular geometry is least likely to result from a trigonal bipyramidal electron geometry ?

A. Trigonal planar

B. See-saw

C. Linear

D. T-shpaed

Answer: A

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96. Give the correct order of initials T or F for following statements. Use T if statement is true and F if it is falese :

(I) The order of repulsion between different pair of electron is $I_p - I_p > I_p - b_p > b_p - b_p$

(II) In general, as the number o flone pair of electron on central atom increases, value of bond angle from normal bond angle also increases

(III) The number of lone pair on O in H_2O is 2 while on N in NH_3 is 1

(IV) The structures of xenon fluorides and xenon oxyfluorides could not be explained on the basis of VSEPR theory

A. T T TF

B. TFTF

C. TFT T

D. TF F F

Answer: B

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97. Which species is planar ?

A. CO_3^{2-}

B. SO_3^{2-}

C. ClO_3^{-}

D. BF_4^-

Answer: A

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98. What is the geometry 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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99. What is the shape ClF_3 molecule ?

A. Trigonal planar

B. Trigonal pyramidal

C. T-shaped

D. Tetrahedral

Answer: C

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100. Which species below has the same general shape as NH_3?

A. SO_3^{2-}

B. CO_3^{2-}

C. NO_3^-

D. SO_3

Answer: A

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101. 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 nor 2

Answer: A

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102. Which of the following species / molecules does not have same number of bond pairs and lone pairs ?

A. OCN^-

B. H_2O

C. $C_2H_2Cl_2$

D. O_3

Answer: D

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103. Least stable hydride is

A. stannane

B. silane

C. plumbane

D. germane

Answer: C

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104. The lowest O-O bond length in the following molecule is :

A. O_2F_2

B. O_2

C. H_2O_2

D. O_3

Answer: B

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105. The fluorine molecules is formed by :

A. p-p orbitals (sideways overlap)

B. p-p orbitals (end -to -end overlap)

C. sp-sp orbitals

D. s-s orbitals

Answer: B

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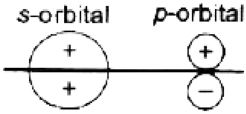
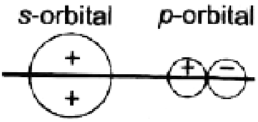
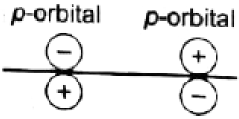
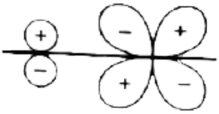
106. Which of the following leads to bonding?

A. 

B. 

C. 

D. 

Answer: B

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107. Which of the following overlaps is incorrect (assuming Z-axis is internucler axis) ?

$(A) 2P_y + 2p_y \rightarrow \pi$- Bond formation $(B) 2p_x + 2p_x \rightarrow \sigma$- Bond formation

(C) $33d_{xy} + 3dp_{xy} \rightarrow \pi$- Bond formation $(D) 2s + 2p_y \rightarrow \pi$- Bond formation

(E) $3d_{xy} + 3d_{xy} \rightarrow \delta$- Bond formation $(F) 2p_x + 2p_x \rightarrow \sigma$-Bond formation

A. A,B,C

B. C,F

C. B,E

D. B,C,D

Answer: D

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108. Which of the following overlapping is not present in XeO_3 molecule ?

A. $sp^3 + p_x$

B. $sp^3 + p_y$

C. $d_{xz} + p_x$

D. $sp^3 + s$

Answer: D

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109. 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

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110. The lattice energies of KF, KCl, KBr and KI follow the order :

A. $KF > KCl > KBr > KI$

B. $KI > KBr > KCl > KF$

C. $KF > KCl > KI > KBr$

D. $KI > KBr > KF > KCl$

Answer: A

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111. Which set of compounds in the following pair of ionic compounds has the higher lattice energy ?

(i) KCl or MgO $(ii) LiF$ or $LiBr$ $(iii) Mg_3N_2$ or $NaCl$

A. $KCl, LiBr, Mg_3N_2$

B. $MgO, LiBr, Mg_3N_2$

C. $MgO, LiF, NaCl$

D. MgO, LiF, Mg_3N_2

Answer: D

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112. The incorrect order of lattice energy is :

A. $AlF_3 > MgF_2$

B. $Li_3N > Li_2O$

C. $NaCl > LiF$

D. $TiC > ScN$

Answer: C

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113. Which ionic compound has the largest amount of lattice energy ?

A. NaF

B. AlF_3

C. AlN

D. MgF_2

Answer: C

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114. Which of the following compounds has the smallest bond angle in its molecule ?

A. OH_2

B. SH_2

C. NH_3

D. SO_2

Answer: B

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115. Maximum bond angle is present in case of

A. BBr_3

B. BCl_3

C. BF_3

D. none of these

Answer: D

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116. The correct order of H-M-H bonds angle is :

A. $NH_3 < PH_3 < SbH_3 < BiH_3$

B. $AsH_3 < SbH_3 < PH_3 < NH_3$

C. $NH_3 < PH_3 < BiH_3 < SbH_3$

D. $BiH_3 < SbH_3 < AsH_3 < PH_3$

Answer: D

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117. The correct increasing bomnd angle among BF_3, PF_3 and CIF_3 follow the order

A. $BF_3 < PF_3 < ClF_3$

B. $PF_3 < BF_3 < ClF_3$

C. $ClF_3 < PF_3 < BF_3$

D. $BF_3 = PF_3 = ClF_3$

Answer: C

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118. Among the following species, the least angle around the central atom is in :

A. O_3

B. I_3^-

C. NO_2^-

D. PH_3

Answer: D

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119. The bond angles of NH_3, $NH_4^{\oplus}$ and $\overset{\ominus}{N}H_2$ are in the order .

A. $NH_2^- > NH_3 > NH_4^+$

B. $NH_4^+ > NH_3 > NH_2^-$

C. $NH_3 > NH_2^- > NH_4^+$

D. $NH_3 > NH_4^+ > NH_2^-$

Answer: B

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120. The H-C-H bond angle in $CH_4 is 109.5^{\circ}$, due to lone pair repulsion, the H-O-H angle in H_2O will :

A. remain the same

B. increase

C. decrease

D. become 180°

Answer: C

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121. The molecule having the largest bond angle is :

A. H_2O

B. H_2S

C. H_2Se

D. H_2Te

Answer: A

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122. The compound MX_4 is tetrahedral. The number of $\angle XMX$ angles formed in the compound is

A. three

B. four

C. five

D. six

Answer: D

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123. Which of the following is the correct order for increasing bond angle ?

A. $Nh_3 < PH_3 < AsH_3 < SbH_3$

B. $H_2O < OF_2 < Cl_2O$

C. $H_2Te^+ < H_3Se^+ < H_3S^+ < H_3O^+$

D. $BF_3 < BCl_3 < BBr_3 < BI_3$

Answer: C

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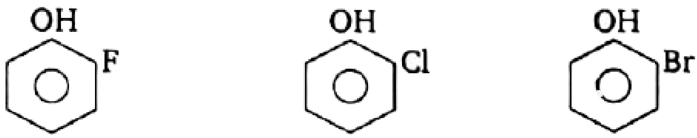
124. The correct order of boiling point is :



(I) (II) (III)

A. $I > II > III$

B. $III > II > I$

C. $II > I > III$

D. $III > I > II$

Answer: B

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125. 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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126. The boiling points at atmospheric pressure of HF, H_2S, NH_3 can be arranged in the following order :

A. $HF > NH_3 > H_2S$

B. $HF > H_2S > NH_3$

C. $HF < H_2S < NH_3$

D. $HF < NH_3 < H_2S$

Answer: A

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127. The correct order of strength of $H-$ bond in the following compound :

A. $H_2O > H_2O_2 > HF > H_2S$

B. $HF > H_2O_2 > H_2O_2 > H_2S$

C. $HF > H_2O > H_2S > H_2O_2$

D. $HF > H_2O > H_2O_2 > H_2S$

Answer: D

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128. Which compound has electrovalent, covalent, co-ordinate as well as hydrogen bond ?

A. $[Cu(H_2O)_4]SO_4. H_2O$

B. $[Zn(H_2O)_6]SO_4. H_2O$

C. $[Fe(H_2O)_6]SO_4. H_2O$

D. $[Fe(H_2O)_6]Cl_3$

Answer: A

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129. 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 out of 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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130. Which of the following molecules are expected to exhibit intermolecular H-bonding ?

(I) Acetic acid ((II) o-nitrophenol (III) m-nitrophenol (IV)o-boric acid

Select correct alternate :

A. I, II, III

B. I,II,IV

C. I,III,IV

D. II,III,IV

Answer: C

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131. Which of the following compounds can form H-bonding with each other ?

A. CH_3COOH and H_2O

B. Phenol and CH_4

C. CHF_3 and acetone

D. PH_3 and HF

Answer: A

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132. BF_3 and NF_3 both are covalent compounds but NF_3 is polar whereas BF_3 is non-polar. This is because :

A. Nitrogen atom is smaller than boron atom

B. N-F bond is more polar than B-F bond

C. NF_3 is pyramidal whereas BF_3 is planar triangular

D. BF_3 is electron deficient whereas NF_3 is not

Answer: C

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133. Dipole moment of NF_3 is smaller than :

A. NH_3

B. CO_2

C. BF_3

D. CCl_4

Answer: A

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134. Which of the following molecules will have polar bonds but zero dipole moment ?

A. O_2

B. $CHCl_3$

C. CF_4

D. none of these

Answer: C

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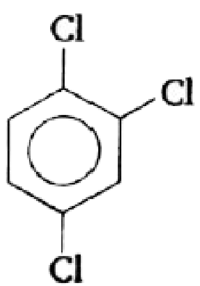
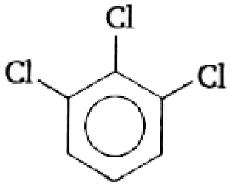
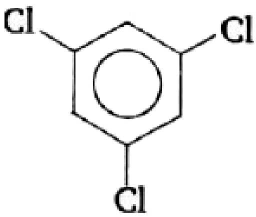
135. Which has maximum dipole moment ?

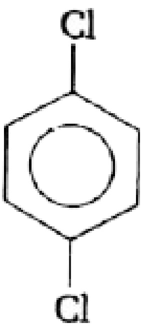
A. 



B.



C.



D.

Answer: B

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136. Which of the following compound is planar and non-polar ?

A. XeO_4

B. SF_4

C. XeF_4

D. CF_4

Answer: C

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137. H_2O has a net dipole moment while BeF_2 has zero dipole moment because :

A. F is more electronegativity than oxygen

B. Be is more electronegativity than oxygen

C. H_2O molecule is linear and BeF_2 is bent

D. BeF_2 molecule is linear and H_2O is bent

Answer: D

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

(i) CO_2 $(ii)COCl_2$ $(iii)CH_2Cl_2$ $(iv)BCl_3$

A. i and iv

B. ii and iv

C. iii and iv

D. I, iii and iv

Answer: A

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139. Which pair of molecules are polar species ?

A. CO_2 and H_2O

B. BF_3 and PCl_3

C. SO_2 and SCl_2

D. CS_2 and SO_3

Answer: C

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140. In which molecule does the chlorine have the most positive partial charge?

A. HCl

B. $BrCl$

C. OCl_2

D. SCl_2

Answer: C

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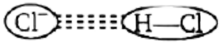
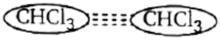
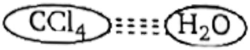
141. Which of the following attraction is strongest ?

A. 

B. 

C. 

D. 

Answer: D

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142. Which is distilled first ?

A. Liquid H_2

B. Liquid CO_2

C. Liquid O_2

D. Liquid N_2

Answer: A

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143. The molecular size of Icl and Br_2 is approximately same, but b.p. if Icl is about $40^\circ C$ higher than that of Br_2. It is because :

A. Icl bond is stronger than Br-Br bond

B. IE of iodine $<$ IE of bromine

C. Icl is polar while Br_2 is nonpolar

D. I has larger size than Br

Answer: C

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144. Which of the following order of molecular force of attraction among given species is incorect ?

A. $HI > HBr > Cl_2$

B. $CH_3Cl > CCl_4 > CH_4$

C. n-pentane $>$ iso-pentane $>$ neo-pentane

D. $OH_2 > O(CH_3)_2 > OBr_2$

Answer: D

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145. Which gas should not be collected over water because of its high solubility in water ?

A. H_2

B. N_2

C. CH_4

D. HCl

Answer: D

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146. Low melting point is expected for a solid :

A. Ionic solid

B. Metallic solid

C. Molecular solid

D. Covalent solid

Answer: C

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147. Which substance has the strongest London dispersion forces ?

A. SiH_4

B. CH_4

C. SnH_4

D. GeH_4

Answer: C

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148. Which of the following compounds has the lowest boiling point ?

A. HF

B. HCl

C. HBr

D. HI

Answer: B

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149. When the substances Si, KCl, CH_3OH and C_2H_6 are arranged in order of increasing melting point, what is the correct order ?

A. Si, KCl, CH_3OH, C_2H_6

B. CH_3OH, C_2H_6, Si, KCl

C. KCl, Si, C_2H_6, CH_3OH

D. C_2H_6, CH_3OH, KCl, Si

Answer: D

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150. Which substance has the highest melting point ?

A. CO

B. CO_2

C. SiO_2

D. P_2O_5

Answer: C

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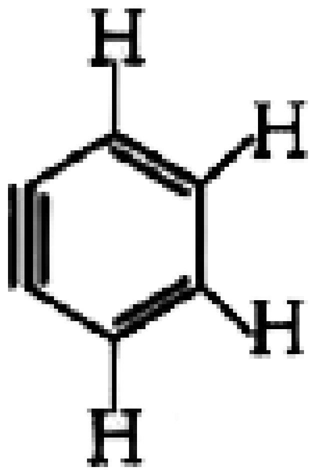
151. How many sp^2 and sp-hybridised carbon atoms are present respectively in the following compound ?



A. 4,2

B. 6,0

C. 3,3

D. 5,1

Answer: B

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152. Which one of the following is the correct set with respect to molecule, hybridization and shape ?

A. $BeCl_2$, sp^2, linear

B. $BeCl_2$, sp^2, triangular planar

C. BCl_3, sp^2, triangular planar

D. BCl_3, sp^3, tetrahedral

Answer: C

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153. Hybridisation of central atom in ICl_2^+ is

A. dsp^2

B. sp

C. sp^2

D. sp^3

Answer: D

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154. The state of hybridization of the central atom is not the same as in the others :

A. B in BF_3

B. O in H_3O^+

C. N in NH_3

D. P in PCl_3

Answer: A

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155. The number of $sp^2 - s$ sigma bonds in benzene are

A. 3

B. 6

C. 12

D. none of these

Answer: B

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156. The hybridization of the central atom will change when :

A. NH_3 combines with H^+

B. H_3BO_3 combines withOH^-

C. NH_3 forms NH_2^-

D. H_2O combines with H^+

Answer: B

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157. $CH_3 - CH_2 - CH = CH_2$ has hybridisation :

A. sp, sp, sp^2, sp^2

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

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

D. sp^3, sp^2, sp^2, sp

Answer: C

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158. What is the state of hybridisation of Xe in cationic part of solid XeF_6

A. sp^3d^3

B. sp^3d^2

C. sp^3d

D. sp^3

Answer: B

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159. During the complete combustion of methane CH_4, what change in hybridisation does the carbon atom undergo ?

A. sp^3 to sp

B. $sp^3 \text{ to } sp^2$

C. sp^2 to sp

D. $sp^2 \text{ to } sp^3$

Answer: A

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160. The hybridisation of central iodine atom in IF_5, I_3^- and I_3^+ are respectively :

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

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

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

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

Answer: A

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161. In which of the following combination hybridisation of central atom ($*$) does not change ?

A. $H_2O + \overset{*}{C}O_2$

B. $H_3\overset{*}{B}O_3 + OH^-$

C. $BF_3 + \overset{*}{N}H_3$

D. none of these

Answer: C

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

A. 4π-bonds

B. 2π-bonds and 2σ-bonds

C. 1π-bonds and 3σ-bonds

D. 4σ-bonds

Answer: C

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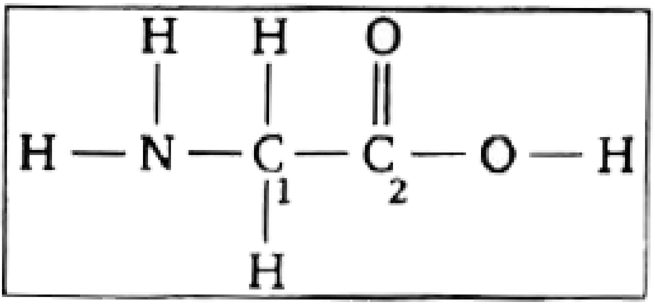
164. What are the hybridisation of the carbon atoms labeled C_1 and C_2, respectively in glycine ?



A. $\begin{matrix} C_1 & C_2 \\ sp^2 & sp^2 \end{matrix}$

B. $\begin{matrix} C_1 & C_2 \\ sp^2 & sp^3 \end{matrix}$

C. $\begin{matrix} C_1 & C_2 \\ sp^3 & sp^2 \end{matrix}$

D. $\begin{matrix} C_1 & C_2 \\ sp^3 & sp^3 \end{matrix}$

Answer: C

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165. The H-O-H bond angles in H_3O^+ are approximately 107°. The orbitals used by oxygen in these bonds are best described as :

A. p-orbitals

B. sp-hybrid orbitals

C. sp^2-hybrid orbital

D. sp^3-hybrid orbital

Answer: D

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166. Which pair of elements can form multiple bond with itself and oxygen ?

A. F, N

B. N, Cl

C. N, P

D. N, C

Answer: D

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167. Which of the following is a covalent compound ?

A. Al_2O_3

B. AlF_3

C. $AlCl_3$

D. $Al_2(SO_4)_3$

Answer: C

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168. Which of the following is an example of super octet molecule ?

A. ClF_3

B. PCl_5

C. IF_7

D. All the three

Answer: D

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169. Which of the following molecule is theoretically not possible ?

A. SF_4

B. OF_2

C. OF_4

D. O_2F_2

Answer: C

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170. The phosphate of a metal has the formula $MHPO_4$. The formula of its chloride would be

A. MCl

B. MCl_2

C. MCl_3

D. M_2Cl_3

Answer: B

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171. 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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172. The bond having the highest bond energy is :

A. $C = C$

B. $C = S$

C. $C = O$

D. $P = N$

Answer: C

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173. Which of the following species is neither hypervalent nor hypovalent ?

A. ClO_4^-

B. BF_3

C. SO_4^{2-}

D. CO_3^{2-}

Answer: D

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

A. BF_4^-

B. NCl_3

C. PCl_4^+

D. SF_4

Answer: D

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175. Which atom can have more than eight valence electrons when it is forming covalent bonds ?

A. H

B. N

C. F

D. Cl

Answer: D

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176. Which bond is expected to be the least polar?

A. $O - F$

B. $P - F$

C. $Si - N$

D. $B - F$

Answer: A

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177. Which set contains only covalently bonded molecules ?

A. $BCl_3, SiCl_4, PCl_3$

B. NH_4Br, N_2H_4, HBr

C. I_2, H_2S, NaI

D. Al, O_3, As_4

Answer: A

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178. Which molecule does not exist ?

A. OF_2

B. OF_4

C. SF_2

D. SF_4

Answer: B

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179. Solid NaCl is a bad conductor of electricity because

A. in solid $NaCl$ there are no ions

B. solid $NaCl$ is covalent

C. in solid $NaCl$ there is no mobility of ions

D. in solid $NaCl$ there are no electrons

Answer: C

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180. An ionic compound $A^{+}B^{-}$ is most likely to be formed when :

A. the ionization energy of A high and electron affinity of B is low

B. the ionization energy of A is low and electron affinity of B is high

C. both, the ionization energy of A and electron affinity of B are high

D. both, the ionization energy of A and electron affinity of B are low

Answer: B

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181. A compound contains three elements A, B and C, if the oxidation number of $A = +2B = +5$ and $C = -2$ then possible formula of the compound is

A. $A_3(B_4C)_2$

B. $A_3(BC_4)_2$

C. $A_2(BC_3)_2$

D. ABC_2

Answer: B

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182. Which pair of atoms form strongest ionic bond ?

A. Al and As

B. Al and N

C. Al and Se

D. Al and O

Answer: D

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183. The correct order of increasing C-O bond strength of CO, CO_3^{2-}, CO_2 is :

A. $CO_3^{2-} < CO_2 < CO$

B. $CO_2 < CO_3^{2-} < CO$

C. $CO < CO_3^{2-} < CO_2$

D. $CO < CO_2 < CO_3^{2-}$

Answer: A

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184. Resonance structures can be written for .

A. O_3

B. NH_3

C. CH_4

D. H_2O

Answer: A

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185. The correct order of Cl-O bond order is :

A. $ClO_3^- < ClO_4^- < ClO_2^- < ClO^-$

B. $ClO^- < ClO_4^- < ClO_3^- < ClO_2^-$

C. $ClO^- < ClO_2^- < ClO_3^- < ClO_4^-$

D. $ClO_4^- < ClO_3^- < ClO_3^- < ClO^-$

Answer: C

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186. How many resonance structures can be drawn for the nitrate ion, NO_3^- ?

A. 1

B. 2

C. 3

D. 4

Answer: C

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187. Among given species identify the isostructural pairs :

A. $[NF_3 \text{ and } BF_3]$

B. $\left[BF_4^- \text{ and } NH_4^+\right]$

C. $[BCl_3 \text{ and } BrCl_3]$

D. $\left[NH_3 \text{ and } NO_3^-\right]$

Answer: B

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188. 0.01 mole H_3PO_x is completely neutralised by 0.56 gram of KOH hence :

A. x=3 and given acid is dibasic

B. x=2 and given acid is monobasic

C. x=3 and given acid is monobasic

D. x=4 and given acid forms three series of salt

Answer: B

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189. Phosphorus pentachloride in the solid exists as :

A. PCl_5

B. $PCl_4^+ Cl^-$

C. $PCl_4^+ PCl_6^-$

D. $PCl_5 . Cl_2$

Answer: C

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190. The ratio of $\sigma -$ bond and $\pi -$ bond in tetracryano ethylene is :

A. $2 : 1$

B. $1 : 1$

C. $1 : 2$

D. none of these

Answer: B

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191. The bonds present in N_2O_5 are .

A. only ionic

B. only covalent

C. covalent and co-ordinate

D. covalent and ionic

Answer: C

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192. The pair of species with similar shape is

A. PCl_3, NH_3

B. CF_4, SF_4

C. $PbCl_2, CO_2$

D. PF_5, IF_5

Answer: A

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193. 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 π-bonds

D. all are correct

Answer: D

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194. Number of S-S bond is $H_2S_nO_6$:

A. n

B. (n-1)

C. (n-2)

D. (n+1)

Answer: B

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195. How many S-S bonds, S-O-S bonds, σ-bonds, π-bonds are present in trimer of sulphur trioxide ?

A. 0,3,16,2

B. 0,3,12,6

C. 0,6,12,16

D. 0,4,12,6

Answer: B

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196. Number of identical Cr-O bonds in dichromate ion $Cr_2O_7^{2-}$ is :

A. 4

B. 6

C. 7

D. 8

Answer: B

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197. The nodal plane in the π-bond of ethene is located in:

A. the molecular plane

B. a plane parallel to the molecular plane

C. a plane perpendicular to the molecular plane which bisects the carbon-carbon σ bond at right angle

D. a plane perpendicular to the molecular plane which contains the carbon-carbon bond

Answer: A

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198. Which of the following are isoelectronics and isostructural ?

A. NO_3^-, CO_3^{2-}

B. SO_3, NO_3^-

C. ClO_3^-, CO_3^{2-}

D. CO_3^{2-}, ClO_3^-

Answer: A

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199. In the electronic structure of H_2SO_4, the total number of unshared electrons is

A. 20

B. 16

C. 12

D. 8

Answer: B

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200. Which of the following xenon compound has the same number of lone pairs as in I_3^-? (near central atom)

A. XeO_4

B. XeF_4

C. XeF_2

D. XeO_3

Answer: C

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201. The shape of XeF_3^{+} is :

A. Trigonal planar

B. Pyramidal

C. Bent T-shpae

D. See-saw

Answer: C

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202. Which of the following shape are not possible for possible value of n in XeF_n molecule ?

A. Linear

B. Square planar

C. Trigonal planar

D. Capped octahedral

Answer: C

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203. $BeCl_2$ is not isostructural with

A. ICl_2^-

B. C_2H_2

C. XeF_2

D. $GeCl_2$

Answer: D

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204. Which statement is true about the most stable Lewis structure for CS_2 ?

A. There are no lone pairs in molecule

B. All bonds are double bonds

C. The central atom does not have an octet of electrons

D. A sulfur atom must be the central atom for the structure to be stable

Answer: B

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205. SbF_5 reacts with XeF_4 and XeF_6 to form ionic compounds $\left[XeF_3^{+}\right]\left[SbF_6^{-}\right]$ and $\left[XeF_5^{+}\right]\left[SbF_6^{-}\text{`}thenmo \leq c\underline{a}rshapeof$ [XeF_(3)^(+)]$ion$ and [XeF_(5)^(+)]` ion respectively :

A. Square pyramidal, T-shpaed

B. Bent-T-shape, square pyramidal

C. See-saw, square pyramidal

D. Square pyramidal, see -saw

Answer: B

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206. In which of the following species maximum atom can lie in same plane ?

A. XeF_2O_2

B. PCl_5

C. AsH_4^+

D. XeF_4

Answer: D

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207. Correct statement regarding molecules SF_4, CF_4 and XeF_4 are :

A. $2, 0$ and 1 lone pairs of central atom respectively

B. $1, 0$ and 1 lone pairs of central atom respectively

C. $0, 0$ and 2 lone pairs of central atom respectively

D. $1, 0$ and 2 lone pairs of central atom respectively

Answer: D

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208. The geometrical arrangement and shape of I_3^- are respectively

A. trigonal bipyramidal geometry, linear shape

B. hexagonal geometry, T-shape

C. triangular planar geometry, triangular shape

D. tetrahedral geometry, pyramidal shape

Answer: A

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209. Which of the following statements is incorrect for PCl_5 ?

A. Its three $P - Cl$ bond lengths are equal

B. It involves sp^3d hybridization

C. It has an regular geometry

D. Its shape is trigonal bipyramidal

Answer: C

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210. Molecular shapes of SF_4, CF_4 and XeF_4 are :

A. the same with 2,0 and 1 lone pair of electrons respectively

B. the same with 1,1 and 1 lone pair of electrons respectively

C. the same with 0m1 and 2 lone pair of electrons respectively

D. the same with 1,0 and 2 lone pair of electrons respectively

Answer: D

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211. 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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212. The molecule exhibiting maximum number of non-bonding electron pairs (l.p.) around the central atom is :

A. $XeOF_4$

B. XeO_2F_2

C. XeF_3^{+}

D. XeO_3

Answer: C

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213. 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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214. 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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215. Which is not correctly matched ?

A. XeO_3 -Trigonal bipyramidal

B. ClF_3- bent T-shape

C. $XeOF_4$- Square pyramidal

D. XeF_2- Linear shape

Answer: A

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216. 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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217. The geometry of ammonia molecule can be best described as :

A. Nitrogen at one vetex of a regular tetrahedron, the other three vertices being occupied by three hydrogens

B. Nitrogen at the centre of the tetrahedron, three of the vertices being occupied by three hydrogens

C. Nitrogen at the centre of an equilateral triangle, three corners being occupied by three hydrogens

D. Nitrogen at the junction of a T, three open ends being occupied by three hydrogens

Answer: B

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218. Which molecular geometry is least likely to result from a trigonal bipyramidal electron geometry ?

A. Trigonal planar

B. See-saw

C. Linear

D. T-shpaed

Answer: A

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219. Give the correct order of initials T or F for following statements. Use T if statement is true and F if it is falese :

(I) The order of repulsion between different pair of electron is $I_p - I_p > I_p - b_p > b_p - b_p$

(II) In general, as the number o flone pair of electron on central atom increases, value of bond angle from normal bond angle also increases

(III) The number of lone pair on O in H_2O is 2 while on N in NH_3 is 1

(IV) The structures of xenon fluorides and xenon oxyfluorides could not be explained on the basis of VSEPR theory

A. T T TF

B. TFTF

C. TFT T

D. TF F F

Answer: B

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220. Which species is planar ?

A. CO_3^{2-}

B. SO_3^{2-}

C. ClO_3^-

D. BF_4^-

Answer: A

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221. What is the geometry 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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222. What is the shape of the ClF_3 molecule?

A. Trigonal planar

B. Trigonal pyramidal

C. T-shaped

D. Tetrahedral

Answer: C

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223. Which species below has the same general shape as NH_3?

A. SO_3^{2-}

B. CO_3^{2-}

C. NO_3^-

D. SO_3

Answer: A

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

$1.\ CH_3^+ \qquad 2.\ CH_3^-$

A. 1 only

B. 2 only

C. both 1 and 2

D. neither 1 nor 2

Answer: A

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225. Which of the following species / molecules does not have same number of bond pairs and lone pairs ?

A. OCN^{-}

B. H_2O

C. $C_2H_2Cl_2$

D. O_3

Answer: D

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226. Least stable hydride is

A. stannane

B. silane

C. plumbane

D. germane

Answer: C

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227. The lowest O-O bond length in the following molecule is :

A. O_2F_2

B. O_2

C. H_2O_2

D. O_3

Answer: B

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228. The fluorine molecules is formed by :

A. p-p orbitals (sideways overlap)

B. p-p orbitals (end -to -end overlap)

C. sp-sp orbitals

D. s-s orbitals

Answer: B

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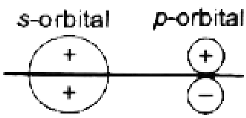
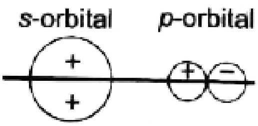
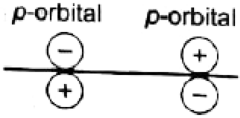
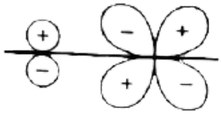
229. Which of the following leads to bonding?

A. 

B. 

C. 

D. 

Answer: B

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230. Which of the following overlaps is incorrect (assuming Z-axis is internucler axis) ?

$(A)2P_y + 2p_y \rightarrow \pi$- Bond formation $(B)2p_x + 2p_x \rightarrow \sigma$- Bond formation

(C) $3d_{xy} + 3d_{xy} \rightarrow \pi$- Bond formation $(D)2s + 2p_y \rightarrow \pi$- Bond formation

(E) $3d_{xy} + 3d_{xy} \rightarrow \delta$- Bond formation

A. A,B,C

B. C,F

C. B,E

D. B,C,D

Answer: D

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231. Which of the following overlapping is not present in XeO_3 molecule ?

A. $sp^3 + p_x$

B. $sp^3 + p_y$

C. $d_{xz} + p_x$

D. $sp^3 + s$

Answer: D

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232. 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

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233. The lattice energies of KF, KCl, KBr and KI follow the order :

A. $KF > KCl > KBr > KI$

B. $KI > KBr > KCl > KF$

C. $KF > KCl > KI > KBr$

D. $KI > KBr > KF > KCl$

Answer: A

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234. Which set of compounds in the following pair of ionic compounds has the higher lattice energy ?

(i) KCl or MgO $(ii) LiF$ or $LiBr$ $(iii) Mg_3N_2$ or $NaCl$

A. $KCl, LiBr, Mg_2N_2$

B. $MgO, LiBr, Mg_3N_2$

C. $MgO, LiF, NaCl$

D. MgO, LiF, Mg_3N_2

Answer: D

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235. The incorrect order of lattice energy is :

A. $AlF_3 > MgF_2$

B. $Li_3N > Li_2O$

C. $NaCl > LiF$

D. $TiC > ScN$

Answer: C

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236. Which ionic compound has the largest amount of lattice energy ?

A. NaF

B. AlF_3

C. AlN

D. MgF_2

Answer: C

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237. Which of the following compounds has the smallest bond angle?

A. OH_2

B. SH_2

C. NH_3

D. SO_2

Answer: B

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238. Maximum bond angle is present in case of

A. BBr_3

B. BCl_3

C. BF_3

D. none of these

Answer: D

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239. The correct order of H-M-H bonds angle is :

A. $NH_3 < PH_3 < SbH_3 < BiH_3$

B. $AsH_3 < SbH_3 < PH_3 < NH_3$

C. $NH_3 < PH_3 < BiH_3 < SbH_3$

D. $BiH_3 < SbH_3 < AsH_3 < PH_3$

Answer: D

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240. The correct increasing bomnd angle among BF_3, PF_3 and CIF_3 follow the order

A. $BF_3 < PF_3 < ClF_3$

B. $PF_3 < BF_3 < ClF_3$

C. $ClF_3 < PF_3 < BF_3$

D. $BF_3 = PF_3 = ClF_3$

Answer: C

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241. Among the following species, the least angle around the central atom is in :

A. O_3

B. I_3^-

C. NO_2^-

D. PH_3

Answer: D

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242. The bond angles of NH_3, NH_4^+ and NH_2^- are in the order

A. $NH_2^- > NH_3 > NH_4^+$

B. $NH_4^+ > NH_3 > NH_2^-$

C. $NH_3 > NH_2^- > NH_4^+$

D. $NH_3 > NH_4^+ > NH_2^-$

Answer: B

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243. The H-C-H bond angle in $CH_4 is 109.5^\circ$, due to lone pair repulsion, the H-O-H angle in H_2O will :

A. remain the same

B. increase

C. decrease

D. become 180°

Answer: C

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244. The molecule having the largest bond angle is :

A. H_2O

B. H_2S

C. H_2Se

D. H_2Te

Answer: A

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245. The compound MX_4 is tetrahedral. The number of $\angle XMX$ angles formed in the compound is

A. three

B. four

C. five

D. six

Answer: D

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246. The $O - N - O$ bond angle in the nitrite ion, NO_2^-, is closest to :

A. N_2O

B. NO_2^+

C. NO_2^-

D. NO_3^-

Answer: B

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247. Which of the following is the correct order for increasing bond angle ?

A. $Nh_3 < PH_3 < AsH_3 < SbH_3$

B. $H_2O < OF_2 < Cl_2O$

C. $H_2Te^+ < H_3Se^+ < H_3S^+ < H_3O^+$

D. $BF_3 < BCl_3 < BBr_3 < BI_3$

Answer: C

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1. $N - O - N$ bond angle is maximum in :

A. N_2O

B. NO_2^+

C. NO_2^-

D. NO_3^-

Answer: B

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Level 2

1. The incorrect order of boiling point is :

A. $H_2O > CH_3OH$

B. $N(CH_3)_3 > NH(CH_3)_2$

C. $H_3PO_4 > Me_3PO_4$

D. $CH_3N_3 > HN_3$

Answer: B,D

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2. Iodine molecules are held in the solid lattice by _____

A. London forces

B. dipole-dipole interactions

C. covalent bonds

D. coulombic force

Answer: A

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3. At room temperature, CO_2 is a gas while SiO_2 is a solid because

A. CO_2 is a linear molecule, while SiO_2 is angular

B. van der Waals's forces are very strong in SiO_2

C. CO_2 is covalent, while SiO_2 is ionic

D. Si cannot form stable bonds with O, hence Si has to form a 3D lattice

Answer: D

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4. Choose the correct code of characteristics for the given order of hybrid orbitals of same atom,

$sp < sp^2 < sp^3$

(i) Electrongativity (ii) Bond angle between same hybrid orbitals

(iii) Size (iv) Energy level

A. ii, iii and iv

B. iii, iv

C. ii and iv

D. I, ii, iii and iv

Answer: B

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5. Which is correct statement ?

As the s-character of a hybrid orbital decreases

(I) The bond angle decreases (II) The bond strength increases

(III) The bond length increases (IV) Size of orbitals increases

A. I, III and IV

B. II, III and IV

C. I and II

D. all are correct

Answer: A

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6. Which of the following is incorrectly match ?

A.

Hybridisation	Geometry	Orbitals use
sp^3d	Trigonal bipyramidal	$s + p_x + p_y + p_s + d_{s^2}$

B.

Hybridisation	Geometry	Orbitals use
sp^3d^3	Pentagonal bipyramidal	$s + p_x + p_y + p_s + d_{x^2-}$

C.

Hybridisation	Geometry	Orbitals use
sp^3d^2	Capped octahedral	$s + p_x + p_y + p_s + d_{x^2-y^2} + d$

D.

Hybridisation	Geometry	Orbitals use
sp^3	Tetrahedral	$s + p_x + p_y + p_s$

Answer: C

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7. The ionic bond X^+Y^- are formed when :

(I) electron affinity of Y is high (II) ionization energy of X is low

(III) lattice energy of XY is high (IV) lattice energy of XY is low

Choose the correct code :

A. I and II

B. I and III

C. I, II and III

D. All

Answer: C

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8. In the Born-Haber cycle for the formation of solid common salt (NaCl), the largest contribution comes from :

A. the low ionization potential of Na

B. the high electron affinity of Cl

C. the low ΔH_{vap} of Na(s)

D. the lattice energy

Answer: D

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9. Species having maximum 'Cl-O' bond order is :

A. ClO_3^-

B. ClO_3

C. ClO_2

D. ClO_2^-

Answer: B

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10. Which of the following species contains minimum number of atoms in XY plane ?

A. XeF_5^-

B. SF_6

C. IF_7

D. All

Answer: B

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11. The molecule ML_x is planar with 7 pairs of electrons around M in the valence shell. The value of x is :

A. 6

B. 5

C. 4

D. 3

Answer: B

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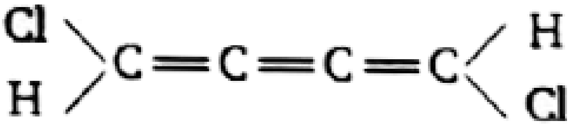
12. Choose the correct option for the collowing molecule in view of chemical bonding :



A. non-planar

B. $\mu \neq 0$

C. both a and b

D. $\mu = 0$

Answer: D

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13. Which of the following statement is correct about I_3^+ and I_3^- molecular ions ?

A. Number of lone pairs at central atoms are same in both molecular ions

B. Hybridization of central atoms in both ions are same

C. Both are polar species

D. Both are planar species

Answer: D

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14. In which of the following molecular shape d_{z^2} orbital must not be involved in bonding ?

A. Pentagonal planar

B. Trigonal planar

C. Linear

D. Square planar

Answer: B

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15. The correct statement regarding SO_2 molecule is :

A. two $p\pi - d\pi$bonds

B. molecule has 2 lone pair, 2σ bonds and 2π bonds

C. two $p\pi - p\pi$ bonds

D. one $p\pi - p\pi$ and one $p\pi - d\pi$ bond

Answer: D

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16. A molecule XY_2 contains two σ bonds two π bond and one lone pair of electrons in the valence shell of X. The arrangement of lone pair as well as bond pairs is

A. square pyramidal

B. linear

C. Trigonal planar

D. unpredictable

Answer: C

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17. In which of the following pairs, both the species have the same hybridisation ?

(I)

$SF_4, XeF_4 \qquad (II) I_3^-, XeF_2 \qquad (III) ICI_4^-, SiCl_4 \qquad (IV) ClO_3^-, PO_4^{3-}$

A. I,II

B. II, III

C. II, IV

D. I,II,III

Answer: C

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18. Which of the following possess two lone pair of electrons on the central atom and square planar in shape ?

(I) SF_4 $(II) XeO_4$ $(III) XeF_4$ $(IV) ICl_4^-$

A. I,III

B. II,IV

C. III, IV

D. All

Answer: C

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19. Select pair of compounds in which both have different hybridization but have same molecular geometry :

A. BF_3, BrF_3

B. $ICl_2^{\Theta}, BeCl_2$

C. BCl_3, PCl_3

D. PCl_3, NCl_3

Answer: B

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20. The species having no $p\pi - p\pi$ bond but its bond order equal to that of O_2^-

A. ClO_3^-

B. PO_4^{3-}

C. SO_4^{2-}

D. XeO_3

Answer: C

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21. Which of the following fact is directly explained by the statement oxygen is a smaller atom than sulphur ?

A. H_2O boils at a much higher temperature than H_2S

B. H_2O undergoes intermolecular hydrogen bonding

C. H_2O is liquid and H_2S is gas at room temperature

D. S-H bond is longer than O-H bond

Answer: D

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22. Which of the following compound has maximum "C-C" single bond length ?

A. CH_2CHCCH

B. HC C C CH

C. CH_3CHCH_2

D. $CH_2CHCHCH_2$

Answer: C

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23. If two different non-axial d-orbitals having 'xz' nodal plane form π-bond by overlapping each other, then internuclear axis will be :

A. x

B. y

C. z

D. They don't form π-bond

Answer: D

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24. Assuming pure 2s and 2p orbitals of carbon are used in forming CH_4 molecule, which of the following statement is false ?

A. Three C-H bonds will be at right angle

B. One C-H bond will be weaker than other three C-H bonds

C. The shape of molecule will be tetrahedral

D. The angle of C-H bond formed by s-s overlapping will be uncertain with respect to other three bonds.

Answer: C

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25. The strength of bonds by 2s -2s, 2p2p and 2p-2s overlap has the order

A. $s-s > p-p > p-s$

B. $s-s > p-s > p-p$

C. $p-p > p-s > s-s$

D. $p-p > s-s > p-s$

Answer: C

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

A. Sigma-bond is stronger than a π-bond

B. Bond energies of sigma and π -bonds are of the order of 264 kJ / mol and 347 kJ / mol

C. Free rotation of surrounding atoms about a sigma -bond is allowed but not in case of a π-bond

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

Answer: B

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27. Assuming the bond direction to the z-axis, which of the overlapping of atomic orbitals of two atom (A) and (B) will result in bonding ?

(I) s-orbital of A and p_x orbital of B (II) s-orbital of A and p_z orbital of B

(III) p_y-orbital of A and p_z orbital of B (IV) s-orbital of both (A) and (B)

A. I and IV

B. I and II

C. III and IV

D. II and IV

Answer: D

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28. Which of the following orbital can not form π as well as δ-Bond ?

A. d_{xy}

B. d_{z^2}

C. $d_{x^2-y^2}$

D. d_{yz}

Answer: B

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29. Incorrect statement is :

A. $AlF_3 > MgO > MgF_2$: Lattice energy

B. $Li > Na > Al > Mg$: Electron afinity

C. $SF_6 > PF_5 > SiF_4$: Lewis acidic character

D. $SiCl_4 > SiBr_4 > SiI_4$: Decreasing order of electronegativity of Si

Answer: C

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30. 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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31. Which of the following compound has the smallest $(X - A - X)$ bond angle in each series repectively.

(A) $OsF_2, OsCl_2, OsBr_2$

(B) $SbCl_3, SbBr_3, SbI_3$

(C) Pl_3, AsI_3, SbI_3

A. $OSF_2, SbCl_3 \text{ and } PI_3$

B. $OSBr_2, SbI_3 \text{ and } PI_3$

C. $OSF_2, SbI_3 \text{ and } PI_3$

D. $OSF_2, SbCl_3 \text{ and } SbI_3$

Answer: D

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32. The incorrect order of boiling point is :

A. $H_2O > CH_3OH$

B. $N(CH_3)_3 > NH(CH_3)_2$

C. $H_3PO_4 > Me_3PO_4$

D. $CH_3N_3 > HN_3$

Answer: D

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33. Iodine molecules are held in the solid lattice by _____

A. London forces

B. dipole-dipole interactions

C. covalent bonds

D. coulombic force

Answer: A

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34. Carbon dioxide is a gas but silica is a solid because:

A. CO_2 is a linear molecule, while SiO_2 is angular

B. van der Waals's forces are very strong in SiO_2

C. CO_2 is covalent, while SiO_2 is ionic

D. Si cannot form stable bonds with O, hence Si has to form a 3D lattice

Answer: D

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35. Choose the correct code of characteristics for the given order of hybrid orbitals of same atom,

$sp < sp^2 < sp^3$

(i) Electrongativity (ii) Bond angle between same hybrid orbitals

(iii) Size (iv) Energy level

A. ii, iii and iv

B. iii, iv

C. ii and iv

D. I, ii, iii and iv

Answer: B

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36. Which is correct statement ?

As the s-character of a hybrid orbital decreases

(I) The bond angle decreases (II) The bond strength increases

(III) The bond length increases (IV) Size of orbitals increases

A. I, III and IV

B. II, III and IV

C. I and II

D. all are correct

Answer: A

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37. Which of the following is incorrectly matched ?

A.

Hybridisation	Geometry	Orbitals use
sp^3d	Trigonal bipyramidal	$s + p_x + p_y + p_s + d_{s^2}$

B.

Hybridisation	Geometry	Orbitals use
sp^3d^3	Pentagonal bipyramidal	$s + p_x + p_y + p_s + d_{x^2-y^2}$

C.

Hybridisation	Geometry	Orbitals use
sp^3d^2	Capped octahedral	$s + p_x + p_y + p_s + d_{x^2-y^2} + d$

D.

Hybridisation	Geometry	Orbitals use
sp^3	Tetrahedral	$s + p_x + p_y + p_s$

Answer: C

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38. The ionic bond $X^{+}Y^{-}$ are formed when :

(I) electron affinity of Y is high (II) ionization energy of X is low

(III) lattice energy of XY is high (IV) lattice energy of XY is low

Choose the correct code :

A. I and II

B. I and III

C. I, II and III

D. All

Answer: C

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39. In the Born-Haber cycle for the formation of solid common salt (NaCl), the largest contribution comes from :

A. the low ionization potential of Na

B. the high electron affinity of Cl

C. the low ΔH_{vap} of Na(s)

D. the lattice energy

Answer: D

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40. Species having maximum 'Cl-O' bond order is :

A. ClO_3^-

B. ClO_3

C. ClO_2

D. ClO_2^-

Answer: B

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41. Which of the following species contains minimum number of atoms in XY plane ?

A. XeF_5^{-}

B. SF_6

C. IF_7

D. All

Answer: B

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42. The molecule ML_x is planar with 7 pairs of electrons around M in the valence shell. The value of x is :

A. 6

B. 5

C. 4

D. 3

Answer: B

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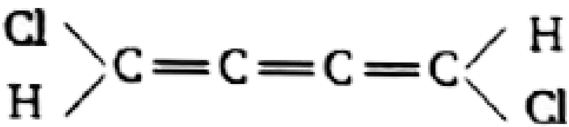
43. Choose the correct option for the collowing molecule in view of chemical bonding :



A. non-planar

B. $\mu \neq 0$

C. both a and b

D. $\mu = 0$

Answer: D

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44. Which of the following statement is correct about I_3^+ and I_3^- molecular ions ?

A. Number of lone pairs at central atoms are same in both molecular ions

B. Hybridization of central atoms in both ions are same

C. Both are polar species

D. Both are planar species

Answer: D

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45. In which of the following molecular shape d_{z^2} orbital must not be involved in bonding ?

A. Pentagonal planar

B. Trigonal planar

C. Linear

D. Square planar

Answer: B

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46. The correct statement regarding SO_2 molecule is :

A. two $p\pi - d\pi$bonds

B. molecule has 2 lone pair, 2σ bonds and 2π bonds

C. two $p\pi - p\pi$ bonds

D. one $p\pi - p\pi$ and one $p\pi - \pi$ bond

Answer: D

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47. A molecule XY_2 contains two σ bonds two π bond and one lone pair of electrons in the valence shell of X. The arrangement of lone pair as well as bond pairs is

A. square pyramidal

B. linear

C. Trigonal planar

D. unpredictable

Answer: C

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48. In which of the following pairs, both the species have the same hybridisation ?

(I)

$SF_4, XeF_4 \quad (II) I_3^-, XeF_2 \quad (III) ICI_4^-, SiCl_4 \quad (IV) ClO_3^-, PO_4^{3-}$

A. I,II

B. II, III

C. II, IV

D. I,II,III

Answer: C

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49. Which of the following possess two lone pair of electrons on the central atom and square planar in shape ?

(I) SF_4 $(II)XeO_4$ $(III)XeF_4$ $(IV)ICl_4^-$

A. I,III

B. II,IV

C. III, IV

D. All

Answer: C

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50. Select pair of compounds in which both have different hybridization but have same molecular geometry :

A. BF_3, BrF_3

B. $ICl_2^{\Theta}, BeCl_2$

C. BCl_3, PCl_3

D. PCl_3, NCl_3

Answer: B

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51. The species having no $p\pi - p\pi$ bond but its bond order equal to that of O_2^-

A. ClO_3^-

B. PO_4^{3-}

C. SO_4^{2-}

D. XeO_3

Answer: D

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52. Which of the following fact is directly explained by the statement oxygen is a smaller atom than sulphur ?

A. H_2O boils at a much higher temperature than H_2S

B. H_2O undergoes intermolecular hydrogen bonding

C. H_2O is liquid and H_2S is gas at room temperature

D. S-H bond is longer than O-H bond

Answer: D

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53. Which of the following compound has maximum "C-C" single bond length ?

A. CH_2CHCCH

B. HC C C CH

C. CH_3CHCH_2

D. $CH_2CHCHCH_2$

Answer: C

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54. If two different non-axial d-orbitals having 'xz' nodal plane form π-bond by overlapping each other, then internuclear axis will be :

A. x

B. y

C. z

D. They don't form π-bond

Answer: D

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55. Assuming pure 2s and 2p orbitals of carbon are used in forming CH_4 molecule, which of the following statement is false ?

A. Three C-H bonds will be at right angle

B. One C-H bond will be weaker than other three C-H bonds

C. The shape of molecule will be tetrahedral

D. The angle of C-H bond formed by s-s overlapping will be uncertain with respect to other three bonds.

Answer: C

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

I. 2s-2s

II. 2s-2p

III. 2p-2p

IV. 3s-3s

A. $s-s>p-p>p-s$

B. $s-s>p-s>p-p$

C. $p-p>p-s>s-s$

D. $p-p>s-s>p-s$

Answer: C

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57. Which of the following statements in incorrect for sigma and π -bonds formed between two carbon atoms ?

A. Sigma-bond is stronger than a π-bond

B. Bond energies of sigma and π -bonds are of the order of 264 kJ / mol and 347 kJ / mol

C. Free rotation of surrounding atoms about a sigma -bond is allowed but not in case of a π-bond

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

Answer: B

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58. Assuming the bond direction to the z-axis, which of the overlapping of atomic orbitals of two atom (A) and (B) will result in bonding ?

(I) s-orbital of A and p_x orbital of B (II) s-orbital of A and p_z orbital of B

(III) p_y-orbital of A and p_z orbital of B (IV) s-orbital of both (A) and (B)

A. I and IV

B. I and II

C. III and IV

D. II and IV

Answer: D

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59. Which of the following orbital can not form π as well as δ-Bond ?

A. d_{xy}

B. d_{z^2}

C. $d_{x^2-y^2}$

D. d_{yz}

Answer: B

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60. Incorrect statement is :

A. $AlF_3 > MgO > MgF_2$: Lattice energy

B. $Li > Na > Al > Mg$: Electron afinity

C. $SF_6 > PF_5 > SiF_4$: Lewis acidic character

D. $SiCl_4 > SiBr_4 > SiI_4$: Decreasing order of electronegativity of Si

Answer: C

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61. 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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62. Which of the following compound has the smallest $(X - A - X)$ bond angle in each series repectively.

(A) $OsF_2, OsCl_2, OsBr_2$

(B) $SbCl_3, SbBr_3, SbI_3$

(C) Pl_3, AsI_3, SbI_3

A. $OSF_2, SbCl_3$ and PI_3

B. $OSBr_2, SbI_3$ and PI_3

C. OSF_2, SbI_3 and PI_3

D. OSF_2, $SbCl_3$ and SbI_3

Answer: D

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Level 3 (Passive 1)

1. According to VSEPR model, molecules adopt geometries in which their valence electron pairs position themselves as far from each other as possible. The VSEPR model considers double and triple bonds to have slightly greater repulsive effects than single bonds because of the repulsive effect of π -electrons. However the lone pair creates the maximum repulsive effect.

Which of the following statement is false ?

A. SbF_4^- and SF_4 are isostructural

B. In IOF_5 the hybridization of central atom is sp^3d^2

C. Double bond(s) in SOF_4 and XeO_3F_2, is / are occupying equatorial position(s) of their respective geometry

D. none of these

Answer: D

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2. According to VSEPR model, molecules adopt geometries in which their valence electron pairs position themselves as far from each other as possible. The VSEPR model considers double and triple bonds to have slightly greater repulsive effects than single bonds because of the repulsive effect of π -electrons. However the lone pair creates the maximum repulsive effect.

Which of the following does not represent the isostructural pair ?

A. SF_5^- and IF_5

B. ClO_2F_3 and SOF_4

C. SeF_3^+ and XeO_3

D. None

Answer: D

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3. According to VSEPR model, molecules adopt geometries in which their valence electron pairs position themselves as far from each other as possible. The VSEPR model considers double and triple bonds to have slightly greater repulsive effects than single bonds because of the repulsive effect of π -electrons. However the lone pair creates the maximum repulsive effect.

Select the incorrect statement with respect to SO_2Cl_2 molecule :

A. It gives H_2SO_4 and HCl on hydrolysis at room temperature

B. It has two $d\pi - p\pi$ bonds between S and O bonded atoms

C. It is a polar molecule

D. None

Answer: D

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4. According to VSEPR model, molecules adopt geometries in which their valence electron pairs position themselves as far from each other as possible. The VSEPR model considers double and triple bonds to have slightly greater repulsive effects than single bonds because of the repulsive effect of π -electrons. However the lone pair creates the maximum repulsive effect.

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C. Double bond(s) in SOF_4 and XeO_3F_2, is / are occupying equatorial position(s) of their respective geometry

D. none of these

Answer: D

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5. According to VSEPR model, molecules adopt geometries in which their valence electron pairs position themselves as far from each other as possible. The VSEPR model considers double and triple bonds to have slightly greater repulsive effects than single bonds because of the repulsive effect of π -electrons. However the lone pair creates the maximum repulsive effect.

Which of the following does not represent the isostructural pair ?

A. SF_5^- and IF_5

B. ClO_2F_3 and SOF_4

C. SeF_3^+ and XeO_3

D. None

Answer: D

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6. According to VSEPR model, molecules adopt geometries in which their valence electron pairs position themselves as far from each other as possible. The VSEPR model considers double and triple bonds to have slightly greater repulsive effects than single bonds because of the repulsive effect of π -electrons. However the lone pair creates the maximum repulsive effect.

Select the incorrect statement with respect to SO_2Cl_2 molecule :

A. It gives H_2SO_4 and HCl on hydrolysis at room temperature

B. It has two $d\pi - p\pi$ bonds between S and O bonded atoms

C. It is a polar molecule

D. None

Answer: D

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Level 3 (Passive 2)

1. According to VBT any covalent bond will be formed by overlapping of atomic orbitals of bonded atoms provided atomic orbitals must be half-filled and electrons be in opposite spin. According to type of overlapping covalent bonds can be classified as (a)σ-bond (b) π-bond (c) δ-bond :

Which of the following set of orbitals does not produce nobal plane in xz-plane ?

A. $d_{yz} + d_{yz}$

B. $d_{xy} + d_{xy}$

C. $p_y + d_{xy}$

D. none of these

Answer: D

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2. According to VBT any covalent bond will be formed by overlapping of atomic orbitals of bonded atoms provided atomic orbitals must be half-filled and electrons be in opposite spin. According to type of overlapping covalent bonds can be classified as (a)σ-bond (b) π-bond (c) δ-bond :

The combination of orbital that can not produce non-bonding molecular orbital is (internuclear axis is z-axis) :

A. $p_y + d_{x^2-y^2}$

B. $p_z + d_{yz}$

C. $s + d_{xz}$

D. $d_{xy} + d_{xy}$

Answer: D

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3. According to VBT any covalent bond will be formed by overlapping of atomic orbitals of bonded atoms provided atomic orbitals must be half-filled and electrons be in opposite spin. According to type of overlapping covalent bonds can be classified as (a)σ-bond (b) π-bond (c) δ-bond :

If $F_2C_1 = C_2$ part of $F_2C_1 = C_2 = C_3 = C_4F_2$ lies in yz-plane, then incorrect statment is :

A. Nodal plane of π-bond between C_1 and C_2 lies in yz-plane, formed by sideways overlapping of p_x-orbitals

B. Nodal plane of π-bond between C_2 and C_3 lies in xz-plane, formed by sideways overlapping of p_y-orbitals

C. Nodal plane of π- bond between C_3 and C_4 lies in yz-plane, formed by sideways overlapping of p_y -orbitals

D. Nodal plane of π-bond between C_2 and C_3 lies in xy-plane, formed by sideways overlapping of p_x - orbitals

Answer: C

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4. According to VBT any covalent bond will be formed by overlapping of atomic orbitals of bonded atoms provided atomic orbitals must be half-filled and electrons be in opposite spin. According to type of overlapping covalent bonds can be classified as (a)σ-bond (b) π-bond (c) δ-bond :

Which of the following set of orbitals does not produce nobal plane in xz-plane ?

A. $d_{yz}+d_{yz}$

B. $d_{xy}+d_{xy}$

C. p_y+d_{xy}

D. none of these

Answer: D

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5. According to VBT any covalent bond will be formed by overlapping of atomic orbitals of bonded atoms provided atomic orbitals must be half-filled and electrons be in opposite spin. According to type of overlapping covalent bonds can be classified as (a)σ-bond (b) π-bond (c) δ-bond :

The combination of orbital that can not produce non-bonding molecular orbital is (internuclear axis is z-axis) :

A. $p_y + d_{x^2 - y^2}$

B. $p_z + d_{yz}$

C. $s + d_{xz}$

D. $d_{xy} + d_{xy}$

Answer: D

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6. According to VBT any covalent bond will be formed by overlapping of atomic orbitals of bonded atoms provided atomic orbitals must be half-filled and electrons be in opposite spin. According to type of overlapping covalent bonds can be classified as (a)σ-bond (b) π-bond (c) δ-bond :

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A. Nodal plane of π-bond between C_1 and C_2 lies in yz-plane, formed by sideways overlapping of p_x-orbitals

B. Nodal plane of π-bond between C_2 and C_3 lies in xz-plane, formed by sideways overlapping of p_y-orbitals

C. Nodal plane of π- bond between C_3 and C_4 lies in yz-plane, formed by sideways overlapping of p_y -orbitals

D. Nodal plane of π-bond between C_2 and C_3 lies in xy-plane, formed by sideways overlapping of p_x - orbitals

Answer: C

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Level 3 (Passive 3)

1. If the central atom is of third row or below this in the periodic table, then lone pair will occupy a stereochemically inactive s-orbital and bonding will be through almost pure p-orbitals and bond angles are nearly 90°, if the substituent's electronegativity value is ≤ 2.5.

In which of the following option, covalent bond is having maximum s% character ?

A. S-H bond in H_2S

B. P-H bond in PH_3

C. N-H bond in NH_3

D. All have equal s% character

Answer: C

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2. If the central atom is of third row or below this in the periodic table, then lone pair will occupy a stereochemically inactive s-orbital and bonding will be through almost pure p-orbitals and bond angles are nearly 90°, if the substituent's electronegativity value is ≤ 2.5.

Select incorrect statement regarding P_4 molecule.

A. Each P atom is ioined with three P-atoms

B. P_4 molecule contains total 12 bond angles

C. Lone pair of each P atom is present in almost pure s-orbital

D. Lone pair of each P atom present in hybrid orbital

Answer: D

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3. If the central atom is of third row or below this in the periodic table, then lone pair will occupy a stereochemically inactive s-orbital and bonding will be through almost pure p-orbitals and bond angles are nearly 90°, if the substituent's electronegativity value is ≤ 2.5.

The hybridisation of atomic orbitals of central atom "Xe" in XeO_4, XeO_2F_2 and $XeOF_4$ respectively.

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

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

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

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

Answer: D

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4. If the central atom is of third row or below this in the periodic table, then lone pair will occupy a stereochemically inactive s-orbital and bonding will be through almost pure p-orbitals and bond angles are nearly 90°, if the substituent's electronegativity value is ≤ 2.5.

In which of the following option, covalent bond is having maximum s% character ?

A. S-H bond in H_2S

B. P-H bond in PH_3

C. N-H bond in NH_3

D. All have equal s% character

Answer: C

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Select incorrect statement regarding P_4 molecule.

A. Each P atom is ioined with three P-atoms

B. P_4 molecule contains total 12 bond angles

C. Lone pair of each P atom is present in almost pure s-orbital

D. Lone pair of each P atom present in hybrid orbital

Answer: D

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6. If the central atom is of third row or below this in the periodic table, then lone pair will occupy a stereochemically inactive s-orbital and bonding will be through almost pure p-orbitals and bond angles are nearly 90°, if the substituent's electronegativity value is ≤ 2.5.

The hybridisation of atomic orbitals of central atom "Xe" in XeO_4, XeO_2F_2 and $XeOF_4$ respectively.

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

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

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

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

Answer: D

Watch Video Solution

Level 3 (Passive 4)

1. According to V.B.T., atoms of element form bond only to pair up their unpaired electrons present in ground state or excited state. This pairing of unpaired electron will take place by overlapping of orbitals each one having one unpaired electron with opposite spin.

Which of the following orbital combination does not form π-bond ?

A. $p_x + p_x$ sideways overlapping

B. $d_{x^2-y^2} + p_y$ sideways overlapping

C. $d_{xy} + d_{xy}$ sideways overlapping

D. $d_{yz} + p_y$ sideways overlapping

Answer: B

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2. According to V.B.T., atoms of element form bond only to pair up their unpaired electrons present in ground state or excited state. This pairing of unpaired electron will take place by overlapping of orbitals each one having one unpaired electron with opposite spin.

Which of the following orbital cannot form δ-bond ?

A. $d_{x^2-y^2}$ orbital

B. d_{xy} orbital

C. d_{z^2} orbital

D. d_{zx} orbital

Answer: C

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3. According to V.B.T., atoms of element form bond only to pair up their unpaired electrons present in ground state or excited state. This pairing of unpaired electron will take place by overlapping of orbitals each one having one unpaired electron with opposite spin.

Which of the following combination of orbitals does not from any type of covalent bond (if z-axis is molecular axis)?

A. $p_s + p_z$

B. $p_y + p_y$

C. $s + p_y$

D. $s + s$

Answer: C

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4. According to V.B.T., atoms of element form bond only to pair up their unpaired electrons present in ground state or excited state. This pairing of unpaired electron will take place by overlapping of orbitals each one having one unpaired electron with opposite spin.

Which of the following orbital combination does not form π-bond ?

A. $p_x + p_x$ sideways overlapping

B. $d_{x^2-y^2} + p_y$ sideways overlapping

C. $d_{xy} + d_{xy}$ sideways overlapping

D. $d_{yz} + p_y$ sideways overlapping

Answer: B

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5. According to V.B.T., atoms of element form bond only to pair up their unpaired electrons present in ground state or excited state. This pairing of unpaired electron will take place by overlapping of orbitals each one having one unpaired electron with opposite spin.

Which of the following orbital cannot form δ-bond ?

A. $d_{x^2-y^2}$ orbital

B. d_{xy} orbital

C. d_{x^2} orbital

D. d_{zx} orbital

Answer: C

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6. According to V.B.T., atoms of element form bond only to pair up their unpaired electrons present in ground state or excited state. This pairing of unpaired electron will take place by overlapping of orbitals each one having one unpaired electron with opposite spin.

Which of the following combination of orbitals does not from any type of covalent bond (if z-axis is molecular axis)?

A. $p_s + p_z$

B. $p_y + p_y$

C. $s + p_y$

D. $s + s$

Answer: C

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Level 3 (Passive 5)

1. The space model which is obtained by joining the points representing various bonded atoms gives the shape of the molecule. The geometry of the molecule is definite relative arrangement of the bonded atoms in a molecule. The shape and geometry of a molecule is explained by valence shell electron pair repulsion theory given by Gillespie and Nyholm.

Select the correct code for the following repulsion orders, according to VSEPR theory :

(I) lone pair -lone pair $>$ lone pair-bond pair

(II) lone pair-bond pair $>$ bond pair -bond pair

(III) lone pair -lone pair $>$ bond pair-bond pair

(IV) lone pair - bond pair $>$ lone pair-lone pair

A. I,II and III

B. II and IV

C. I,II and IV

D. All

Answer: A

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2. The space model which is obtained by joining the points representing various bonded atoms gives the shape of the molecule. The geometry of the molecule is definite relative arrangement of the bonded atoms in a molecule. The shape and geometry of a molecule is explained by valence shell electron pair repulsion theory given by Gillespie and Nyholm.

Which molecule has both shape and geometry identical ?

$(I) SnCl_2 \quad (II) NH_3 \quad (III) PCl_5 \quad (IV) SF_6$

A. I, III and IV

B. II,III and IV

C. III and IV

D. All

Answer: C

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3. The space model which is obtained by joining the points representing various bonded atoms gives the shape of the molecule. The geometry of the molecule is definite relative arrangement of the bonded atoms in a molecule. The shape and geometry of a molecule is explained by valence shell electron pair repulsion theory given by Gillespie and Nyholm.

Which is not the electron geometry of covalent molecules ?

A. Pentagonal bipyramidal

B. Octahedral

C. Hexagonal

D. Tetrahedral

Answer: C

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4. The space model which is obtained by joining the points representing various bonded atoms gives the shape of the molecule. The geometry of the molecule is definite relative arrangement of the bonded atoms in a molecule. The shape and geometry of a molecule is explained by valence shell electron pair repulsion theory given by Gillespie and Nyholm.

Select the correct code for the following repulsion orders, according to VSEPR theory :

(I) lone pair -lone pair $>$ lone pair-bond pair

(II) lone pair-bond pair $>$ bond pair -bond pair

(III) lone pair -lone pair $>$ bond pair-bond pair

(IV) lone pair - bond pair $>$ lone pair-lone pair

A. I,II and III

B. II and IV

C. I,II and IV

D. All

Answer: A

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5. The space model which is obtained by joining the points representing various bonded atoms gives the shape of the molecule. The geometry of the molecule is definite relative arrangement of the bonded atoms in a molecule. The shape and geometry of a molecule is explained by valence shell electron pair repulsion theory given by Gillespie and Nyholm.

Which molecule has both shape and geometry identical ?

$(I) SnCl_2 \quad (II) NH_3 \quad (III) PCl_5 \quad (IV) SF_6$

A. I, III and IV

B. II,III and IV

C. III and IV

D. All

Answer: C

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6. The space model which is obtained by joining the points representing various bonded atoms gives the shape of the molecule. The geometry of the molecule is definite relative arrangement of the bonded atoms in a molecule. The shape and geometry of a molecule is explained by valence shell electron pair repulsion theory given by Gillespie and Nyholm.

Which is not the electron geometry of covalent molecules ?

A. Pentagonal bipyramidal

B. Octahedral

C. Hexagonal

D. Tetrahedral

Answer: C

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Level 3 (Passive 6)

1. When hybridisation involving d-orbitals are considered then all the five d-orbitals are not degenerate, rather $d_{x^2-y^2}$, d_{s^2} and d_{xy}, d_{zx} form two different sets of orbitals and orbitals of appropriate set is involved in the hybridisation.

In sp^3d^2 hybridisation, which sets of d-orbitals is involved ?

A. $d_{x^2-y^2}$, d_{z^2}

B. d_{z^2}, d_{xy}

C. d_{xy}, d_{yz}

D. $d_{x^2-y^2}$, d_{xy}

Answer: A

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2. The d orbitals involved in sp^3d^3 hybridization are ?

A. $d_{x^2-y^2}$, d_{z^2}, d_{xy}

B. d_{xy}, d_{yz}, d_{zx}

C. $d_{x^2-y^2}, d_{xy}, d_{xz}$

D. d_{x^2}, d_{yz}, d_{zx}

Answer: A

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3. When hybridisation involving d-orbitals are considered then all the five d-orbitals are not degenerate, rather $d_{x^2-y^2}, d_{s^2}$ and d_{xy}, d_{zx} form two different sets of orbitals and orbitals of appropriate set is involved in the hybridisation.

Molecule having trigonal bipyramidal geometry and sp^3d hybridisation, d-orbitals involved is :

A. d_{xy}

B. d_{yz}

C. $d_{x^2-y^2}$

D. d_{z^2}

Answer: D

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4. When hybridisation involving d-orbitals are considered then all the five d-orbitals are not degenerate, rather $d_{x^2-y^2}, d_{s^2}$ and d_{xy}, d_{zx} form two different sets of orbitals and orbitals of appropriate set is involved in the hybridisation.

Which of the following orbitals can not undergo hybridisation amongst themselves.

(I) $3d, 4s$ $\quad (II) 3d, 4d$

(III) $3d, 4s \& 4p$ $\quad (IV) 3s, 3p \& 4s$

A. only II

B. II and III

C. I, II and IV

D. II and IV

Answer: D

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5. When hybridisation involving d-orbitals are considered then all the five d-orbitals are not degenerate, rather $d_{x^2-y^2}, d_{s^2}$ and d_{xy}, d_{zx} form two different sets of orbitals and orbitals of appropriate set is involved in the hybridisation.

In sp^3d^2 hybridisation, which sets of d-orbitals is involved ?

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

B. d_{z^2}, d_{xy}

C. d_{xy}, d_{yz}

D. $d_{x^2-y^2}, d_{xy}$

Answer: A

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6. When hybridisation involving d-orbitals are considered then all the five d-orbitals are not degenerate, rather $d_{x^2-y^2}, d_{s^2}$ and d_{xy}, d_{zx} form two different sets of orbitals and orbitals of appropriate set is involved in the hybridisation.

In sp^3d^3 hybridisation, which orbitals are involved ?

A. $d_{x^2-y^2}, d_{z^2}, d_{xy}$

B. d_{xy}, d_{yz}, d_{zx}

C. $d_{x^2-y^2}, d_{xy}, d_{xz}$

D. d_{x^2}, d_{yz}, d_{zx}

Answer: A

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7. When hybridisation involving d-orbitals are considered then all the five d-orbitals are not degenerate, rather $d_{x^2-y^2}, d_{s^2}$ and d_{xy}, d_{zx} form two different sets of orbitals and orbitals of appropriate set is involved in the hybridisation.

Molecule having trigonal bipyramidal geometry and sp^3d hybridisation, d-orbitals involved is :

A. d_{xy}

B. d_{yz}

C. $d_{x^2-y^2}$

D. d_{z^2}

Answer: D

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8. When hybridisation involving d-orbitals are considered then all the five d-orbitals are not degenerate, rather $d_{x^2-y^2}, d_{s^2}$ and d_{xy}, d_{zx} form two different sets of orbitals and orbitals of appropriate set is involved in the hybridisation.

Which of the following orbitals can not undergo hybridisation amongst themselves.

(I) $3d, 4s$ $(II) 3d, 4d$

(III) $3d, 4s \& 4p$ $(IV) 3s, 3p \& 4s$

A. only II

B. II and III

C. I, II and IV

D. II and IV

Answer: D

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Level 3 (Passive 7)

1. Ionic bond is defined as the electrostatic force of attraction holding the oppositely charged ions. Ionic compounds are mostly crystalline solid having high melting and boiling points, electrical conductivity in moleten state, solubility in water etc. Covalent bond is defined as the force which binds atoms of same or different elements by mutual sharing of electrons in a covalent bond. Covalent compounds are solids, liquids or gases. They have low melting and boiling points compounds. They are more soluble in non-polar solvents.

The valence electrons are involved in formation of covalent bonds is /are called :

A. non-bonding electrons

B. lone pairs

C. unshared pairs

D. none of these

Answer: D

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2. Ionic bond is defined as the electrostatic force of attraction holding the oppositely charged ions. Ionic compounds are mostly crystalline solid having high melting and boiling points, electrical conductivity in moleten state, solubility in water etc. Covalent bond is defined as the force which binds atoms of same or different elements by mutual sharing of electrons in a covalent bond. Covalent compounds are solids, liquids or gases. They have low melting and boiling points compounds. They are more soluble in non-polar solvents.

The amount of energy released when one mole of ionic solid is formed by packing of gaseous ion is called :

A. Ionisation energy

B. Solvation energy

C. Lattice energy

D. Hydration energy

Answer: C

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3. Ionic bond is defined as the electrostatic force of attraction holding the oppositely charged ions. Ionic compounds are mostly crystalline solid having high melting and boiling points, electrical conductivity in moleten state, solubility in water etc. Covalent bond is defined as the force which binds atoms of same or different elements by mutual sharing of electrons in a covalent bond. Covalent compounds are solids, liquids or gases. They have low melting and boiling points compounds. They are more soluble in non-polar solvents.

Which of the following is arranged order of increasing boiling point ?

A. $H_2O < CCl_4 < CS_2 < CO_2$

B. $CO_2 < CS_2 < CCl_4 < H_2O$

C. $CS_2 < H_2O < CO_2 < CCl_4$

D. $CCl_4 < H_2O < CO_2 < CS_2$

Answer: B

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4. Ionic bond is defined as the electrostatic force of attraction holding the oppositely charged ions. Ionic compounds are mostly crystalline solid having high melting and boiling points, electrical conductivity in moleten state, solubility in water etc. Covalent bond is defined as the force which binds atoms of same or different elements by mutual sharing of electrons in a covalent bond. Covalent compounds are solids, liquids or gases. They have low melting and boiling points compounds. They are more soluble in non-polar solvents.

The valence electrons are involved in formation of covalent bonds is /are called :

A. non-bonding electrons

B. lone pairs

C. unshared pairs

D. none of these

Answer: D

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5. Ionic bond is defined as the electrostatic force of attraction holding the oppositely charged ions. Ionic compounds are mostly crystalline solid having high melting and boiling points, electrical conductivity in moleten state, solubility in water etc. Covalent bond is defined as the force which binds atoms of same or different elements by mutual sharing of electrons in a covalent bond. Covalent compounds are solids, liquids or gases. They have low melting and boiling points compounds. They are more soluble in non-polar solvents.

The amount of energy released when one mole of ionic solid is formed by packing of gaseous ion is called :

A. Ionisation energy

B. Solvation energy

C. Lattice energy

D. Hydration energy

Answer: C

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6. Ionic bond is defined as the electrostatic force of attraction holding the oppositely charged ions. Ionic compounds are mostly crystalline solid having high melting and boiling points, electrical conductivity in moleten state, solubility in water etc. Covalent bond is defined as the force which binds atoms of same or different elements by mutual sharing of electrons in a covalent bond. Covalent compounds are solids, liquids or gases. They have low melting and boiling points compounds. They are more soluble in non-polar solvents.

Which of the following is arranged order of increasing boiling point ?

A. $H_2O < CCl_4 < CS_2 < CO_2$

B. $CO_2 < CS_2 < CCl_4 < H_2O$

C. $CS_2H_2O < CO_2 < CCl_4$

D. $CCl_4 < H_2O < CO_2 < CS_2$

Answer: B

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Level 3 (Passive 8)

1. When an ionic compound is dissolved in water (polar solvent), it breaks up into its constituent ions. The given ionic compound will be dissolved in water if its hydration energy is more than lattice energy . IF hydration energy is less than lattice energy then ionic compound is usually either sparingly soluble or insoluble in water.

Which of the following ionic compound is having maximum lattice energy :

A. NaF

B. MgF_2

C. AlF_3

D. KF

Answer: C

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2. When an ionic compound is dissolved in water (polar solvent), it breaks up into its constituent ions. The given ionic compound will be dissolved in water if its hydration energy is more than lattice energy . IF hydration energy is less than lattice energy then ionic compound is usually either sparingly soluble or insoluble in water.

Most hydrated cation is :

A. $Ce^{4+}_{(aq.)}$

B. $La^{3+}_{(aq.)}$

C. $Ba^{2+}_{(aq.)}$

D. $Cs^{+}_{(aq)}$

Answer: A

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3. When an ionic compound is dissolved in water (polar solvent), it breaks up into its constituent ions. The given ionic compound will be dissolved in water if its hydration energy is more than lattice energy . IF hydration energy is less than lattice energy then ionic compound is usually either sparingly soluble or insoluble in water.

Which of the following ionic compound is having maximum lattice energy :

A. NaF

B. MgF_2

C. AlF_3

D. KF

Answer: C

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4. When an ionic compound is dissolved in water (polar solvent), it breaks up into its constituent ions. The given ionic compound will be dissolved in water if its hydration energy is more than lattice energy . IF hydration energy is less than lattice energy then ionic compound is usually either sparingly soluble or insoluble in water.

Most hydrated cation is :

A. $Ce^{4+}_{(aq.)}$

B. $La^{3+}_{(aq.)}$

C. $Ba^{2+}_{(aq.)}$

D. $CS^{+}_{(aq)}$

Answer: A

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Level 3 (Passive 9)

1. A covalent bond will be formed by the overlapping of atomic orbitals having single electron of opposite spin, according to the overlapping of atomic orbitals the covalent bond may be of two types :

(i) Sigma bond (σ) (ii) Pi bond (π)

Sigma bond is stronger bond than the Pi-bond. If atomic orbitals overlap about the nuclear axis then sigma bond is formed but when atomic orbitals overlap sideway then Pi-bond is formed.

The correct order of increasing C-O bond length of CO, CO_3^{2-}, CO_2 is :

A. $CO_3^{2-} < CO_2 < CO$

B. $CO_2 < CO_3^{2-} < CO$

C. $CO < CO_3^{2-} < CO_2$

D. $CO < CO_2 < CO_3^{2-}$

Answer: D

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2. A covalent bond will be formed by the overlapping of atomic orbitals having single electron of opposite spin, according to the overlapping of atomic orbitals the covalent bond may be of two types :

(i) Sigma bond (σ) (ii) Pi bond (π)

Sigma bond is stronger bond than the Pi-bond. If atomic orbitals overlap about the nuclear axis then sigma bond is formed but when atomic

orbitals overlap sideway then Pi-bond is formed.

Compound having maximum bond angle is :

A. BBr_3

B. BCl_3

C. BF_3

D. none of these

Answer: D

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3. A covalent bond will be formed by the overlapping of atomic orbitals having single electron of opposite spin, according to the overlapping of atomic orbitals the covalent bond may be of two types :

(i) Sigma bond (σ) (ii) Pi bond (π)

Sigma bond is stronger bond than the Pi-bond. If atomic orbitals overlap about the nuclear axis then sigma bond is formed but when atomic orbitals overlap sideway then Pi-bond is formed.

The strength of bonds formed by 2s-2s,2p-2p and 2p-2s overlap has the order :

A. $s - s > p - p > p - s$

B. $s - s > p - s > p - p$

C. $p - p > p - s > s - s$

D. $p - p > s - s > p - s$

Answer: C

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4. A covalent bond will be formed by the overlapping of atomic orbitals having single electron of opposite spin, according to the overlapping of atomic orbitals the covalent bond may be of two types :

(i) Sigma bond (σ) (ii) Pi bond (π)

Sigma bond is stronger bond than the Pi-bond. If atomic orbitals overlap about the nuclear axis then sigma bond is formed but when atomic

orbitals overlap sideway then Pi-bond is formed.

The correct order of increasing C-O bond length of CO, CO_3^{2-}, CO_2 is :

A. $CO_3^{2-} < CO_2 < CO$

B. $CO_2 < CO_3^{2-} < CO$

C. $CO < CO_3^{2-} < CO_2$

D. $CO < CO_2 < CO_3^{2-}$

Answer: D

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5. A covalent bond will be formed by the overlapping of atomic orbitals having single electron of opposite spin, according to the overlapping of atomic orbitals the covalent bond may be of two types :

(i) Sigma bond (σ) (ii) Pi bond (π)

Sigma bond is stronger bond than the Pi-bond. If atomic orbitals overlap about the nuclear axis then sigma bond is formed but when atomic

orbitals overlap sideway then Pi-bond is formed.

Compound having maximum bond angle is :

A. BBr_3

B. BCl_3

C. BF_3

D. none of these

Answer: D

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6. A covalent bond will be formed by the overlapping of atomic orbitals having single electron of opposite spin, according to the overlapping of atomic orbitals the covalent bond may be of two types :

(i) Sigma bond (σ) (ii) Pi bond (π)

Sigma bond is stronger bond than the Pi-bond. If atomic orbitals overlap about the nuclear axis then sigma bond is formed but when atomic orbitals overlap sideway then Pi-bond is formed.

The strength of bonds formed by 2s-2s,2p-2p and 2p-2s overlap has the order :

A. $s-s>p-p>p-s$

B. $s-s>p-s>p-p$

C. $p-p>p-s>s-s$

D. $p-p>s-s>p-s$

Answer: C

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Level 3 (Passive 10)

1. According to VBT the extent of overlapping depends upon types of orbitals involved in overlapping and nature of overlapping. More will be the overlapping and the bond energy will also be high.

The incorrect order of bond dissociation energy will be :

A. $H-H > Cl-Cl > Br-Br$

B. $Si-Si > P-P > Cl-Cl$

C. $C-C > N-N > O-O$

D. $H-Cl > H-Br > H-I$

Answer: B

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2. According to VBT the extent of overlapping depends upon types of orbitals involved in overlapping and nature of overlapping. More will be the overlapping and the bond energy will also be high.

Which of the following combination of orbitals does not form covalent bond (x-axis is inter nuclear axis) :

A. $s+p_y$

B. p_y+p_y

C. $d_{yz}+d_{yz}$

D. $d_{xy} + d_{xy}$

Answer: A

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3. According to VBT the extent of overlapping depends upon types of orbitals involved in overlapping and nature of overlapping. More will be the overlapping and the bond energy will also be high.

Which of the following compound does not form $p\pi - p\pi$ bond ?

A. SO_3

B. NO_3^-

C. SO_4^{2-}

D. CO_3^{2-}

Answer: C

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4. According to VBT the extent of overlapping depends upon types of orbitals involved in overlapping and nature of overlapping. More will be the overlapping and the bond energy will also be high.

The incorrect order of bond dissociation energy will be :

A. $H-H > Cl-Cl > Br-Br$

B. $Si-Si > P-P > Cl-Cl$

C. $C-C > N-N > O-O$

D. $H-Cl > H-Br > H-I$

Answer: B

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5. According to VBT the extent of overlapping depends upon types of orbitals involved in overlapping and nature of overlapping. More will be the overlapping and the bond energy will also be high.

Which of the following combination of orbitals does not form covalent bond (x-axis is inter nuclear axis) :

A. $s + p_y$

B. $p_y + p_y$

C. $d_{yz} + d_{yz}$

D. $d_{xy} + d_{xy}$

Answer: A

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6. According to VBT the extent of overlapping depends upon types of orbitals involved in overlapping and nature of overlapping. More will be the overlapping and the bond energy will also be high.

Which of the following compound does not form $p\pi - p\pi$ bond ?

A. SO_3

B. NO_3^-

C. SO_4^{2-}

D. CO_3^{2-}

Answer: C

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Level 3 (Passive 11)

1. Consider the following elements with their period number and valence electrons.

Elements	Period number	Total valence e^-
P	2	4
Q	2	6
R	3	7
S	3	3
T	3	6
U	3	4

According to the given informations, answer the following questions :

Choose incorrect statement :

A. R exhibits maximum covalency among all elements given

B. Q does not exhibit variable covalency

C. R exhibits minimum covalency among all elements given

D. R and S combine each other and form SR_5 type of compound

Answer: D

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2. Consider the following elements with their period number and valence electrons.

Elements	Period number	Total valencee^-
P	2	4
Q	2	6
R	3	7
S	3	3
T	3	6
U	3	4

According to the given informations, answer the following questions :

Choose the correct statement :

A. Q has maximum value of electron affinity

B. R has maximum value of electronegativity

C. S has maximum atomic size

D. T and U are same group elements

Answer: C

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3. Consider the following elements with their period number and valence electrons.

Elements	Period number	Total valence e^-
P	2	4
Q	2	6
R	3	7
S	3	3
T	3	6
U	3	4

According to the given informations, answer the following questions :

Choose incorrect statement :

A. SR_3 is a hypovalent compound

B. UR_4 can act as a Lewis acid

C. PQ_2 can not acts as Lewis acid

D. $UR_4 > SR_3$: Lewis acidic character

Answer: C

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4. Consider the following elements with their period number and valence electrons.

Elements	Period number	Total valence e^-
P	2	4
Q	2	6
R	3	7
S	3	3
T	3	6
U	3	4

According to the given informations, answer the following questions :

Choose incorrect statement :

A. R exhibits maximum covalency among all elements given

B. Q does not exhibit variable covalency

C. R exhibits minimum covalency among all elements given

D. R and S combine each other and form SR_5 type of compound

Answer: D

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5. Consider the following elements with their period number and valence electrons.

Elements	Period number	Total valencee^-
P	2	4
Q	2	6
R	3	7
S	3	3
T	3	6
U	3	4

According to the given informations, answer the following questions :

Choose the correct statement :

A. Q has maximum value of electron affinity

B. R has maximum value of electronegativity

C. S has maximum atomic size

D. T and U are same group elements

Answer: C

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6. Consider the following elements with their period number and valence electrons.

Elements	Period number	Total valence e^-
P	2	4
Q	2	6
R	3	7
S	3	3
T	3	6
U	3	4

According to the given informations, answer the following questions :

Choose the incorrect statement :

A. SR_3 is a hypovalent compound

B. UR_4 can act as a Lewis acid

C. PQ_2 can not acts as Lewis acid

D. $UR_4 > SR_3$: Lewis acidic character

Answer: C

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Level 3 (Passive 12)

1. Hybridisation involves the mixing of orbitals having comparable energhies of same atom. Hybridised orbitals perform efficient overlapping than overlapping by pure s, p or orbitals.

Which of the following is not correctly match between given species and type of overlapping ?

A. XeO_3 : Three $(d\pi - p\pi)$ bonds

B. H_2SO_4 : Two $(d\pi - p\pi)$ bonds

C. SO_3 : Three $(d\pi - p\pi)$ bonds

D. $HClO_4$: Three $(d\pi - p\pi)$ bonds

Answer: C

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2. Hybridisation involves the mixing of orbitals having comparable energhies of same atom. Hybridised orbitals perform efficient overlapping than overlapping by pure s, p or orbitals.

Consider the following compounds and select the incorrect statement from the following :

$NH_3, PH_3, H_2S, SO_2, BF_3, PCl_3, IF_7, P_4, H_2$

A. Six molecules out of given compounds involves hybridisation

B. Three molecules are hypervalent compounds

C. Six molecules out of above compounds are non-planar in structure

D. Two molecules out of given compounds involves $(d\pi - p\pi)$ bonding as well as also involves $(p\pi - p\pi)$ bonding

Answer: C

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3. Hybridisation involves the mixing of orbitals having comparable energhies of same atom. Hybridised orbitals perform efficient overlapping than overlapping by pure s, p or orbitals.

Which of the following is not correctly match between given species and type of overlapping ?

A. XeO_3 : Three $(d\pi - p\pi)$ bonds

B. H_2SO_4 : Two $(d\pi - p\pi)$ bonds

C. SO_3 : Three $(d\pi - p\pi)$ bonds

D. $HClO_4$: Three $(d\pi - p\pi)$ bonds

Answer: C

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4. Hybridisation involves the mixing of orbitals having comparable energhies of same atom. Hybridised orbitals perform efficient overlapping than overlapping by pure s, p or orbitals.

Consider the following compounds and select the incorrect statement from the following :

$NH_3, PH_3, H_2S, SO_2, BF_3, PCl_3, IF_7, P_4, H_2$

A. Six molecules out of given compounds involves hybridisation

B. Three molecules are hypervalent compounds

C. Six molecules out of above compounds are non-planar in structure

D. Two molecules out of given compounds involves $(d\pi - p\pi)$ bonding as well as also involves $(p\pi - p\pi)$ bonding

Answer: C

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ONE OR MORE ANSWERS IS / ARE CORRECT

1. In which of the following there is intermolecular hydrogen bonding ?

A. Water

B. Ethanol

C. Acetic acid

D. H-F

Answer: A::B::C::D

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2. Correct order of decreasing boiling points is :

A. $HF > HI > HBr > HCl$

B. $H_2O > H_2Te > H_2Se > H_2S$

C. $Br_2 > Cl_2 > F_2$

D. $CH_4 > GeH_4 > SiH_4$

Answer: A::B::C

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3. In which species the hybrid state of central atom is / are sp^3 d ?

A. I_3^-

B. SF_4

C. PF_5

D. IF_5

Answer: A::B::C

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4. Select correct statement(s) is /are :

A. In AsH_3 molecule lone pair at central atom is present in almost pure s-orbital

B. Number of $p\pi - d\pi$ bond in SO_3 and SO_2 are same

C. NF_3 is better Lewis base than NCl_3

D. Stable oxidation state of Lead is $+2$

Answer: A::D

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5. Which of the following species does / do not exist ?

A. OF_4

B. NH_2^-

C. NCl_5

D. ICl_3^{2-}

Answer: A::C::D

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6. Which of the following species is /are superoctet molecule ?

A. AlF_3

B. $SiCl_4$

C. XeF_2

D. ICl_3

Answer: C::D

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7. Which of the following statements is incorrect ?

A. $A\sigma$ - bond is weaker than $a\pi$-bond

B. There are four co-ordinate bonds in the NH_4^+ ions

C. The covalent bond is directional in nature

D. HF is less polar than HCl

Answer: A::B::D

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8. Which of the following species is /are capable of forming a coordinate bond with BF_3 ?

A. PH_3

B. NH_4^+

C. OH^-

D. Mg^{2+}

Answer: A::C

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9. Ionic compounds in geneal do not possess :

A. high melting points and non-directional bonds

B. high melting points and low-boiling points

C. directional bonds and low-boiling points

D. high solubilities in polar and non-polar solvents

Answer: B::C::D

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10. Correct statbility order of metal cation is /are :

A. $Pb^{2+} < Sn^{2+}$

B. $Pb^{4+} < Pb^{2+}$

C. $Sn^{4+} < Sn^{2+}$

D. $Pb^{4+} < Sn^{4+}$

Answer: B::D

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11. Consider the following molecule :

$$\underset{(1)}{H_2C} = \underset{(2)}{C} = \underset{(3)}{C} = \underset{(4)}{C} = \underset{(5)}{CF_2}$$

Ih hybridization of $C_{(1)}$ carbon atom is $sp^2(s + p_y + p_z$ and hybridization of $C_{(4)}$ carbon atom is $sp(s + p_z)$. Then according to given information the correct statement(s) is / are :

A. Nodal plane of π-bond between $C_{(2)}$ and $C_{(3)}$ lies in xz-plane, formed by sideways overlapping of p_y-orbitals

B. Nodal plane of π-bond between $C_{(3)}$ and $C_{(4)}$ lies in yz-plane, formed by side ways overlapping of p_x-orbitals

C. The orbitals involve in hybridization of $C_{(5)}$ carbon atom are $s + p_x + p_z$

D. Nodal plane of π-bond between $C_{(1)}$ and $C_{(2)}$ lies in yz-plane, formed by side ways overlapping of p_y-orbitals

Answer: A::B::C

View Text Solution

12. Consider the following two molecules and according to the given information select correct statement(s) about AX_2 and AY_2 :

where A: 16th group of 3rd period element

X: more electronegative than (A) and same group number of (A) ltbgt Y: Less atomic size than (A) and same period number of (A)

A. The hybridization of central atoms are different in both compounds

B. The shape of both molecules are same

C. Both compounds are planar

D. The X-A-X bond angle is less than Y-A-Y bond angle

Answer: A::B::C

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13. Which of the following statements are correct about sulphur hexafluoride ?

A. all S-F bonds are equivalent

B. SF_6 is a planar molecule

C. oxidation number of sulphur is the same as number of electrons of sulphu involved in bonding

D. sulphur has acquired the elctronic structure of the gas argon

Answer: A::C

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14. If AB_4^n types species are tetrahedral, then which of the following is /are correctly match ?

A. $\begin{matrix} A & B & n \\ Xe & O & 0 \end{matrix}$

B. $\begin{matrix} A & B & n \\ Se & F & 0 \end{matrix}$

C. $\begin{matrix} A & B & n \\ P & O & -3 \end{matrix}$

D. $\begin{matrix} A & B & n \\ N & H & +1 \end{matrix}$

Answer: A::C::D

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15. Which of the following statements is correct ?

A. ClF_3 molecule is bent T-shape

B. In SF_4 molecule, F-S-F equatorial bond angle is 103° due to lp-lp repulsion

C. In $[ICl_4]^-$ molecular ion, Cl-I-Cl bond angle is 90°

D. In OBr_2, the bond angle is less than OCl_2

Answer: A::C

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16. Which of the following combination of bond pair (b.p.) and lone pair (l.p.) give same shape ?

(i) 3 b.p.+1 l.p. (ii) 2 b.p.+2 l.p. (iii) 2 b.p.1 l.p. (iv) 2 b.p. + 0 l. p.

(v) 3 b.p. +2 l.p. (vi) 2 b.p.+3 l.p.

A. ii and iii

B. iv and v

C. iv and vi

D. iii and vi

Answer: A::C

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17. Select the true statement(s) among the following :

A. Pure overlapping of two d_{xy} orbitals along x-axis results in the formation of π-bond

B. $NO_2^+ > NO_3^- > NO_2^-$ is the correct order of bond angle as well as N-O bond order

C. $NF_3 < NCl_3 < NBr_3 < NI_3$ is the correct order of Lewis basic character as well as bond angle

D. $HF > HCl > HBr > HI$ is the correct order of dipole moment as well as boiling point

Answer: A::C

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18. p_y-orbital can not form π -bond by lateral overlap with :

A. d_{xz}- orbital

B. $d_{x^2-y^2}$-orbitals

C. d_{xy}-orbital

D. p_z -orbital

Answer: A::B::D

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19. Which of the following orbital (s) cannot form δ-bond ?

A. $d_{x^2-y^2}$-orbital

B. d_{xy}-orbital

C. d_{z^2}-orbital

D. p_x-orbital

Answer: C::D

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20. Select correct statement(s) regarding σ and π bonds :

A. σ - bond lies on the line joining the nuclei of bonded atoms

B. π - electron cloud lies on either side to the line joining the nuclei of bonded atoms

C. $(2p_{\pi} - 3d_{\pi})\pi$ - bond is stronger than $(2p_{\pi} - 3p_{\pi})\pi$ - bond.

D. σ-bond has primary effect to decide direction of covalent bond, while π- bond has no primary effect in direction of bond

Answer: A::B::C::D

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21. Which of the following statements is / are correct ?

A. All carbon to carbon bonds contain a sigma bond and one or more π- bonds

B. All carbon to carbon bonds are sigma bonds

C. All oxygen to hydrogen bonds are hydrogen bonds

D. All carbon to hydrogen bonds are sigma bonds

Answer: D

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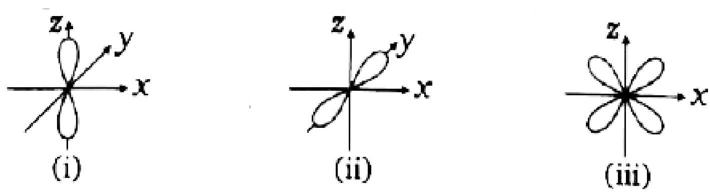
22. Consider the following three orbitals :



Correct statement(s) regarding given information is /are :

A. Orbitals (i) and (ii) can never form any type of covalent bond

B. If internuclear axis is x, then combination of (ii) and (iii) orbitals can form π- bond

C. Orbital (iii) can form δ- bond with other orbital having same orientation of lobes

D. If internuclear axis is 'x', then combination of (i) and (iii) orbitals can form π - bond

Answer: A::C::D

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23. Which of the following combination of orbitals can not form bond. (If x axis in internuclear axis)

A. $s + p_z$

B. $s + s$

C. $p_z + p_x$

D. $d_{xy} + p_y$

Answer: A::C

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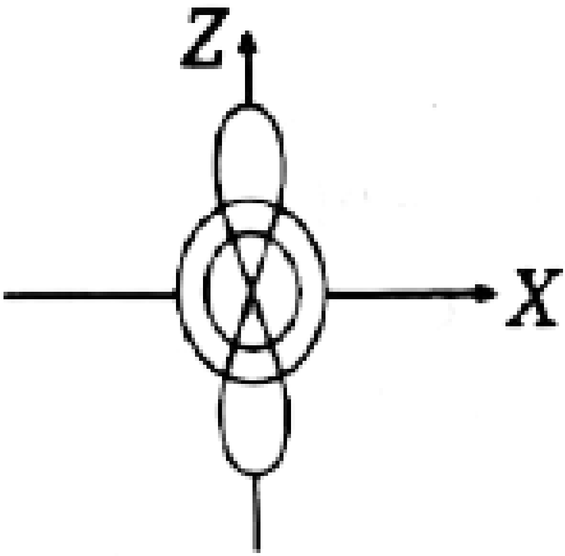
24. Consider the following atomic orbitals :



Which of the following statement(s) is /are correct regarding given orbital ?

A. It is a gerade atomic orbital

B. It has zero nodal plane

C. Circular electron density is present in XY plane

D. Opposite lobes of orbital have same sign of wave function (ψ)

Answer: A::B::C::D

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25. In which of the following there is intermolecular hydrogen bonding ?

A. Water

B. Ethanol

C. Acetic acid

D. H-F

Answer: A::B::C::D

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26. Correct order of decreasing boiling points is :

A. $HF > HI > HBr > HCl$

B. $H_2O > H_2Te > H_2Se > H_2S$

C. $Br_2 > Cl_2 > F_2$

D. $CH_4 > GeH_4 > SiH_4$

Answer: A::B::C

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27. In which species the hybrid state of central atom is / are sp^3d ?

A. I_3^-

B. SF_4

C. PF_5

D. IF_5

Answer: A::B::C

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28. Select correct statement(s) is /are :

A. In AsH_3 molecule lone pair at central atom is present in almost pure s-orbital

B. Number of $p\pi - d\pi$ bond in SO_3 and SO_2 are same

C. NF_3 is better Lewis base than NCl_3

D. Stable oxidation state of Lead is $+2$

Answer: A::D

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29. Which of the following species does / do not exist ?

A. OF_4

B. NH_2^-

C. NCl_5

D. ICl_3^{2-}

Answer: A::C::D

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30. Which of the following species is /are superoctet molecule ?

A. AlF_3

B. $SiCl_4$

C. XeF_2

D. ICl_3

Answer: C::D

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31. Which of the following statements is incorrect ?

A. $A\sigma$ - bond is weaker than $a\pi$-bond

B. There are four co-ordinate bonds in the NH_4^+ ions

C. The covalent bond is directional in nature

D. HF is less polar than HCl

Answer: A::B::D

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A. PH_3

B. NH_4^+

C. OH^-

D. Mg^{2+}

Answer: A::C

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A. high melting points and non-directional bonds

B. high melting points and low-boiling points

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D. high solubilities in polar and non-polar solvents

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A. $Pb^{2+} < Sn^{2+}$

B. $Pb^{4+} < Pb^{2+}$

C. $Sn^{4+} < Sn^{2+}$

D. $Pb^{4+} < Sn^{4+}$

Answer: B::D

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Ih hybridization of $C_{(1)}$ carbon atom is $sp^2\left(s + p_y + p_z\right.$ and hybridization of $C_{(4)}$ carbon atom is $sp(s + p_z)$. Then according to given information the correct statement(s) is / are :

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B. Nodal plane of π-bond between $C_{(3)}$ and $C_{(4)}$ lies in yz-plane, formed by side ways overlapping of p_x-orbitals

C. The orbitals involve in hybridization of $C_{(5)}$ carbon atom are $s + p_x + p_z$

D. Nodal plane of π-bond between $C_{(1)}$ and $C_{(2)}$ lies in yz-plane, formed by side ways overlapping of p_y-orbitals

Answer: A::B::C

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36. Consider the following two molecules and according to the given information select correct statement(s) about AX_2 and AY_2 :

where A: 16th group of 3rd period element

X: more electronegative than (A) and same group number of (A) ltbgt Y: Less atomic size than (A) and same period number of (A)

A. The hybridization of central atoms are different in both compounds

B. The shape of both molecules are same

C. Both compounds are planar

D. The X-A-X bond angle is less than Y-A-Y bond angle

Answer: A::B::C

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A. all $S-F$ bonds are equivalent

B. SF_6 is a planar molecule

C. oxidation number of sulphur is the same as number of electrons of sulphu involved in bonding

D. sulphur has acquired the elctronic structure of the gas argon

Answer: A::C

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38. If AB_4^n types species are tetrahedral, then which of the following is /are correctly match ?

A. $\begin{matrix} A & B & n \\ Xe & O & 0 \end{matrix}$

B. $\begin{matrix} A & B & n \\ Se & F & 0 \end{matrix}$

C. $\begin{matrix} A & B & n \\ P & O & -3 \end{matrix}$

D. $\begin{matrix} A & B & n \\ N & H & +1 \end{matrix}$

Answer: A::C::D

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A. ClF_3 molecule is bent T-shape

B. In SF_4 molecule, F-S-F equatorial bond angle is 103° due to lp-lp repulsion

C. In $[ICl_4]^-$ molecular ion, Cl-I-Cl bond angle is 90°

D. In OBr_2, the bond angle is less than OCl_2

Answer: A::C

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(i) 3 b.p.+1 l.p. (ii) 2 b.p.+2 l.p. (iii) 2 b.p.1 l.p. (iv) 2 b.p. + 0 l. p.

(v) 3 b.p. +2 l.p. (vi) 2 b.p.+3 l.p.

A. ii and iii

B. iv and v

C. iv and vi

D. iii and vi

Answer: A::C

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41. Select the true statement(s) among the following :

A. Pure overlapping of two d_{xy} orbitals along x-axis results in the formation of π-bond

B. $NO_2^+ > NO_3^- > NO_2^-$ is the correct order of bond angle as well as N-O bond order

C. $NF_3 < NCl_3 < NBr_3 < NI_3$ is the correct order of Lewis basic character as well as bond angle

D. $HF > HCl > HBr > HI$ is the correct order of dipole moment as well as boiling point

Answer: A::C

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42. p_y-orbital can not form π -bond by lateral overlap with :

A. d_{xz}- orbital

B. $d_{x^2-y^2}$-orbitals

C. d_{xy}-orbital

D. p_z -orbital

Answer: A::B::D

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43. Which of the following orbital (s) cannot form δ-bond ?

A. $d_{x^2-y^2}$-orbitals

B. d_{xy}-orbital

C. d_{z^2}-orbital

D. p_x-orbital

Answer: C::D

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44. Select correct statement(s) regarding σ and π bonds :

A. σ - bond lies on the line joining the nuclei of bonded atoms

B. π - electron cloud lies on either side to the line joining the nuclei of bonded atoms

C. $(2p_{\pi} - 3d_{\pi})\pi$ - bond is stronger than $(2p_{\pi} - 3p_{\pi})\pi$ - bond.

D. σ-bond has primary effect to decide direction of covalent bond, while π- bond has no primary effect in direction of bond

Answer: A::B::C::D

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45. Which of the following statements is / are correct ?

A. All carbon to carbon bonds contain a sigma bond and one or more π- bonds

B. All carbon to carbon bonds are sigma bonds

C. All oxygen to hydrogen bonds are hydrogen bonds

D. All carbon to hydrogen bonds are sigma bonds

Answer: D

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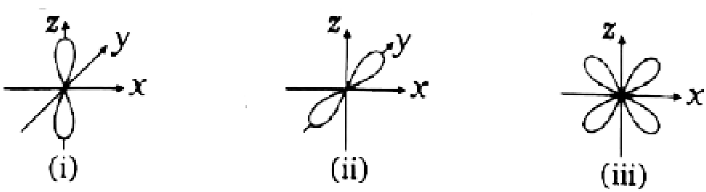
46. Consider the following three orbitals :



Correct statement(s) regarding given information is /are :

A. Orbitals (i) and (ii) can never form any type of covalent bond

B. If internuclear axis is x, then combination of (ii) and (iii) orbitals can form π- bond

C. Orbital (iii) can form δ- bond with other orbital having same orientation of lobes

D. If internuclear axis is 'x', then combination of (i) and (iii) orbitals can form π - bond

Answer: A::C::D

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47. Which of the following combination of orbitals do / does not form bond (if x-axis is internuclear axis) ?

A. $s + p_z$

B. $s + s$

C. $p_z + p_x$

D. $d_{xy} + p_y$

Answer: A::C

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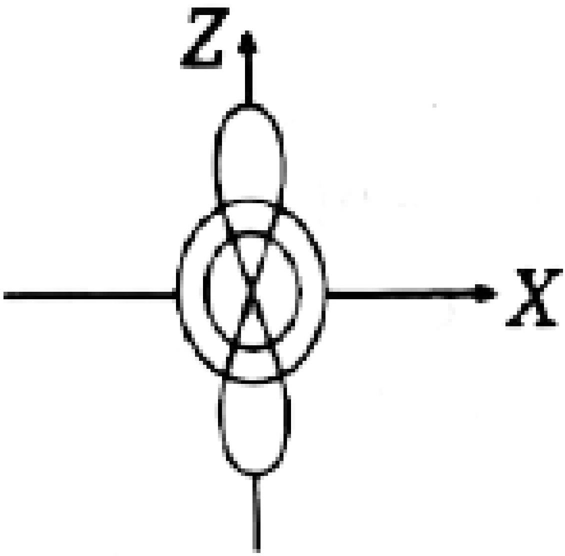
48. Consider the following atomic orbitals :



Which of the following statement(s) is /are correct regarding given orbital ?

A. It is a gerade atomic orbital

B. It has zero nodal plane

C. Circular electron density is present in XY plane

D. Opposite lobes of orbital have same sign of wave function (ψ)

Answer: A::B::C::D

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MATCH THE COLUMN

1. Column-I and Column -II contains four entries each. Entries of Column-I are to be matched with some entries of Column-II. One or more than one entries of Column-I may have the matching with the same entries of Column-II.

Column-I	Column-II
(A) $B_3N_3H_6$	(P) Planar geometry
(B) I_3^-	(Q) Non-planar geometry
(C) B_2Cl_4 (Solid)	(R) Compound having coordinate bond
(D) SiF_4	(S) Compound having back bond
	(T) Non-polar compound

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2. Column-I and Column -II contains four entries each. Entries of Column-I are to be matched with some entries of Column-II. One or more than one

entries of Column-I may have the matching with the same entries of Column-II.

Column-I (Shape)	Column-II (Hybridisation)
(A) Linear	(P) sp^3
(B) Angular	(Q) sp^3d^2
(C) Square planar	(R) sp^2
(D) Trigonal planar	(S) sp^3d

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3. Column-I and Column -II contains four entries each. Entries of Column-I are to be matched with some entries of Column-II. One or more than one entries of Column-I may have the matching with the same entries of Column-II.

Column-I	Column-II
(A) SO_3	(P) Largest bond angle
(B) $BeCl_2$	(Q) Lowest bond angle
(C) NH_3	(R) sp^2-hybridisation
(D) NO_2^-	(S) sp^3-hybridisation

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4. Column-I and Column -II contains four entries each. Entries of Column-I are to be matched with some entries of Column-II. One or more than one

entries of Column-I may have the matching with the same entries of Column-II.

Column-I	Column-II
(A) Hypo phosphoric acid	(P) All hydrogen are ionizable in water
(B) Pyro phosphorous acid	(Q) Lewis acid in water
(C) Boric acid	(R) Monobasic
(D) Hypo phosphorous acid	(S) sp^3-hybridised central atom

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5. Column-I and Column -II contains four entries each. Entries of Column-I are to be matched with some entries of Column-II. One or more than one entries of Column-I may have the matching with the same entries of Column-II.

Column-I	Column-II
(A) NH_2^-	(P) Square pyramidal
(B) $XeOF_2$	(Q) V-shaped
(C) ICl_4^-	(R) T-shaped
(D) $[SbF_5]^{2-}$	(S) Square planar

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6. Column-I and Column -II contains four entries each. Entries of Column-I are to be matched with some entries of Column-II. One or more than one entries of Column-I may have the matching with the same entries of Column-II.

Column-I	Column-II
(A) ICl_2^-	(P) Linear
(B) BrF_2^+	(Q) Pyramidal
(C) ClF_4^-	(R) Tetrahedral
(D) $AlCl_4^-$	(S) Square planar
	(T) Angular

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7. Column-I and Column -II contains four entries each. Entries of Column-I are to be matched with some entries of Column-II. One or more than one entries of Column-I may have the matching with the same entries of Column-II.

Column-I (Bond order range)	Column-II (Oxyanions)
(A) 1.0 to 1.30	(P) NO_3^-
(B) 1.31 to 1.55	(Q) ClO_4^-
(C) 1.56 to 1.70	(R) PO_4^{3-}
(D) 1.71 to 2.0	(S) ClO_3^-
	(T) SO_4^{2-}

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8. Column-I and Column -II contains four entries each. Entries of Column-I are to be matched with some entries of Column-II. One or more than one entries of Column-I may have the matching with the same entries of Column-II.

Column-I	Column-II
(A) AsO_4^{3-}	(P) All three p-orbitals used in hybridisation
(B) ICl_2^+	(Q) Tetrahedral shape
(C) SOF_4	(R) Axial d-orbital with two nodal cones used in hybridisation
(D) $XeOF_4$	(S) All bond lengths are identical
	(T) $p\pi - d\pi$ bond(s) present

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9. Column-I and Column -II contains four entries each. Entries of Column-I are to be matched with some entries of Column-II. One or more than one entries of Column-I may have the matching with the same entries of

Column-II.

Column-I σ-bond pairs + lone pairs around central atom of AB_x type compound	Column-II Characteristics/shape of compound
(A) 2 + 1	(P) Linear
(B) 2 + 3	(Q) Angular
(C) 4 + 2	(R) Polar
(D) 2 + 2	(S) Non-polar
	(T) Planar

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10. Column-I and Column -II contains four entries each. Entries of Column-I are to be matched with some entries of Column-II. One or more than one entries of Column-I may have the matching with the same entries of Column-II.

Column-I (Type of bond formed)	Column-II [Combining orbitals (Internuclear axis)]
(A) π-bond	(P) $d_{yz} + p_y$, (z)
(B) σ-bond	(Q) $s + p_x$, (y)
(C) δ-bond	(R) $d_{yz} + d_{yz}$, (x)
(D) Non-bonding	(S) $s + s$, (z)
	(T) $s + d_{xy}$, (y)

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11. Column-I and Column -II contains four entries each. Entries of Column-I are to be matched with some entries of Column-II. One or more than one entries of Column-I may have the matching with the same entries of Column-II.

Column-I	Column-II
(A) XeF_5^-	(P) *d*-orbital with zero nodal plane is used in hybridisation
(B) PBr_4^+	(Q) Non-axial *d*-orbital is used in hybridisation
(C) IOF_3	(R) Planar species
(D) NH_2^-	(S) Non-planar species
	(T) Bond angle 109°28' or less than 109°28'

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Column-I	Column-II
(A) $IO_2F_2^-$	(P) Trigonal pyramidal shape
(B) IOF_4^-	(Q) Square pyramidal shape
(C) $SeOF_2$	(R) See-saw shape
(D) $XeOF_2$	(S) Non-planar
	(T) One of the bond angle < 90°

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(B) I_3^-	(Q) Non-planar geometry
(C) B_2Cl_4 (Solid)	(R) Compound having coordinate bond
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	(T) Non-polar compound

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(B) BrF_2^+	(Q) Pyramidal
(C) ClF_4^-	(R) Tetrahedral
(D) $AlCl_4^-$	(S) Square planar
	(T) Angular

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Column-I	Column-II
(A) $Re_2Cl_8^{2-}$	(P) $p\pi - p\pi$ bonding
(B) NO_3^-	(Q) $p\pi - d\pi$ bonding
(C) SO_4^{2-}	(R) $d\pi - d\pi$ bonding
(D) SO_3	(S) δ-bonding

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(D) 1.71 to 2.0	(S) ClO_3^-
	(T) SO_4^{2-}

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21. Column-I and Column -II contains four entries each. Entries of Column-I are to be matched with some entries of Column-II. One or more than one entries of Column-I may have the matching with the same entries of Column-II.

Column-I	Column-II
(A) AsO_4^{3-}	(P) All three p-orbitals used in hybridisation
(B) ICl_2^+	(Q) Tetrahedral shape
(C) SOF_4	(R) Axial d-orbital with two nodal cones used in hybridisation
(D) $XeOF_4$	(S) All bond lengths are identical
	(T) $p\pi - d\pi$ bond(s) present

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22. Column-I and Column -II contains four entries each. Entries of Column-I are to be matched with some entries of Column-II. One or more than one entries of Column-I may have the matching with the same entries of Column-II.

Column-I σ-bond pairs + lone pairs around central atom of AB_x type compound	Column-II Characteristics/shape of compound
(A) 2 + 1	(P) Linear
(B) 2 + 3	(Q) Angular
(C) 4 + 2	(R) Polar
(D) 2 + 2	(S) Non-polar
	(T) Planar

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23. Column-I and Column -II contains four entries each. Entries of Column-I are to be matched with some entries of Column-II. One or more than one entries of Column-I may have the matching with the same entries of

Column-II.

Column-I (Type of bond formed)	Column-II [Combining orbitals (Internuclear axis)]
(A) π-bond	(P) $d_{yz} + p_y$, (z)
(B) σ-bond	(Q) $s + p_x$, (y)
(C) δ-bond	(R) $d_{yz} + d_{yz}$, (x)
(D) Non-bonding	(S) $s + s$, (z)
	(T) $s + d_{xy}$, (y)

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24. Column-I and Column -II contains four entries each. Entries of Column-I are to be matched with some entries of Column-II. One or more than one entries of Column-I may have the matching with the same entries of Column-II.

Column-I	Column-II
(A) XeF_5^-	(P) d-orbital with zero nodal plane is used in hybridisation
(B) PBr_4^+	(Q) Non-axial d-orbital is used in hybridisation
(C) IOF_3	(R) Planar species
(D) NH_2^-	(S) Non-planar species
	(T) Bond angle 109°28' or less than 109°28'

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25. Column-I and Column -II contains four entries each. Entries of Column-I are to be matched with some entries of Column-II. One or more than one entries of Column-I may have the matching with the same entries of Column-II.

Column-I	Column-II
(A) $IO_2F_2^-$	(P) Trigonal pyramidal shape
(B) IOF_4^-	(Q) Square pyramidal shape
(C) $SeOF_2$	(R) See-saw shape
(D) $XeOF_2$	(S) Non-planar
	(T) One of the bond angle $< 90^\circ$

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ASSERTION-REASON TYPE QUESTIONS

1. Assertion : Multiple bond between two bonded atoms can have more than three bonds.

Reason : Multiple bond between two bonded atoms can not have more than two π-bonds.

A. If assertion is true but the reason is false

B. If assertion is false but reason is true

C. IF both assertion and reason are true and the reason is the correct explanation of assertion

D. If both assertion and reason are true but reason is not the correct explanation of assertion

Answer: D

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2. Assertion : 2^{nd} period elements do not involve in excitation of electron.

Reason : 2^{nd} period elements do not have vacant 2d-orbitals.

A. If assertion is true but the reason is false

B. If assertion is false but reason is true

C. IF both assertion and reason are true and the reason is the correct explanation of assertion

D. If both assertion and reason are true but reason is not the correct explanation of assertion

Answer: B

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3. Assertion : In SO_3 molecule bond dissociation energy of all S=O bonds are not equivalent.

Reason : SO_3 molecule is having two types of $2p\pi - 3p\pi$ and $2p\pi - 3d\pi$ pi-bonds.

A. If assertion is true but the reason is false

B. If assertion is false but reason is true

C. IF both assertion and reason are true and the reason is the correct explanation of assertion

D. If both assertion and reason are true but reason is not the correct explanation of assertion

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4. Assertion : PH_4^+ ion is having tetrahedron geometry.

Reason : P-atom is unhybridised in PH_4^+ ion.

A. If assertion is true but the reason is false

B. If assertion is false but reason is true

C. IF both assertion and reason are true and the reason is the correct explanation of assertion

D. If both assertion and reason are true but reason is not the correct explanation of assertion

Answer: A

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5. Assertion : All diatomic molecules with polar bond have dipole moment.

Reason : Dipole moment is a vector quantity.

A. If assertion is true but the reason is false

B. If assertion is false but reason is true

C. IF both assertion and reason are true and the reason is the correct explanation of assertion

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Answer: D

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6. Assertion : Water is a good solvent for ionic compounds but poor one for covalent compounds.

Reason :Hydrogen energy of ions realeases sufficient energy to overcome lattice energy and break hydrogen bonds in water, white covalent bonded compound interact so weakly that even van der walls force between molecule of convalent compounds cannot be broken .

A. If assertion is true but the reason is false

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C. IF both assertion and reason are true and the reason is the correct explanation of assertion

D. If both assertion and reason are true but reason is not the correct explanation of assertion

Answer: C

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7. Assertion : Xe-atom in XeF_2 assumes sp-hybrid state.

Reason : XeF_2 molecule does not follow octet rule.

A. If assertion is true but the reason is false

B. If assertion is false but reason is true

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8. Assertion : The atoms in a covalent molecule are said to share electrons, yet some covalent molecule are polar.

Reason :In a polar covalent molecule , the shared electron spend more time on the average near one of the atoms .

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Answer: C

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9. Assertion : CCl_4 is a non-polar molecule.

Reason : CCl_4 has polar bonds.

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B. If assertion is false but reason is true

C. IF both assertion and reason are true and the reason is the correct explanation of assertion

D. If both assertion and reason are true but reason is not the correct explanation of assertion

Answer: D

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10. Assertion : Geometry of ICl_3 is tetrahedral.

Reason : Its shape is T-shape, due to the presence of two lone pairs.

A. assertion is true but the reason is false

B. assertion is false but reason is true

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D. both assertion and reason are true but reason is not the correct explanation of assertion

Answer: B

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11. Assertion : The covalency of carbon is four in excited state.

Reason : The four half-filled pure orbitals of carbon form same kind of bonds with an atom as those are with hybridised orbitals.

A. If assertion is true but the reason is false

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D. If both assertion and reason are true but reason is not the correct explanation of assertion

Answer: A

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12. Assertion : The shape of XeF_4 is square- planar.

Reason : In an octahedral geometry, a single lone pair can occupy any position but a second lone pair will occupy the opposite position to the first lone pair.

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Reason :Hydrogen energy of ions realeases sufficient energy to overcome lattice energy and break hydrogen bonds in water, white covalent bonded compound interact so weakly that even van der walls force between molecule of convalent compounds cannot be broken .

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Answer: C

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Answer: C

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21. Assertion : CCl_4 is a non-polar molecule.

Reason : CCl_4 has polar bonds.

A. If assertion is true but the reason is false

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C. IF both assertion and reason are true and the reason is the correct explanation of assertion

D. If both assertion and reason are true but reason is not the correct explanation of assertion

Answer: C

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SUBJECTIVE PROBLEMS

1. Consider following compounds A to E :

(A) XeF_n $(B)XeF^{+}_{(n+1)}$ $(C)XeF^{-}_{(n+1)}$ $(D)XeF_{(n+2)}$

(E) $XeF^{2-}_{(n+4)}$,

If value of n is 4, then calculate value of $p \div q$ here, 'p' is total number of bond pair and 'q' is total number of lone pair on central atoms of compounds (A) to (E).

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2. Consider the following five group (According to modern periodic table) of elements with their increasing order to atomic numbers :

Group $1 \rightarrow A, B, C, D, E$ $\text{Group2} \rightarrow F, G, H, I, J$

Group

$13 \rightarrow K, L, M, N, O$ Group15 $\rightarrow P, Q, R, S, T$ Group $17 \rightarrow U$

IF first and last element of each group belongs to 2nd and 6th period respectively and Z represents to carbonate ion $\left(CO_3^{2-}\right)$ then consider the following orders.

$(i) O^{+} > H^{2+}$, Polarising power

(ii) $T^{3+} > S^{3+} > R^{3+}$, Stability of cation

$(iii) U^{-}(aq) > V^{-}(aq) > W^{-}(aq) > X^{-}(aq)$, Size

(iv) $JV_2 < IV_2 < GV_2 < LV_3$, Covalent character

(v) $GZ > IZ > JZ$, Thermal stability

(vi) $AV > BV > CV > DV > EV$, Thermal stability

(vii) $C_3P > B_3P > A_3P$, Lattice energy

(viii) $KU_3 < KV_3 < KW_3 < KX_3$, Melting point

Then calculate value of $|p-q|^2$, here p and q are correct and incorrect orders in the given eight orders respectively.

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3. Consider the following species and find out total number of species which are polar and can act as Lewis acid

$CCl_4, CO_2, SO_2, AlCl_3, HCHO, SO_3, SiCl_4, BCl_3, CF_4$

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4. Consider the following table regarding interhalogen compounds, XY_n (where Y is more electronegative than X)

Value of n for respective interhalogen compound	Total number of d-orbitals used in hybridization of central atom	Polarity	Planarity
P_1	1	Polar	Planar
P_2	Q_1	Polar	Non-Planar
P_3	Q_2	Non-Polar	Non-Planar

Thn according to given information calculate value of expression

$$P_2 \times \left(\frac{P_3 - P_1}{(Q_1 + Q_2)}\right)$$

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5. What is covalency of chlorine atom in second excited state ?

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6. Sum of σ and π bonds in NH_4^+ cation is ..

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7. Calculate the value $X - Y$ for $XeOF_4$. ($X =$ Number of σ bond pair and $Y =$ Number of lone pair on central atom).

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8. The molecule AB_n is planar with six pairs of electrons around A in the valence shell. The value of n is

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9. Calculate value of $\frac{X + Y + Z}{10}$, here X is O-N-O bond angle in NO_3^- Y is O-N-O bond angle in NO_2^+ and Z is F-Xe-F adjacent bond angle in

XeF_4.

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10. Calculate x+y+z for H_3PO_3 acid, where x is no. of lone pairs, y is no. of σ bonds and z is no. of π bonds.

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11. How many right angle, bond angles are present in TeF_5^- molecular ion ?

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12. How may possible $\angle FSeF$ bond angles are present in SeF_4 molecule ?

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13. In IF_6^- and TeF_5^-, sum of axial d-orbitals which are used in hybridisation in both species.

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14. Among the following, total no. of planar species is :

(i) SF_4 $(ii) BrF_3$ $(iii) XeF_2$ $(iv) IF_5$

(v)SbF_4^- $(vi) SF_5^-$ $(vii) SeF_3^+$ $(viii) CH_3^+$

(ix) PCl_4^+

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15. Calculate the value of " x+y-z" here x,y and z are total number of non-bonded electron pair (s),pie (π) bond(s) and sigma (σ) bonds in hydrogen phosphite ion respectively.

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16. Consider the following table

Total number of electron pairs (l.p. + σ-bond)	Total number of lone pairs	Shape
5	....p....	linear
....q....	1	see-saw
4	....r....	Bent shape
....s....	2	Square planar
5	....t....	Bent 'T' shape

Then calculate value of "p+q+r-s-t".

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17. In phosphorus acid, if X is number of non bonding electron pairs. Y is number of σ-bonds and Z is number of π- bonds. Then, calculate value of $Y \times Z - X$.

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18. Calculate the number of $p_{\pi} - d_{\pi}$ bond(s) present in SO_4^{2-} :

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19. Sum of σ and π bonds in NH_4^+ cation is ..

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20. Consider the following orbitals (i)$3p_x$ (ii)$4d_{x^2}$ (iii)$3d_{x^2-y^2}$ (iv)$3d_{yz}$

Then, calculate value of "$x + y - z$" here x is total number of gerade orbital and y is total number of ungerade orbitals and z is total number of axial orbitals in given above orbitals.

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21. Calculate value of |x-y|, here x and y are the total number of bonds in benzene and benzyne respectively which are formed by overlapping of hybridized orbitals.

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22. Consider the following compounds :

$(i) IF_5$ $(ii) ClI_4^-$ $(iii) XeO_2F_2$ $(iv) NH_2^-$

$(v) BCl_3$ $(vi) BeCl_2$ $(vii) AsCl_4^+$ $(viii) B(OH)_3$

(ix) NO_2^- $(x) ClO_2^+$

Then calculate value of "x+y-z", here, x,y and z are total number of compounds in given compounds in which central atom used their all three p-orbitals, only two p-orbitals and only one p-orbital in hybridisation respectively .

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23. Total number of species which used all three p-orbitals in hybridisation of central atom and should be non-polar also.

$XeO_2F_2, SnCl_2, IF_5, I_3^+, XeO_4, SO_2, XeF_7^+, SeF_4$

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24. Consider the following species

NO_3^-, SO_4^{2-}, ClO_3^-, SO_3, PO_4^{3-}, XeO_3, CO_3^{2-}, SO_3^{2-}

Then calculate value of |x-y|, where

x : Total number of species which have bond order 1.5 or greater than 1.5

y : Total number of species which have bond order less than 1.5

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25. Consider the following orbitals

$3s$, $2p_x$, $4d_{xy}$, $4d_{z^2}$, $3d_{x^2-y^2}$, $3p_y$, $4s$, $4p_z$ and find total number of orbital (s) having even number of nodal plane.

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26. For the following molecules :

PCl_5, BrF_3, ICl_2^-, XeF_5^-, NO_3^-, XeO_2F_2, PCl_4^+, CH_3^+

Calculate the value of $\dfrac{a+b}{c}$

a = Number of species having sp^3 d-hybridisation

b= Number of species which are planar

c= Number of species which are non-planar

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27. Find out number of transformation among following which involves the change of hybridisation of underlined atom.

(a)

$H_2\underline{O} + H^+ \rightarrow H_3\underline{O}^+$ $(b) NH_3 + \underline{B}F_3 \rightarrow NH_3. Underl \in e(B)F_3$

(c) $\underline{X}eF_6 \rightarrow \underline{X}eF_5^+ + F^-$ $(d) 2\underline{P}Cl_5 \rightarrow \underline{P}Cl_4^+) + PCl_6^-$

(e) $\underline{C}H_3 - CH_3 \rightarrow \underline{C}H_3^- + CH_3^+$

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28. Consider following compounds A to E :

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IF first and last element of each group belongs to 2nd and 6th period respectively and Z represents to carbonate ion $\left(CO_3^{2-}\right)$ then consider the following orders.

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Thn according to given information calculate value of expression $P_2 \times \left(\frac{P_3 - P_1}{(Q_1 + Q_2)}\right)$

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50. Total number of species which used all three p-orbitals in hybridisation of central atom and should be non-polar also.

$XeO_2F_2, SnCl_2, IF_5, I_3^+, XeO_4, SO_2, XeF_7^+, SeF_4$

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51. Consider the following species $NO_3^-, SO_4^{2-}, ClO_3^-, SO_3, PO_4^{3-}, XeO_3, CO_3^{2-}, SO_3^{2-}$

Then calculate value of |x-y|, where

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y : Total number of species which have bond order less than 1.5

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52. Consider the following orbitals $3s, 2p_x, 4d_{xy}, 4d_{z^2}, 3d_{x^2-y^2}, 3p_y, 4s, 4p_z$ and find total number of orbital

(s) having even number of nodal plane.

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53. For the following molecules :

$PCl_5, BrF_3, ICl_2^-, XeF_5^-, NO_3^-, XeO_2F_2, PCl_4^+, CH_3^+$

Calculate the value of $\frac{a+b}{c}$

a = Number of species having sp^3 d-hybridisation

b= Number of species which are planar

c= Number of species which are non-planar

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54. Find out number of transformation among following which involves the change of hybridisation of underlined atom.

(a)

$H_2\underline{O} + H^+ \rightarrow H_3\underline{O}^+ \qquad (b) NH_3 + \underline{B}F_3 \rightarrow NH_3 . Underl \in e(B)F_3$

(c) $\underline{X}eF_6 \rightarrow \underline{X}eF_5^{+} + F^{-}$ $(d) 2\underline{P}Cl_5 \rightarrow \underline{P}Cl_4^{+}) + PCl_6^{-}$

(e) $\underline{C}H_3 - CH_3 \rightarrow \underline{C}H_3^{-} + CH_3^{+}$

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