CHEMISTRY

BOOKS - GRB CHEMISTRY (HINGLISH)

CHEMICAL BONDING-I

STRAIGHT OBJECTIVE TYPE(A)

1. The electronic configuration of four elements are :

(P) $[Xe]6s^2$

(Q) $[Xe]4f^{14}, 5d^1, 6s^2$

(R) $[Ar]4s^2, 4p^5$

(S) $[Ar]3d^{10}, 4s^2, 4p^3$

Which of the following is/are correct?

A. (P) is a d-block element

B. (Q) is a d-block element

C. (R) has highest electron affinity among given elements

D. (S) shows maximum covalency of 4

Answer: C

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2. The compound which contains both ionic and covalent bonds is :

A. CH_4

B. H_2

C. KCN

D. KCl

Answer: C

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3. In $SnCl_3^-$ ion, calculate the formal charge on Sn :

A. $+1$

B. -1

C. 0

D. -2

Answer: B

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4. Which of following species follows the octet rule for all of its atoms?

A. BF_3

B. TeF_6

C. XeF_6

D. C_2F_6

Answer: D

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5. Which is corrent Lewis structure with formal charge on particular atom?

A. 

B. 

C. 

D. 

Answer: A

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6. Which of the following is a hypovalent molecule species?

A. NaF

B. $COCl_2$

C. NF_4^+

D. $BeCl_2$

Answer: D

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

A. Sodium chloride

B. Silica

C. Aluminium chloride

D. Lead oxide

Answer: B

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8. The maximum covalency for representative elements is equal to (excluding 1st and 2nd period)

A. the number of unpaired p-electrons

B. the number of paired d-electrons

C. the number of unpaired s and p-electrons

D. the actual number of s and p-electrons in the outermost shell

Answer: D

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9. Which of the following contains both covalent and ionic bond?

A. CH_4

B. H_2O_2

C. NH_4Cl

D. none of these

Answer: C

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10. The bonds present in N_2O_5 are .

A. only covalent

B. only ionic

C. ionic and covalent

D. covalent and coordinate

Answer: D

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11. Bonds presents in $CuSO_4.5H_2O$ is

A. electrovalent and covalent

B. electrovalent and coordinate

C. covalent and coordinate

D. electrovalent, covalent and coordinate

Answer: D

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12. Example of super octet molecule is :

A. SF_6

B. PCl_5

C. IF_7

D. all of these

Answer: D

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13. The octet rule is not obeyed in :

A. CO_2

B. BCl_3

C. PCl_5

D. (b) and (c) both

Answer: D

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14. Select the element which can donate it's lone pair from it's 'd' orbital during co-ordinate bond formation :

A. S

B. Cl

C. Ar

D. none of these

Answer: D

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15. Which of the following species are hypervalent?

(P) ClO_4^-

(Q) BF_3

(R) SO_4^{2-}

(S) CO_3^{2-}

A. P, Q, R

B. P, R

C. R, S

D. P, Q

Answer: B

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16. BF_3 and NH_3 combine readily because of the formation of

A. a covalent bond

B. a hydrogne

C. a coordinate bond

D. an ionic bond

Answer: C

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17. Which of the following species does not contain N - N covalent bond?

A. N_2O_3

B. $N_2O_2^{2-}$

C. N_2O_5

D. N_2O_4

Answer: C

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18. Which of the following Lewis diagram is incorrect?

A. $Na^+\left[:\ddot{O}..-\ddot{C}..l:\right]^-$

$$:\ddot{C}l:$$

$$|$$

B. $:\ddot{C}..l - C - \ddot{C}..l:$

$$|$$

$$:C..l:$$

C. $\left[\begin{matrix} & H & \\ & | & \\ H - & N | H & - H \end{matrix}\right]^+ \left[:\ddot{S}..\right]^{2-}$

D. $\begin{matrix} & H & & H & \\ & | & & | & \\ H - & N.. & - & N.. & - H \end{matrix}$

Answer: C

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19. The possible structure (s) of monnthio-carbonate ion is :

A. 

B. 

C. 

D. 

Answer: D

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20. Pick out among the following, species isoelectronic with CO_2.

A. N_3^-

B. $(CNO)^-$

C. $(NCN)^{2-}$

D. All of these

Answer: D

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21. Which of the following is weak bond?

A. Ionic bond

B. Covalent bond

C. Hydrogen bond

D. Metallic bond

Answer: C

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22. Which species is isoelectronic with NO_2^+ ?

A. N_2O

B. NO_2^-

C. NH_2^-

D. SO_2

Answer: A

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23. In the Lewis structure for the selenite ion, SeO_3^{2-}, how many lone pairs are around the central atom?

A. 0

B. 1

C. 2

D. 3

Answer: B

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24. Which of the following are ionic compounds?

(P) NH_2NO_2

(Q) NH_4NO_3

A. P only

B. Q only

C. Both P and Q

D. Neither P nor Q

Answer: B

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25. Which atom is least likely to violate the octet rule in its compounds?

A. B

B. Cl

C. F

D. H

Answer: C

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26. In the Lewis structure for formic acid, HCOOH, how many bonding pairs and lone pairs of electrons are present?

A. 4 bonding, 2 lone

B. 4 bonding, 5 lone

C. 5 bonding, 0 lone

D. 5 bonding, 4 lone

Answer: D

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27. What is the formal charge on the oxygen atom in :C:::O:?

A. +1

B. 0

C. -1

D. -2

Answer: A

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28. Write the various steps involved in the Lewis structure for nitrate $\left(NO_3^-\right)$ ion.

A. $\left[\begin{matrix} \cdot\cdot & & \cdot\cdot \\ O\,\cdot\cdot & =N\mid :O\,\cdot\cdot: & =O\,\cdot\cdot \end{matrix}\right]^-$

B. 

C. 

D. 

Answer: B

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29. Which Lewis dot structure is a valid representation for the sulfite ion, $\left[SO_3^{2-}\right]$?

A. 

B. 

C. 

D. 

Answer: D

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30. Which species contains only covalent bonds?

A. AlF_3

B. NH_4NO_3

C. H_2SO_4

D. $K_2Cr_2O_7$

Answer: C

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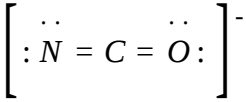
31. From a consideration of the Lewis structure,



What are the formal charges?

A. N = -1, C = 0, O = 0

B. N = 0, C = 0, O = -1

C. N = -1, C = +1, O = -1

D. N = -1, C = -1, O = +1

Answer: A

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32. In the Lewis structure of nitrous acid:

What is the formal charge on nitrogen?

A. -1

B. 0

C. $+1$

D. $+3$

Answer: B

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33. How many valence electrons are in a persulphate ion, SO_5^{2-} ?

A. 32

B. 34

C. 36

D. 38

Answer: D

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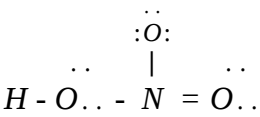
34. What is the formal charge on the nitrogen atom in HNO_3?



A. 0

B. $+1$

C. $+3$

D. $+5$

Answer: B

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35. Which property or properties of metals can be accounted for the electron sea model?

(P) Electrical conductivity

(Q) Malleability

A. P only

B. Q only

C. Both P and Q

D. Neither P nor Q

Answer: C

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36. According to the Lewis dot structure for ozone, what is the formal charge on the central oxygen atom?

$$\overset{\cdot\cdot}{O}\cdot\cdot = O - \overset{\cdot\cdot}{O}\cdot\cdot :$$

A. -2

B. -1

C. 0

D. $+1$

Answer: D

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37. What is the total number of valence elctrons in the thisoulphate ion, $S_2O_3^{2-}$?

A. 28

B. 30

C. 32

D. 34

Answer: C

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38. For which species is the electron pair geometry around the central atom of the Lewis dot structure the same as the geometry of the atoms?

A. CO_2

B. SO_2

C. BrO_2^-

D. NO_2^-

Answer: A

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39. Which molecule is least stable?

A. OF_2

B. OF_4

C. SF_2

D. SF_4

Answer: B

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40. Which substance has both covalent and ionic bonds?

A. $NH_4Br(s)$

B. $KI(s)$

C. $CH_2Cl_2(l)$

D. $SiF_4(g)$

Answer: A

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41. Which species have one or more atoms that violate the octet rule?

(P) NO

(Q) SF_2

(R) PF_4^+

A. P only

B. R only

C. P and Q only

D. Q and R only

Answer: A

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42. Assuming a Lewis structure for SO_2 in which all the atoms obey the octet rule, the formal charge on S is:

A. $+1$

B. $+2$

C. -1

D. -2

Answer: A

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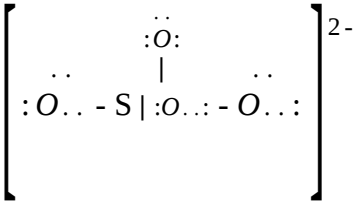
43. In the Lewis structure what are the formal charges on the sulphur and oxygen atoms, respectively?



A. 0, 0

B. -2, 0

C. +2, -1

D. +6, -2

Answer: C

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44. Which statement is true about the most stable Lewis structure for CH_2?

A. tThere are no lone pairs.

B. All bonds are double bonds.

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

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

Answer: B

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45. The formula for terbium phosphate is $TbPO_4$. The formula for terbium sulphate is :

A. Tb_2SO_4

B. $TbSO_4$

C. $Tb_2\left(SO_4\right)_3$

D. $Tb\left(SO_4\right)_2$

Answer: C

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46. According to the Lewis dot structure shown, what are the formula charges of the O, C and N atoms, respectively, in the cyanate ion?

A. 0, 0,0

B. $-1, 0, 0$

C. $-1, \ +1, \ -1$

D. $+1, 0, \ -2$

Answer: D

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47. In which species is the central atom 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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48. 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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49. What is the total number of valence electrons in the peroxydisulfate, $S_2O_8^{2-}$, ion?

A. 58

B. 60

C. 62

D. 64

Answer: C

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50. Which species contains only covalent bonds?

A. H_2SO_4

B. NH_4NO_3

C. NaOCl

D. K_2CrO_4

Answer: A

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51. Which pair of the ions has the same shape?

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

B. CO_3^{2-} and SO_3^{2-}

C. NO_3^- and ClO_3^-

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

Answer: A

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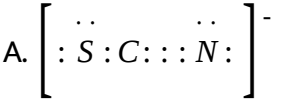
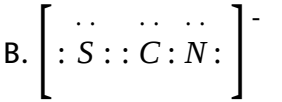
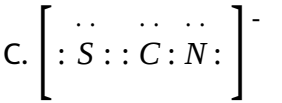
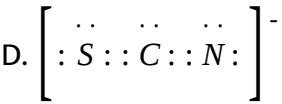
52. Which Lewis dot structure is the best representation of the bonding in the thiocyanate ion, SCN^-?

A. 

B. 

C. 

D. 

Answer: D

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53. In which species does the central atom obey the octet rule?

A. XeF_4

B. SF_4

C. SiF_4

D. ClF_4^-

Answer: C

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54. What is the formal charge on the chlorine atom in the oxyacid $HOClO_2$ if it contains only single bonds?

A. -2

B. -1

C. +1

D. +2

Answer: D

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55. Which is the best description of a covalent bond?

A. Electrons are simultaneously attracted by more than one nucleus.

B. Filled orbitals of two or more atoms overlap on another.

C. Unoccupied orbitals of two or more atoms overlap one another.

D. Oppositely-charged ions attract one another.

Answer: A

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56. For which element would XH_3 be a stable species?

A. C

B. Cl

C. P

D. S

Answer: C

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57. Which species has a Lewis diagram and structure most like that of the carbonate ion, CO_3^{2-}?

A. NO_3^-

B. CH_3^+

C. SO_3^{2-}

D. PO_4^{3-}

Answer: A

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58. Which compounds contain both ionic and covalent bonds?

(P) $BaSO_4$

(Q) $Ca\left(NO_3\right)_2$

(R) NH_3Cl

A. P only

B. P and R only

C. Q and R only

D. P, Q and R

Answer: D

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59. 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, Nal

D. Al, O_3As_4

Answer: A

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60. What is the formal charge on the central atom in N_2O?

$:N \equiv N - \overset{\cdot\cdot}{O}\cdot\cdot :$

A. $+1$

B. 0

C. -1

D. -2

Answer: A

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61. The species having co-ordinate bond from the following options is/are

:

A. CO_3^{2-}

B. NO_3^-

C. NO_2^-

D. BF_3

Answer: B

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62. The incorrect structure of N_2O will be :

A. $\overset{\leftarrow}{N} - O - \vec{N}$

B. $N \equiv N \rightarrow O$

C. $O \leftarrow N \equiv N$

D. Both (b) and (c)

Answer: A

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63. $AF_{3(I)} \xrightarrow{+2F} AF_{5(II)} \xrightarrow{+2F} AF_{7(III)}$

For the above change which statement is correct?

A. Central atom 'A' belongs to 15th group

B. In each step two coordinate bonds are formed

C. Central atom 'A' has five electron in 'p' subshell of its valence shell

D. No such change is possible

Answer: C

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64. Choose the incorrect formula out of the four compounds for an element X below :

A. X_2O_3

B. XPO_4

C. $X_2(SO_4)_3$

D. X_2Cl_3

Answer: D

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65. If the electronic configuration of an element is $1s^2 2s^2 2p^6 3p^6 3d^2 4s^2$, the four electrons involved in chemical bond formation will be :

A. $3p^6$

B. $3p^6, 4s^2$

C. $3p^6, 3d^2$

D. $3d^2, 4s^2$

Answer: D

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66. In PO_4^{3-} ion the formal charge on the oxygen atom of P-O bond is

A. $+1$

B. -1

C. -0.75

D. $+0.75$

Answer: B

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67. In NO_3^- ion, the number of bond pairs and lone pairs of electrons on nitrogen atom are :

A. 2, 2

B. 3, 1

C. 1, 3

D. 4, 0

Answer: D

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68. OF_2 exists but OF_4 does not because:

A. oxygen has no vacant 2d-orbitals

B. OF_4 is unstable

C. oxygen is much smaller than fluorine

D. oxygen is highly inert

Answer: A

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69. Lewis theory of octet does not explain :

A. reactivity of Xe

B. paramagnetic character of oxygen gas

C. structure of odd electron molecules

D. all of the above

Answer: D

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STRAIGHT OBJECTIVE TYPE(B)

1. Which one of the following molecules are formed by p-p overlapping?

A. Cl_2

B. HCl

C. H_2O

D. NH_3

Answer: A

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2. The ratio of sigma and pi bonds in benzene is

A. 2

B. 6

C. 4

D. 8

Answer: C

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3. PCI_5 exists but NCI_5 does not because

A. Nitrogen has no vacant 2d-orbitals

B. NCl_5 is unstable

C. Nitrogen atom is much smaller than P

D. Nitrogen is highly inert

Answer: A

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4. The hybridisation of carbon atoms in C - C single bond is $HC \equiv C - CH = CH_2$ is

A. $sp^3 - sp^3$

B. $sp^2 - sp$

C. $sp - sp^2$

D. $sp^3 - sp$

Answer: B

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5. Shape of NH_3 is very similar to :

A. CH_4

B. CH_3^-

C. BH_3

D. CH_3^+

Answer: B

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6. In C_3O_2, the hybridization state of carbon is :

A. sp

B. sp^2

C. sp^3

D. dsp^3

Answer: A

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7. Which shows a changes in the type of hybridisation when :

A. NH_3 combines with H^+

B. AlH_3 combines with H^-

C. NH_3 forms NH_2^-

D. H_2O forms H_3O^+

Answer: B

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8. VSEPR theory does bot state :

A. the order of repulaion between different pair of elctrons is $lp - lp > lp - bp > bp = bp$ (lp = lone pair electrons, bp = bond pair electrons)

B. as the number of lone pair of electrons on central atom increases, the deviation in BA form normal BA (Bond-Angle) also increases.

C. the number of lone pairs on O in H_2O is 1 while on N in NH_3 is 2.

D. the structures of xenon-fluorides and xenon-oxyfluorides could be explained on the basis of VSEPR theory.

Answer: C

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9. In which of the following N atom is not sp^2 hybridised?

A. HNO_4

B. FNO_3

Θ

C. NH_2

D. $B_3N_3H_6$

Answer: C

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10. Decreasing order of size of various hybrid orbitals is : (when principal quantum number 'n' will remains same)

A. $sp > sp^2 > sp^3$

B. $sp^3 > sp^2 > sp$

C. $sp^2 > sp > sp^3$

D. $sp > sp^3 > sp^2$

Answer: B

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11. Carbon atoms in $C_2(CN)_2$ are :

A. all sp-hybridised

B. sp^3, sp^2,sp-hybridised

C. sp^2, sp, sp^3-hybridised

D. sp, sp^3, sp^2-hybridised

Answer: A

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

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

A. II lt III lt IV lt I lt V

B. II lt IV lt III lt V lt I

C. III lt II lt I lt V lt IV

D. II lt IV lt III lt I lt V

Answer: A

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13. Which of the following species given below have shape similar to $XeOF_4$?

A. XeO_3

B. IF_5

C. PCl_5

D. $XeF_5^{\oplus}$

Answer: B

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14. What is the hybridisation of cation of XeF_6 solid ?

A. sp^3

B. sp^3d^2

C. sp^3d

D. sp^3d^3

Answer: B

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15. Which of the following optian is incorrect regarding N_3^- ?

A. Average oxidation state of N is $-\frac{1}{3}$

B. It has linear structure

C. Its having $p\pi$ - $p\pi$ as well as $p\pi$ - $d\pi$ linkage

D. Hybridisation of central atom is sp

Answer: C

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16. Which of the following has only σ bonds?

A. $\left[XeOF_3\right]^-$

B. $XeOF_4$

C. XeO_2F_2

D. SO_2Cl_2

Answer: A

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17. Maximum number of lone pair electrons present in the molecules among the following :

A. XeF_2

B. XeF_4

C. $XeOF_4$

D. H_2O

Answer: A

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18. If all the F atoms are replaced by 'O' atom from SF_4 without changing the covalency of 'S' atom then, which of the following property undergoes change in the process?

A. Oxidation state of 'S' atom

B. d-orbital participation in bonding

C. Hybridisation of 'S' atom

D. Number of lone pairs on 'S' atom

Answer: C

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19. In XeO_3F_2, d-orbital which is not used in bonding is :

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

B. d_{z^2}

C. d_{xy}

D. d_{yz}

Answer: A

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20. A hybrid orbital formed from s and p-orbital can contribute to

A. σ bond only

B. π bond only

C. either σ and π bond

D. can not be predicted

Answer: A

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21. Which of the following has sp^3 hybridisation?

A. XeF_2

B. XeF_4

C. XeO_3

D. XeF_5^-

Answer: C

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22. Which of the following is sp^3 d hybridised as well as has trigonal bipyramidal geometry?

A. SH_4

B. PCl_5

C. XeF_2

D. ClF_3

Answer: B

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23. Which of the following is linear in shape?

A. CO_2

B. XeF_2

C. Both (a) and (b)

D. none of these

Answer: C

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24. Which of the molecules listed have an sp^3 hybridized central atom?

(P) PCl_3

(Q) $COCl_2$

(R) SF_4

A. P only

B. P and R only

C. Q and R only

D. P, Q and R

Answer: A

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25. Which of the following set of species are isostructural?

A. $\overset{+}{C}H_3, CH_3^-, NH_3$

B. $XeF_2, BeCl_2, NO_2^+$

C. NH_3, NH_4^+, CH_4

D. SF_4, SiF_4, XeF_4

Answer: B

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26. Which of the following are sp^2 hybridised species?

A. CO_3^{2-}

B. NO_3^-

C. BF_3

D. All are correct

Answer: D

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27. Which of the following is the correct representation for formation of σ bond?

A. 

B. 

C. 

D. 

Answer: A

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28. The pair of compounds having similar geometry are :

A. BF_3, NF_3

B. BeF_2, H_2O

C. BCl_3, PCl_3

D. BF_3, CH_3^+

Answer: D

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29. Choose the correct set from the following options regarding the hybridisation of central atom and shape.

A. $SnCl_2$, sp^2, linear

B. $AlCl_4^-$, sp^3, square planar

C. $SOCl_2$, sp^2, planar

D. COF_2, sp^2, planar

Answer: D

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30. The ratio of σ bond in P_4O_{10} and P_4O_6 is respectively :

A. $4:3$

B. $3:4$

C. $1:4$

D. $4:1$

Answer: A

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31. Which of the following has trigonal bipyramidal structure?

A. $PCl_5(s)$

B. $PCl_5(g)$

C. $PBr_5(s)$

D. $\left[SF_5\right]^-$

Answer: B

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32. Which of following pair of species have definite geometry?

A. SF_4 and BF_4^-

B. BF_4^- and CF_4

C. BF_3 and SO_2

D. $COCl_2$ and CO_3^{2-}

Answer: B

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33. If the z-axis is internucleus axis, which of the following orbital can't form δ-bond?

A. d_{z^2}

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

C. d_{xy}

D. all can form

Answer: A

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34. Which of the following compound has number of $p\pi - p\pi$ bond is equal to number of $p\pi - d\pi$ bond?

A. SO_2

B. CO_2

C. SO_3

D. $SOCl_2$

Answer: A

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35. The correct increasing order of molecules in accordance with number of lone pair of electrons on central-atom is :

A. $XeF_2 < H_2O < NH_3$

B. $XeF_2 < NH_3 > H_2O$

C. $NH_3 < H_2O < XeF_2$

D. $H_2O = XeF_2 = NH_3$

Answer: C

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36. Select the ion having $p\pi$ - $d\pi$ bond :

A. SO_4^{-2}

B. PO_4^{-3}

C. ClO_4^-

D. all of these

Answer: D

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37. Select the molecule which is planar:

A. BF_4^-

B. CF_4

C. SF_4

D. XeF_4

Answer: D

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38. If z-axis is internucleus axis then which of the following d-orbital can be used in π-bond formation?

A. d_{xy} and d_{xy}

B. p_z and p_z

C. d_{xz} and d_{xz}

D. All of these

Answer: C

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39. The correct order of hybridisation of the central atom in the following species.

$NH_3, XeO_2F_2, SeF_4, NO_2^+$

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

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

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

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

Answer: B

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40. Which of the following does not contain polyatomic anion in the solid state?

A. PCl_5

B. PBr_5

C. I_2Cl_6

D. ICl

Answer: B

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41. Which of the following overlaps of atomic orbitals does not form π-bond if z-axis is the internuclear axis?

A. d_{zx} - p_x

B. p_y - p_y

C. d_{yz} - p_y

D. d_{z^2} - d_{z^2}

Answer: D

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42. If z-axis be the internuclear axis, which of the following combination of orbitals would not form π-bond?

A. $p_x + p_x$

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

C. $d_{zx} + d_{zx}$

D. $d_{yz} + d_{yz}$

Answer: B

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43. Which of the following pair of species have different hybridisation but similar shape?

A. CO_2 and XeF_2

B. SO_3 and SO_2

C. CF_4 and XeF_4

D. N_2O and CO_2

Answer: A

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44. The d-orbital involved in sp^3d hybridisation is

A. d_{z^2}

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

C. d_{xy}

D. d_{yz}

Answer: B

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45. The cationtic part of $I_2O_6(s)$ has central iodine as :

A. sp hybridised

B. sp^2 hybridised

C. sp^3 hybridised

D. monoatomic cation

Answer: B

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46. Hybridisation of phosphorus in the compound xy is :

$PBr_5(s) + Br_2(g) \rightarrow xy(s)$ [xy = Ionic compound]

A. sp^3, d^3s

B. sp^3d, sp^3

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

D. sp^3

Answer: D

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47. Which of the following is 'T' shaped?

A. IOF_4^+

B. IOF_2^-

C. XeO_6^{4-}

D. XeF_2

Answer: B

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

A. BF_3, BrF_3

B. $ICI_2^-, BeCl_2$

C. BCl_3, PCl_3

D. PCl_3, NCl_3

Answer: B

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49. What will be the ratio of $\pi : \sigma$ bond in a Borax molecule?

$Na_2B_4O_7.10H_2O$

A. 0

B. 34

C. 17

D. none of these

Answer: A

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50. From the given structures, the correct structure(s) of PF_3Cl_2 is a :

A. only P

B. only Q

C. only R

D. P, Q and R

Answer: A

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51. Structure of $Na_2\left[B_4O_5(OH)_4\right]\cdot 8H_2O$ contains

A. two triangular and two tetrahedral units of boron

B. three triangular and one tetrahedral units of boron

C. all tetrahedral units of boron

D. all triangular units of boron

Answer: A

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52. The types of hybridization that take and place in the central atom of the species NH_4^+, BF_4^- and $BeCl_2$ respectively are :

A. sp^2, sp^3 and sp

B. sp^3, sp^3 and sp

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

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

Answer: B

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53. The number of lone pair of electrons on the central atom of SF_4, CF_4 and XeF_4 are :

A. 2, 0, 1

B. 0, 1, 2

C. 1, 1, 1

D. 1, 0, 2

Answer: D

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54. The d-orbital which is not involed is sp^3d^3 hybridisation in pentagonal bipyramidal geometry is :

A. d_{xy}

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

C. d_{z^2}

D. d_{yz}

Answer: D

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55. The number or $p\pi$ - $d\pi$ bonds in SO_3 molecule is

A. 0

B. 1

C. 2

D. 3

Answer: C

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56. Tri-iodide ion has a linear symmetry with bond-angle of 180°. In the structure of I_3^- ion :

A. I_2 acts as a lewis acid while I^- as a lewis base

B. I_2 acts as a lewis base and I^- as a lewis acid

C. both I_2 and I^- as a lewis base

D. both I_2 and I^- as a lewis acid

Answer: A

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57. Which species has the largest $F\text{-}A\text{-}F$ bond angle where A is the central atom?

A. BF_3

B. CF_4

C. NF_3

D. OF_2

Answer: A

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58. In which of the following set of molecules central atoms are sp^3 hybridised ?

A. PCl_3, BCl_3, NCl_3

B. $SnCl_2, I_3^+, I_3^-$

C. NH_2^-, PCl_3, CH_3^-

D. NH_4^+, BF_4^-, SF_4

Answer: C

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59. Which of the following statements are correct about HCN and HCP?

(P) HCN is linear with triple bond between carbon and nitrogen

(Q) HCP does not exist because P does not form triple bond due to large size

(R) In HCP molecule two σ-bond and two π bonds are present

(S) Carbon atom is sp hybridised in HCN

A. Only P

B. P and S

C. P, Q, S

D. P, R and S

Answer: D

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60. Which of the folowing have undistorted octahedral structures:(1) $SF_6 (2) PF_6^- (3) SIF_6^{2-} (4) XeF_6$

Select the correct answer using the codes given below

A. P, R and S

B. P, R and S

C. Q and R

D. P, Q and S

Answer: C

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61. Which of the following has same hybridisation in cationic and anionic part in the solid state?

A. NH_4ClO_3

B. ICl

C. XeF_6

D. N_2O_5

Answer: A

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62. The compound having maximum number of $p\pi$ - $d\pi$ bonds is :

A. SO_2

B. H_2SO_4

C. HNO_3

D. $HClO_4$

Answer: D

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63. Give the molecular structures of :

XeF_2, XeF_4, XeF_6

$XeOF_4$ and XeO_3

A. 

B. 

C. 

D. 

Answer: C

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64. Which of the following compound having number of $p\pi$ - $d\pi$ bond is equal to $p\pi$ - $d\pi$ bonds?

A. SO_2

B. SO_3

C. O_3

D. $POCl_3$

Answer: A

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65. Which of the following compound number of $p\pi$ - $d\pi$ bond is equal to number of $p\pi$ - $d\pi$ bond?

A. SO_2

B. CO_2

C. SO_3

D. $SOCl_2$

Answer: A

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66. Which of the following does not exist as ionic substance in solid state?

A. PBr_5

B. N_2O_5

C. Na_2SO_4

D. H_2O

Answer: D

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67. Which of the following statement is incorrect regarding the structure of XeO_2F_4 molecule?

A. Xe = O bonds are present in axial position

B. All Xe - F bond lengths are identical

C. Shape of the molecule is octahedral

D. Shape of the molecule is octahedral

Answer: A

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68. Choose the correct set from the following options regarding the hybridisation of central atom and shape.

A. $SnCl_2$, sp^2, linear

B. $AlCl_4^-$, sp^3, square planar

C. $SOCl_2$, sp^2, planar

D. COF_2, sp^2, planar

Answer: D

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69. Which of the following has regular octahedral geometry?

A. $SbCl_6^{3-}$

B. XeF_6

C. IF_6^-

D. $PF_3Cl_3^-$

Answer: A

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70. The correct order of hybridisation of the central atom in the following species.

$NH_3, XeO_2F_2, SeF_4, NO_2^+$

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

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

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

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

Answer: B

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71. Which of the following orbitals does not participate in the hybridisation in IF_7?

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

B. d_{xy}

C. p_z

D. d_{yz}

Answer: D

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72. Which of the following statements is not correct?

A. Hybridisation is the mixing of atomic orbitals of large energy difference.

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

C. dsp^2-hybrid orbitals are all at 90° to one another

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

Answer: A

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73. The correct order of hybridisation of the central atom in the following species,

$\left[Ni(CN)_4\right]^{2-}, XeO_4, SF_4$ and NO_3^- is :

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

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

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

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

Answer: B

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74. Which statement is incorrect for OSF_4?

A. S atom has sp^3d hybridisation

B. OSF_4 have distorted trigonal bipyramidal geometry

C. O atom at one of the two axial positions having S=O bond

D. O atom at one of the equatorial position having S=O bond

Answer: C

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75. Which of the following overlaps is incorrect [assuming z-axis to be the internuclear axis]?

(P) $2p_y + 2p_y \rightarrow \pi 2p_y$

(Q) $2p_z + 2p_z \rightarrow \sigma 2p_z$

(R) $2p_x + 2p_x \rightarrow \pi 2p_x$

(S) $1s + 2p_y \rightarrow \pi\left(1s - 2p_y\right)$

A. P and Q

B. Q and S

C. Only S

D. none of these

Answer: C

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76. Effective overlapping will be shown by:

A. 

B. 

C. 

D. all of these

Answer: C

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77. In which of the following pairs hybridization of the central atoms are different?

A. ClF_3, ClF_3O

B. ClF_3O, ClF_3O_2

C. $\left[ClF_2O\right]^+, \left[ClF_4O\right]^-$

D. $\left[ClF_4O\right]^-, \left[XeOF_4\right]$

Answer: C

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78. As the tendency to from $p\pi$ - $d\pi$ bond decreases, the tendency for the polymerisation increases. So the correct order of tendency of polymerisation is :

A. $SiO_4^{4-} < PO_4^{3-} < SO_4^{2-} < ClO_4^-$

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

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

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

Answer: D

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79. Identify the correct match :

A. (i-a), (ii-b), (iii-c), (iv-d)

B. (i-d), (ii-b), (iii-a), (iv-c)

C. (i-b), (ii-c), (iii-a), (iv-d)

D. (i-d), (ii-c), (iii-b), (iv-a)

Answer: D

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80. Which of the following is true statement?

A. All the carbon is $H_2C = C|H - C = C - C|H = CH_2$ are in sp^2 hybridization.

B. In $C_2H_2(CN)_2$ there are six $'\sigma'$ bonds.

C. In diamond 'C' is in sp^2 hybridization

D. In C_3O_2 all the carbons are in sp hybridization.

Answer: D

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

A. SiF_4 and SF_4

B. IO_3^- and XeO_3

C. BH_4^- and NH_4^+

D. PF_6^- and SF_6

Answer: A

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82. Which among the following molecules have sp^3d hybridization with one lone pair of electrons on the central atom?

(P) SF_4

(Q) $\left[PCl_4\right]^+$

(R) XeO_2F_2

(S) $ClOF_3$

A. P, Q and R only

B. P, R and S only

C. P and R only

D. R and S only

Answer: B

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83. Hybridization of iodine atoms in ICl_3 (in its stable form, found in solid state) and $I_2Cl_4Br_2$ are :

A. sp^3 and sp^3d^2

B. sp^3d^2 and sp^3d^3

C. both sp^3d

D. both sp^3d^2

Answer: D

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84. In XeF_2, XeF_4 and $XeF_6(g)$ the number of lone pairs on Xe respectively are :

A. 2, 3, 1

B. 1, 2, 3

C. 4, 1, 2

D. 3, 2, 1

Answer: D

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85. The non-linear molecule is :

A. CO_2

B. HCN

C. C_2H_2

D. SO_2

Answer: D

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86. In which of the following compounds B atoms are in sp^2 and sp^3 hybridisation states both?

A. Borax

B. Diborane

C. Borazole

D. All of these

Answer: A

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87. The hybridisation of central atoms in N_3^-, $NOCl$ and N_2O respectively are :

A. sp, sp^2, sp

B. sp, sp, sp^3

C. sp^2, sp, sp

D. sp^2, sp^2, sp

Answer: A

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88. The difference in the coordination number of the central atom in the anionic and cationic part of Cl_2O_6 is :

A. 0

B. 1

C. 2

D. 3

Answer: C

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89. Which reaction involves a change in the electron-pair geometry for the underlined element?

A. $\underline{B}F_3 + F^- \rightarrow \underline{B}F_4^-$

B. $\underline{N}H_3 + H^+ \rightarrow \underline{N}H_4^+$

C. $2\underline{S}O_2 + O_2 \rightarrow 2\underline{S}O_3$

D. $H_2\underline{O} + H^+ \rightarrow H_3\underline{O}^+$

Answer: A

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90. Which of the following structure is having same shape as SO_3^{2-}?

A. F_2SeO

B. F_2SeO_2

C. SO_4^{2-}

D. SO_2

Answer: A

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91. Which molecule AX_3, AX_4, AX_5, AX_6 is most likely to have a trigonal bipyramidal structure if A has no lone pair?

A. AX_3

B. AX_5

C. Both (a) and (b)

D. AX_6

Answer: B

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92. In which of the following process, hybridisation of the central atom changes?

A. $H_2O + H^+ \rightarrow H_3O^+$

B. $NF_3 + F \rightarrow NF_4^+$

C. $BF_3 + F^- \rightarrow BF_4^-$

D. $NH_3 + H^+ \rightarrow NH_4^+$

Answer: C

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93. Incorrect matched pair is :

A. XeO_2F_2 - sp^3d-hybridized with one lone pair on Xe

B. $I(CN)_2^{\Theta}$ - sp^3d and sp-hybridised on 'I' and 'C' respectively

C. XeF_5^{Θ} - sp^3d^3 hybridised with two lone pair on Xe

D. None of these

Answer: D

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94. Observe the following reaction:

$$BF_3NH_3 \rightarrow \left[F_3B \leftarrow NH_3\right]$$

Choose the correct statement regarding product :

A. Hybridisation state of 'B' is unchanged

B. Formal charge on N atom is -1

C. Covalency of B is changed from 3 to 4

D. All of these

Answer: C

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95. T-shaped geometry is obtained when :

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96. The minimum number of 90° angles between hybrid orbitals is observed in :

A. sp^3d^2

B. d^2sp^3

C. dsp^2

D. sp^3d

Answer: C

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97. Chemical bond results when between combining atoms :

F_A = attraction force

F_R=repulsion forces

P.E. = potential energy

A. $F_A > F_R$, P.E. minimum

B. $F_A < F_R$, P.E. maximum

C. $F_A = F_R$, P.E. minimum

D. $F_A = F_R$, P.E. maximum

Answer: C

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98. Which of the following statement is true of H_2S?

A. The sulphur atom is sp^3 hybridized and bonding take place in excited state.

B. H_2S and BF_3 form adduct readily through coordinate bond between boron and sulphur

C. Its molecular geometry is non-linear and H - S - H bond angle is smaller than H - O - H bond angle in H_2O

D. (b) and (c) both

Answer: D

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99. The structure of F_2SeO is analogous to :

A. SO_3

B. ClO_3^-

C. XeO_3

D. (b) and (c) both

Answer: D

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100. Which of the following statements is true for $IO_2F_2^-$?

A. The electrons are located at the corners of a trigonal bipyramidal but one of the equatorial pairs is unshared.

B. If has sp^3d hybridisation and is T-shaped.

C. Its structure is analogous to SF_4.

D. (a) and (c) both

Answer: D

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101. Which of the following statements are correct?

(*I*) N_2H_4 is pyramidal about each N atom.

(*II*) NH_2OH is pyramidal about the N atom and bent about the O atom.

(*III*) CH_3COCl is trigonal planar about the carbon atom (attached to O and Cl).

A. S_1 and S_2 only

B. S_1 and S_3 only

C. S_2 and S_3 only

D. S_1, S_2 any S_3

Answer: D

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102. Choose the molecules in which hybridization occurs in the ground state?

(P) BCl_3

(Q) NH_3

(R) PCl_3

(S) BeF_2

A. P, Q, S

B. P, Q, R

C. Q, R

D. R, S

Answer: C

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103. Number and type of bonds between two carbon atoms in CaC_2 are :

A. one sigma (σ) and one Pi (π) bond

B. one σ and two π bonds

C. one σ and one and a half π bond

D. one σ bond

Answer: B

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104. The structure of ICl_2^+ would be :

A. 

B. 

C. 

D. none of these

Answer: D

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105. Give the molecular structures of :

XeF_2, XeF_4, XeF_6

$XeOF_4$ and XeO_3

A. 

B. 

C. 

D. 

Answer: C

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106. In which of the following molecules number of lone pairs and bond pairs on central atom are not equal?

A. H_2O

B. I_3^-

C. O_2F_2

D. SCl_2

Answer: B

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107. How many bonds are there in

A. 13

B. 23

C. 20

D. 26

Answer: B

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108. Which of the statements is correct about SO_2?

A. Two σ, two π and two lone pair of electrons on 'S'

B. Two σ and one π

C. Two σ, two π and one lone pair on 'S'

D. none of these

Answer: C

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109. Number of sigma bonds in P_4O_{10} is :

A. 6

B. 7

C. 17

D. 16

Answer: D

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110. Number of $p\pi$ - $d\pi$ bond(s) in SO_2Cl_2 is/are:

A. 1

B. 3

C. 0

D. 2

Answer: D

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111. In which of following option the $(X - A - X)$ adjacent angle difference in cationic part and anionic part is maximum in the solid state?

A. PCl_5

B. Cl_2O_6

C. N_2O_5

D. BeH_2

Answer: C

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112. The ion which is not tetrahedral in shape :

A. BF_4^-

B. NH_4^+

C. XeO_4

D. Icl_4^-

Answer: D

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113. Which of the following species given below have shape similar to $XeOF_4$?

A. XeO_2

B. IOF_4^+

C. PCl_5

D. $XeF_5^\oplus$

Answer: D

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114. For the molecule MA_2L_n (where A is number of single bonded surrounding atoms, L indicates lone pair and n is the number of lone pair and M is the central atom of s or p block element). The possible range of 'n' is :

A. 1 to 4

B. zero to 4

C. 1 to 3

D. 0 to 3

Answer: D

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115. Which species is planar?

A. CO_3^{2-}

B. SO_3^{2-}

C. ClO_3^-

D. BF_4^-

Answer: A

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116. In which of the following N - N bond length is shortest?

A. N_2O

B. N_3^-

C. N_2O_4

D. N_2O_3 (unsymm)

Answer: A

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117. The correct order of single bond energies is :

A. N - N > P - P

B. P - P > N - N

C. O - O > S - S

D. C - C < Si - Si

Answer: B

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118. On the basis of VSEPR theory, what geometry is predicted for the central sulphur atom in $SOCl_2$?

A. Tetrahedral

B. T-shaped

C. Trigonal planar

D. Trigonal pyramidal

Answer: D

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119. How many sigma bonds are present in P_4?

A. 3

B. 4

C. 5

D. 6

Answer: D

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120. Using VSEPR theory, the molecular structure of IF_5 best described as :

A. octahedral

B. square pyramidal

C. trigonal bipyramidal

D. trigonal pyramis

Answer: B

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121. When arranged in orderof increasing bond strength, which order is correct?

A. $O - O < S - S < O = O < S = S$

B. $O - O < S - S < S = S < O = O$

C. $S - S < S - S < S = S < O - O$

D. $S - S < O - O < S = S < O = O$

Answer: B

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122. What is the geometry of ICl_4^- according to VSEPR theory?

A. See-saw

B. Square planar

C. Tetrahedral

D. T-shaped

Answer: B

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123. Which species has a different number of pi bonds than others?

A. C_2H_2

B. CO_2

C. N_2

D. O_3

Answer: D

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124. Which molecule is correctly matched with its shape as predicted by VSEPR theory?

A. PCl_3 trigonal pyramidal

B. OF_2 linear

C. ClF_3 trigonal planar

D. SF_6 hexagonal

Answer: A

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125. Formamide has the structure $HC(O)NH_2$. Which atoms in formamide have a trigonal planar geometry?

A. C only

B. N only

C. Both C and N

D. none of these

Answer: C

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126. Which species are linear?

(P) NO_2^+

(Q) I_3^-

A. P only

B. Q only

C. Both P and Q

D. Neither P nor Q

Answer: C

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127. Which statement about bonding is correct?

A. A σ bond has cylindrical symmetry about the bonding axis.

B. A σ bond is twice as strong as a σ bond.

C. A double bond consists of two π bonds always.

D. A π bond results from the sideways overlap of hybridized orbitals.

Answer: A

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128. What is the geometry of the chlorate ion, ClO_3^-?

A. Trigonal planar

B. Trigonal pyramidal

C. T-shaped

D. Zig-zag

Answer: B

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129. Which of the following species have square pyramidal geometry?

A. XeO_2F_2

B. XeO_3F_2

C. $\left[XeO_6\right]^{4-}$

D. $XeOF_4$

Answer: D

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130. Which bonds are formed by a carbon atom with sp^2 hybridization

A. 4π bonds

B. 2π bonds and 2σ bonds

C. 1π bond and 3σ bonds

D. 4σ bonds

Answer: C

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131. Which of the following molecules are planar?

A. $XeCl_2$

B. $XeBr_2$

C. $XeCl_4$

D. All are planar

Answer: D

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132. What is the geometry of BrF_3?

A. See-saw

B. T-shaped

C. Trigonal planar

D. Trigonal bipyramidal

Answer: D

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133. Which of the following species have same shape and hybridisation?

A. XeF_5^+, XeF_3^+

B. BrF_4^-, XeF_5^-

C. TeF_5^-, XeO_2F_4

D. XeF_5^+, TeF_5^-

Answer: D

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134. Which reaction forms a product with a trigonal planar geometry?

A. $N_2 + 3H_2 \rightarrow$

B. $2CO + O_2 \rightarrow$

C. $PCl_3 + Cl_2$

D. $2SO_2 + O_2 \rightarrow$

Answer: D

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135. What is the best description of the hybridization of each of the carbon atoms (from left to right) in the compound $NCCH_2CO_2H$?

A. sp, sp^3, sp^2

B. sp, sp^2, sp^3

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

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

Answer: A

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136. In which species can we describe the central atom as having sp^2 hybridization?

A. BeF_2

B. CO_2

C. KrF_2

D. SO_2

Answer: D

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137. A triple bond is found in which of the following species?

(P) CO

(Q) C_2H_2

(R) CN^-

A. P only

B. Q only

C. P and Q only

D. P, Q ,R

Answer: D

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138. The silicon-oxygen bonds in SiO_2 are best described as :

A. Coordinate covalent

B. Ionic

C. Non-polar covalent

D. Polar covalent

Answer: D

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139. Which bond is strongest?

A. C=C

B. C=N

C. C=O

D. C=S

Answer: C

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140. In the gas phase PCl_5 exists as individual molecules but in the solid it takes on the ionic structure $PCl_4^+ PCl_6^-$. What are the geometries of these three species?

A.

	PCl_5	PCl_4^+	PCl_6^-
(*a*)	trigonal bipyramidal	see-saw	octahedral

B.

	PCl_5	PCl_4^+	PCl_6^-
(*b*)	trigonal bipyramidal	tetrahedral	octahedral

C.

	PCl_5	PCl_4^+	PCl_6^-
(c)	trigonal bipyramidal	square planar	distorted octahedral

D.

	PCl_5	PCl_4^+	PCl_6^-
(d)	trigonal bipyramidal	see-saw	square planar

Answer: B

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141. Which species has exactly five pairs of electrons around the central atom?

A. ClF_5

B. SF_4

C. SF_5^-

D. XeF_4

Answer: B

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142. Which species has a trigonal planar geometry?

A. ClF_3

B. NCl_3

C. CO_3^{2-}

D. I_3^-

Answer: C

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143. Which diatomic molecule contains the strongest bond?

A. $H - Cl$

B. $H - F$

C. $Cl - Cl$

D. $F - F$

Answer: B

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144. How many pi bonds and how may lone pairs are in the Lewis structure of hydrazine, N_2H_4?

A. 2 π bonds, 0 lone pairs

B. 1 π bond, 0 lone pairs

C. 1 π bond, 1 lone pair

D. 0 π bonds, 2 lone pairs

Answer: D

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145. 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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146. The hybridization of As in AsF_5 is best described as :

A. sp^3

B. sp^4

C. sp^3d

D. d^2sp^3

Answer: C

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147. 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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148. Which diatomic molecule has the shortest bond length?

A. N_2

B. O_2

C. F_2

D. S_2

Answer: A

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149. In which species are all the carbon atoms considered to be sp^2 hybridized?

A. C_2H_2

B. C_2H_4

C. C_3H_8

D. C_4H_{10}

Answer: B

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

A. Trigonal planar

B. See-Saw

C. Linear

D. T-shaped

Answer: A

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151. The triple bond in carbon monoxide consists of :

A. 3 sigma bonds

B. 2 sigma bonds and 1 pi bond

C. 1 sigma bond and 2 pi bonds

D. 3 pi bonds

Answer: C

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152. When is molecules N_2, O_2, F_2 are arranged in order of increasing bond strength, which order is correct?

A. N_2, O_2, F_2

B. N_2, F_2, O_2

C. O_2, N_2, F_2

D. F_2, O_2, N_2

Answer: D

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153. The geometry of I_3^- is

A. Bent

B. Linear

C. T-shaped

D. Triangular

Answer: B

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154. What is the shape of the TeF_5^- anion?

A. See-saw

B. square pyramidal

C. Trigonal pyramidal

D. Trigonal bipyramidal

Answer: B

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155. In which species does the central atom have one or more lone pairs of valence electrons?

A. $AlCl_4^-$

B. CO_2

C. PCl_4^+

D. SO_2

Answer: D

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156. Describe the shapes of BF_3 and $BH_4^{\ominus}$. Assign the hybridisation of boron in these species.

A. Planar

B. See-Saw

C. Tetrahedral

D. Triangular pyramidal

Answer: C

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157. Which species has the same electron distribution around the central atom as SiF_4?

A. SF_4

B. XeF_4

C. ClF_4^+

D. BF_4^-

Answer: D

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

1. CH_3^+ 2. CH_3^-

A. P only

B. Q only

C. Both P and Q

D. Neither P nor Q

Answer: A

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159. 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 orbitals

D. sp^3 hybrid orbitals

Answer: D

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160. Which of these compounds is not adequately represented by a valence bond model?

(P) CO_2

(Q) SO_2

(R) SiO_2

A. P only

B. Q only

C. P and Q only

D. Q and R only

Answer: B

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161. What is the state of hybridisation of P atom in PH_4^+ ?

A. No hybridisation

B. sp^3

C. sp^3d

D. sp^2

Answer: B

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162. Find the ratio of number of σ-bond to π-bonds in $B_3N_3H_6$.

A. 4

B. 6

C. 2

D. 1

Answer: A

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163. Which species has the same shape as the NO_3^- ion?

A. SO_3

B. SO_3^{2-}

C. ClF_3

D. ClO_3^-

Answer: A

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164. How many bonding pairs and lone pairs surround the central atom in the I_3^- ion?

	Bonding pairs	Lone Pairs
(a)	2	2
(b)	2	3
(c)	3	2
(d)	4	3

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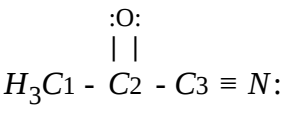
165. What hybrid orbitals are employed by carbon atoms 1,2 and 3 respectively, as labeled in the compound shown?



A. sp^3, sp, sp

B. $sp^2, sp^2 sp$

C. sp^3, sp^2, sp

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

Answer: C

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166. How many unpaired electrons does a gaseous atom of phosphorus, P, have in its ground state?

A. 1

B. 3

C. 5

D. 7

Answer: B

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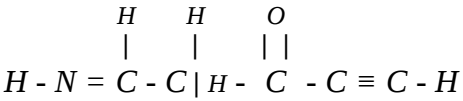
167. How many sigma and pi bonds are shown in this compound?



A. 8σ and 7π

B. 8σ and 3π

C. 11σ and 3π

D. 11σ and 4π

Answer: D

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168. Pair of molecules or ions which are isostructural (similar molecular structure) is :

A. CO_2, I_3^-

B. PCl_4^+, PCl_5

C. XeO_4, XeO_3

D. NO_2^+, NO_2^-

Answer: A

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169. Arrange the species according to the increasing order of the number of lone pair on their cental atom from left to right :

A. XeF_2, ICl_3, SO_2

B. ICl_3, SO_2, XeF_2

C. SO_2, ICl_3, XeF_2

D. SO_2, XeF_2, ICl_3

Answer: C

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170. In which of the follwing molecule / ion bond angle is not affected due to presence of lone pair on central atom from left to righ?

A. BrF_2^-

B. XeO_2F_2

C. XeO_2F_4

D. SF_4

Answer: A

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171. The maximum number of bond and π-bond can be formed between two atoms are respectively:

A. 4, 3

B. 3, 2

C. 2, 3

D. 3,1

Answer: B

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172. Which of the following specie(s)/are linear?

A. H_2O

B. $SnCl_2$

C. I_3^+

D. CS_2

Answer: D

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173. Which of the folowing angles corresponds to sp^2 hybridisation ?

A. 90°

B. 120°

C. 180°

D. 109°

Answer: B

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174. The order of $p\pi$ - $d\pi$ interaction in the compounds containing bond between Si/P/S/Cl and oxygen is in the order :

A. P gt Si gt Cl gt S

B. Si lt P lt S lt Cl

C. S lt Cl lt P lt Si

D. Si gt P gt S gt Cl

Answer: B

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175. The structure of $XeOF_4$ is

A. trigonal bipyramidal

B. octahedral

C. pentagonal planar

D. square pyramidal

Answer: D

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176. Isostructrual species are those which have the same shape and hybridisation. Among the given identify the isostructural pairs.

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

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

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

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

Answer: B

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177. The types of hybrid orbitals of nitrogen in NO_2^+, NO_3^- and NH_4^+ respectively are expected to be :

A. sp, sp^3 and sp^2

B. sp, sp^2 and sp^3

C. sp^2, sp and sp^3

D. sp^2, sp^3 and sp

Answer: B

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178. Which of the following species has tetrahedral geometry?

A. BH_4^-

B. NH_2^-

C. CO_3^{2-}

D. H_3O^+

Answer: A

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179. In which of the following molecule/ion all the bonds are not equal?

A. XeF_4

B. BF_4^-

C. C_2H_4

D. SiF_4

Answer: C

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180. The pair having similar geometry is :

A. BF_3, NF_3

B. $BCl_3, AlCl_3$

C. BeF_2, OF_2

D. BCl_3, PCl_3

Answer: B

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181. A: tetracynomethance, B: Carbon dioxide , C: Benzene, D: $1,3$ butadiene

Ratio of s and p bond is in order

A. A = B lt C lt D

B. A = B lt D lt C

C. A = B = C = D

D. C lt D lt A B

Answer: A

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

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

B. nitrogen at the centre of the tetrahedron, 3 of the vertices being occupied by 3 hydrogens

C. nitrogen at the centre of an equilateral triangle, 3 corners being occupied by 3 hydrogens

D. nitrogen at the junction of T, 3 open ends being occupied by 3 hydrogens

Answer: B

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183. Which of the following set of overlap can not provide π -bond formation

A. 3d and 2p

B. 2p and 3p

C. 2p and 2p

D. 3p and 1s

Answer: D

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184. The ratio of number of σ-bond to π-bond in N_2 and CO molecules are :

A. 2.0, 2.0

B. $2, \frac{1}{2}$

C. $\frac{1}{2}, \frac{1}{2}$

D. 2, 2

Answer: C

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185. 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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186. What is hybridisation of central atom of anionic part of PBr_5 in crystalline state

A. sp^2

B. sp^3

C. sp

D. Not applicable

Answer: D

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187. The % p-character in the orbitals forming C - H bond in CH_4 is :

A. 25

B. 50

C. 75

D. 100

Answer: C

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188. In the following compound :

$\overset{1}{CH_2} = \overset{2}{CH} - \overset{3}{CH_2} - \overset{4}{C} \equiv \overset{5}{CH}$, the C_3 - C_4 bond is of the type :

A. sp - sp^2

B. sp^3 - sp^3

C. sp^3 - sp

D. sp^2 - sp^3

Answer: C

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189. Which of the following molecule/ion has maximum $\sigma:\pi$ bond ratio?

A. $C_3N_3Cl_3$

B. CO_2

C. NO_3^-

D. P_4O^{10}

Answer: D

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190. Which of the following statements is incorrect for the bonding in CaC_2?

A. Ionic bond is present

B. Covalent bond is present

C. One σ and two π bond and present

D. Co-ordiante bond is present

Answer: D

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191. The shapes of $PCI_4^{\oplus}$, $PCI_4^{\ominus}$ and $AsCI_5$ and are respectively .

A. square planar, tetrahedral and see-saw

B. tetrahedral, see-saw and trigoanl bipyramidal

C. tetrahedral, square planar and pentagonal bipyramidal

D. trigonal bipyramidal, tetrahedral and square pyramidal

Answer: B

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192. consider the structures of the following two molecules :

$X: F_2C = C = CF_2$

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

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

A. X

B. Y

C. Both of these

D. none of these

Answer: A

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C.Identification of Planes; Allenes

1. Nodal planes of π-bonds in $CH_2 = C = C = CH_2$ are located in,

A. all are in molecular plane

B. two in molecular plane and one in a plane perpendicular to molecular plane which contains C - $C\sigma$-bond

C. one in molecular plane and two in plane perpendicular to molecular plane which contains C - $C\sigma$-bond

D. two in molecular plane and one in a plane perpendicular to molecular plane which bisects C - $C\sigma$-bond at right angle

Answer: B

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2. If 'XY' plane contains all the atoms of $COCl_2$, nodal plane of π-bond in $COCl_2$ is in :

A. XY

B. XZ

C. YZ

D. cannot be determined

Answer: A

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3. Which of the following would result in the formation of strongest π-bond if the molecular axis is X-axis?

A. $2p_x + 2p_x$

B. $3p_y + 3p_y$

C. $3p_y + 3d_{xy}$

D. $3p_x + 3d_{xy}$

Answer: C

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4. IF z-axis is the bond forming axis, then which of the following type of overlap cannot form π-bond [orbitals given are of two different atoms]?

A. p_y and p_y

B. d_{xy} and d_{xz}

C. d_{xz} and d_{xz}

D. none of these

Answer: B

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5. For the following molecule :

Consider the following statement, if π electron cloud of C_1 - C_2 is present in the plane of papar.

(P) Fluorine is perpendicular to the plane of paper

(Q) Chloring is present in the plane of paper

(R) Nodal plane of π - electron cloud of C_2 - C_3 is in plane of paper

(S) Nodal plane of π-electron cloud of C_3 - C_4 and C_1 - C_2 are in the plane of chlorine atom

Select the correct option.

A. TTTT

B. FFTT

C. FTTT

D. FFTF

Answer: B

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6. For the given compound :

$H_2C = C \mid H - C \mid H = C = C = CH_2$

If π-electron cloud of C_1 - C_2 carbon atoms is perpendicular to the plane of paper, then total number of H-atoms lying in the plane of paper will be :

A. 2

B. 3

C. 4

D. 6

Answer: D

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7. Which of the following statement is incorrect regarding to the bonding in C_3O_2?

A. Nodal planes of adjacent π-bonds are perpendicular to each other

B. Nodal planes of adjacent π - bond are in same plane

C. Nodal planes of alternative π-bond in same plane

D. All carbon atoms are sp-hybridized

Answer: B

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8. In which species do the atoms not lie in a single plane?

A. BF_3

B. PF_3

C. ClF_3

D. XeF_4

Answer: B

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9. In which of the following overlap/hybridisation will result in planar geometry in XY plane only?

A. $s + p_x$

B. $s + p_x + p_z$

C. $s + p_y + p_z$

D. $s + p_x + p_y + d_{x^2\text{-}y^2}$

Answer: D

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10. If the molecular axis is Z then which of the following overlapping is not possible

A. $p_z + p_z = \sigma$ bond

B. $p_x + p_y = \pi$ bond

C. $p_x + p_y = \pi$ bond

D. $p_y + p_y = \pi$ bond

Answer: B

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11. If y-axis is the approaching axis between two atoms, then which of the set of orbitals can not form the π bond between two atoms in general

A. p_z - p_z

B. p_x - p_x

C. p_x - p_y

D. none of these

Answer: C

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12. If ethyne $\left(C_2H_2\right)$ molecule lies along x-axis, then nodal planes of π-bond will lie in :

A. xy plane

B. yz plane

C. xz plane

D. both (a) and (c)

Answer: D

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13. Identify the incorrect statement about the molecule : $HC \equiv C - CH_2 - CH = C = C = CH_2$

A. Ratio of no. sp carbons to no. of sp^3 carbons is 4 : 1

B. The molecule may have maximum 11 atoms in the same plane.

C. Maximum 3 nodal plane of various π-bonds can be in theplane where maximum atoms may be present.

D. Maximum 7 carbon atoms can be along one of the axis.

Answer: D

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14. If ethene molecule is present on YZ plane then nodal plane of its π bond will lie on :

A. XY plane

B. YZ plane

C. molecular plane

D. (b) and (c) are correct

Answer: D

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15. Which of the following molecule is planar ?

A. $F_2C = C = C = CF_2$

B. $H_2C = C = CH_2$

C. C_2H_2

D. All of these

Answer: C

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16. The total number of π - bonds present in a single plane in the compound C_3S_2 is :

A. 1

B. 2

C. 3

D. 4

Answer: B

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17. Which is the correct statement?

A. In $H_2C = C = CH_2$,both the π bonds in same plane.

B. In $CH_2 = C = CH_2$, all the four hydrogens in same plane.

C. $CH_2 = C = CH_2$ molecule is a non-planar molecule.

D. (a) and (b) both are correct.

Answer: C

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18. The number of planes in which at least 4 atoms are present in IF_7, is :

A. 6

B. 5

C. 4

D. 7

Answer: A

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19. Order of number of planes present in molecule which contains maximum number of atoms of correeponding molecule :

A. $IF_7 > SF_6 > CH_4$

B. $CH_4 > SF_6 > IF_7$

C. $SF_6 > IF_7 > CH_4$

D. $CH_4 > IF_7 > SF_6$

Answer: B

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20. 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 formation of two separate π-bonds.

D. All correct

Answer: D

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21. The maximum number of atoms in a plane in PCl_5 is

A. 3

B. 4

C. 2

D. 5

Answer: B

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22. Which statement best describes the structure of the allene molecule, $H_2C = C = CH_2$?

A. The C atoms form an angle of 120° and the H atoms lie in the same plane as the C atoms.

B. The C atoms form and angle of 120° and the H atoms lie in a plane perpendicular to that of the C atoms.

C. The C atoms form an angle of 180° and the four H atoms lie in the same plane.

D. The C atoms form an angle of 180° and the two CH_2 groups are perpendicular to one another.

Answer: D

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D.

1. Consider the following statements :

(P) Steric number '7' gives sp^3d^3 hybridisation

(Q) In ClF_3, at least one bond angle is exactly 180°

(R) Lone pair does not cause any distrotion in the bond angle

The above statements P, Q, R respectively are : (T = True, F = False)

A. TFF

B. TTF

C. FTF

D. TTT

Answer: A

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2. In XeF_2, molecule the angle between two lone pair orbitals is α, the angle between lone pair orbital and bond pair orbital is β and the angle between bond pair orbitals is γ :

A. $\alpha = \beta = \gamma$

B. $\alpha > \beta > \gamma$

C. $\gamma > \beta > \alpha$

D. $\gamma > \alpha > \beta$

Answer: D

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3. Which of the following has highest bond angle?

A. Cl_2O

B. OF_2

C. H_2O

D. All have equal bond angle

Answer: A

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4. Which of the following has the highest bond energy?

A. F_2

B. Cl_2

C. Br_2

D. I_2

Answer: B

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5. Choose the correct order among the following option.

A. $H_2O > Cl_2O > F_2O$: Bond angle order

B. $Cl_2O > H_2O > F_2O$: Bond angle order

C. $XeF_4 < XeO_3 < XeF_2$: Number of lone pair on the central atom

D. $2p\pi$ - $2p\pi > 2p\pi$ - $3p\pi > 2p\pi$ - $3d\pi$: Relative strength of the π-bonds

Answer: B

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6. Arrange the following in increasing order of total number of possible adjecent bond angles?

A. $CCl_4 > SF_6 > IF_7$

B. $CCl_4 < SF_6 < IF_7$

C. $CCl_4 = SF_6 - IF_7$

D. none of these

Answer: B

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7. Select the correct option of the following statements.

(P) Energy of an sp^2 hybrid orbital is equal to that of an sp^3 hybrid orbital.

(Q) % s character in each sp^3d^2 hybrid orbitals are at 90° to one another.

(S) Bond order of C-O bond in CO_3^{2-} is $\frac{4}{3}$

A. TTTT

B. FFTF

C. FFFT

D. FFTT

Answer: D

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8. Consider the following statements :

(P) The hybridisation found in cation of solid PCl_5 is sp^3.

(Q) In AB_2L_2 type the BAB bond angle is always greater than the normal tetrahedral bond angle.

(R) In ClO_3^-, NH_3 and XeO_3, the hybridisation and the number of lone pairs on the central atoms are same.

(S) In P_4 molecule, there are six P - P bonds and four lone pairs of electrons.

Of these statements :

A. P, Q and R are correct only

B. P, R and S are correct only

C. R and S are correct only

D. All are correct

Answer: B

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9. Which of the following molecules has maximum number of 90° bond angle?

A. XeF_4

B. XeF_5^-

C. SF_6

D. IF_7

Answer: C

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10. The difference of maximum number of atoms that are present in a plane and minimum number of atoms that are present in a same plane is SF_6 is :

A. 4

B. 6

C. 2

D. 1

Answer: C

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11. Select the compound having all equivalent bond lengths :

A. PCl_5

B. BF_3

C. PF_5

D. IF_7

Answer: B

Watch Video Solution

12. The correct order of bond angles of following species are :

A. $NH_3 < NH_4^{\oplus} < NH_2^{\oplus}$

B. $O_3 < NO_2^{\oplus} < NO_3^{\Theta}$

C. $I_3^{\Theta} > XeF_4 > ClF_3$

(consider only adjacent bond angle)

D. $H_2O < F_2O < Cl_2O$

Answer: C

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13. Consider the following molecules :

$H_2OH_2SH_2SeH_2Te$

$IIIIIIIV$

Arrange these molecules in increasing order of bond angles

A. I lt II lt III lt IV

B. IV lt III lt II lt I

C. I lt II lt IV lt III

D. II lt IV lt III lt I

Answer: B

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14. Which has the smallest bond angles $(X - S - X)$ in the given molecules?

A. OSF_2

B. $OSCl_2$

C. $OSBr_2$

D. OSI_2

Answer: A

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15. Consider the following iodides :

PI_3	AsI_3	SbI_3
102°	100.2°	99°

The bond angle is maximum in PI_3, which is :

A. due to small size of phosphorous

B. due to more bp-pb repulsion in PI_3

C. due to less electronegativity of P

D. none of the above

Answer: B

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16. Select the correct statement(s) regarding BrF_5 molecule.

A. It has square pyramidal shape

B. All $\angle FBrF$ bond angles are equal to 90°

C. All Br-F bond lengths are equal

D. all of the above

Answer: A

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17. Select the correct statement regarding XeO_4 and IO_4^-.

A. Both are isoelectronic

B. Both have equal number of $p\pi$ - $d\pi$ bonds.

C. Both have different shapes.

D. $\angle OXeO$ and $\angle OClO$ are different bond angles.

Answer: A

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18. The correct order of $\angle OClO$ bond angles in ClO_2^- ClO_2 and ClO_2^+ is :

A. $ClO_2 = ClO_2^+ = ClO_2^-$

B. $ClO_2^+ < ClO_2 < ClO_2^-$

C. $ClO_2^- < ClO_2 < ClO_2^+$

D. $ClO_2^- < ClO_2^+ < ClO_2$

Answer: C

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19. Select the correct statement regarding IF_7.

A. Axial bond length is longer than equatorial bond length.

B. Axial bond length is shorter than equatorial bond length.

C. All bonds are of equal length

D. It is polar in nature.

Answer: B

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20. Consider the structure of P_4O_{10} given below :

Which of the following is correct ?

A. P - O - P linkage in P_4O_{10} is longer than that in P_4O_6

B. P_4O_{10} is less acidic than P_4O_6

C. $\alpha > \beta$

D. $\alpha < \beta$

Answer: D

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21. Which of the following has all equal total angles ?

A. CH_3Cl

B. CH_2F_2

C. NH_3

D. NH_2 - OH

Answer: C

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22. Arrange the following molecules in the correct order of decreasing C-C bond length:

A. $C_2H_6 > C_2H_4 > C_6H_6 > C_2H_2$

B. $C_2H_6 > C_6H_6 > C_2H_4 > C_2H_2\left(C_6H_6 \text{is benzene}\right)$

C. $C_2H_6 > C_2H_6 > C_2H_2 > C_6H_6$

D. $C_2H_6 > C_2H_4 > C_2H_2 > C_6H_6$

Answer: B

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23. Which of the following molecules or species has different bond angles between adjacent atoms ?

A. SF_6

B. NCl_3

C. XeF_5^-

D. SeF_4

Answer: D

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24. In which of the following O-N-O bond angles is highest ?

A. NO_2^+

B. NO_3^-

C. NO_2^-

D. None of these

Answer: A

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25. The correct order of bond angle in the given molecules is :

A. $PH_3 < NH_3 < H_2O < NH_4^+$

B. $PH_3 < H_2O < NH_3 < NH_4^+$

C. $NH_3 < PH_3 < H_3O < NH_4^+$

D. $NH_4^+ < NH_3 < H_2O < PH_3$

Answer: B

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26. Which of the following molecules or ions has different bond lengths ?

A. XeF_4

B. BF_4^-

C. SF_4

D. SiF_4

Answer: C

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27. Which of the following molecules has two lone pairs and bond angle (need not to be all bond angles) $< 109.5^\circ$?

A. SF_2

B. XeF_4

C. ICl_4^-

D. All of these

Answer: D

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28. Which of the following has maximum bond angle in the anionic part in the solid state ?

A. XeF_6

B. ICN

C. N_2O_3

D. N_2O_4

Answer: B

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29. Which of the following has maximum bond angle in its anionic part in the solid state?

A. PCl_5

B. PBr_5

C. N_2O_5

D. Cl_2O_6

Answer: C

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30. Shape of O_2F_2 is similar to that of

A. C_2F_2

B. H_2O_2

C. H_2F_2

D. C_2H_2

Answer: B

Watch Video Solution

31. The ONO angle is maximum in :

A. HNO_3

B. NO_2^+

C. HNO_2

D. NO_2^+

Answer: B

Watch Video Solution

32. Arrange the following in the increasing order of deviation from normal tetrahedral angle :

A. $P_4 < PH_3 < H_2O$

B. $PH_3 < H_2O < P_4$

C. $P_4 < H_2O < PH_3$

D. $H_2O < PH_3 < P_4$

Answer: D

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33. Which of the following bond angle order is correct?

A. $PH_3 > PH_4^+$

B. $NH_4^+ > PH_4^+$

C. $H_2O > H_3O^+$

D. $OF_2 < H_2O$

Answer: D

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34. Hydridisation of the central atom in BrF_5 molecule is :

A. BF_3

B. CF_4

C. NH_3

D. OF_2

Answer: D

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35. The infrated frequency of the CX vibration for CH_3X depends on which of the following?

(P) Mass of X

(Q) Strength of the CX bond

(R) Type of CX vibration (stretch or bend)

A. P only

B. Q only

C. Q and R only

D. P, Q and R

Answer: D

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36. What is the geometry of the IBr_2^- ion ?

A. Linear

B. Bent with a bond angle of about 90°

C. Bent with a bond angle of about 109°

D. Bent with a bond angle of about 120°

Answer: A

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37. When the molecules N_2, N_2O and N_2O_4 are arranged in order of decreasing N - N bond length which order is correct?

A. N_2O_4, N_2O, N_2

B. N_2, N_2O, N_2O_4

C. N_2O, N_2, N_2O_4

D. N_2, N_2O_4, N_2O

Answer: A

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38. Which molecule contains the smallest F - S - F angle ?

A. SF_2

B. SOF_2

C. SO_2F_2

D. SF_6

Answer: D

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39. Which of the following species does not have all types of bond length same?

A. SiF_6^{2-}

B. CIF_3

C. SO_4^{-2}

D. XeF_4

Answer: B

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40. In which choice are molecules listed in order of increasing bond angle?

A. H_2O, CH_4, NH_3

B. CH_4, NH_3, H_2O

C. H_2O, NH_3, CH_4

D. NH_3, CH_4, H_2O

Answer: C

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41. What is the I - I - I bond angle in the I_3^- ion ?

A. 180°

B. 120°

C. 90°

D. More than 90° but less than 120°

Answer: A

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42. When the species NH_4^+, H_3O^+ and H_2F^+ are arranged in order of increasing H - X - H bond angles, what is the correct order?

A. $H_3O^+ < NH_4^+ < H_2F^+$

B. $H_2F^+ < H_3O^+ < NH_4^+$

C. $NH_4^+ < H_2F^+ < H_3O^+$

D. $NH_4^+ < H_3O^+ < H_2F^+$

Answer: B

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43. When the species listed are arranged in order of increasing bond angle, which order is correct?

A. H_2Se, H_2S, H_2O

B. H_2S, H_2Se, H_2O

C. H_2S, H_2O, H_2Se

D. H_2O, H_2S, H_2Se

Answer: A

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44. The bond angles of $NH_3, NH_4^{\oplus}$ and $\overset{\Theta}{NH_2}$ are in the order .

A. NH_3, NH_2^-, NH_4^+

B. NH_4^+, NH_2^-, NH_3

C. NH_3, NH_4^+, NH_2^-

D. NH_2^-, NH_3, NH_4^+

Answer: D

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45. Which is true about NH_2^-, NH_3, NH_4^+ ?

A. All three have different bond angles

B. All three have different number of bond angles

C. All three have different hybridisation of nitrogen

D. All three are isoelectronic with each other and can act as a Lewis base

Answer: C

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46. Identify the correct order in the following :

A. $NH_3 < PH_3$ (bond angle)

B. $CO_3^{2-} > NO_3^-$ (bond angle)

C. $NO_2^- < NO_3^-$ (O - N - O angle)

D. $H_2O > O$ - C - O in $O\left(CH_3\right)_2$ (bond angle)

Answer: C

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47. In which of the following case the F - Br - F angle is less than 90° ?

A. BrF_3

B. BrF_4^-

C. BrF_5

D. both (a) and (c)

Answer: D

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48. What is the difference between bond angles in cationic species of PCl_5 and PBr_5 in solid state?

A. 60°

B. $109^\circ 28'$

C. 0°

D. 90°

Answer: C

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49. All possible bond angles in anionic part of PCl_5 are

A. $190^\circ, 28'$ only

B. $90^\circ, 180^\circ$

C. $90^\circ, 120^\circ, 180^\circ$

D. $72^\circ, 90^\circ, 180^\circ$

Answer: B

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50. If bond lengths by x, y and z respectively, then, estimate the order of bond lengths.

A. x gt y gtz

B. y gt x gt z

C. y gt z gt x

D. z gt y gt x

Answer: A

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

A. $PBr_5 > PCl_5 > PF_5$

B. $CCl_4 > SnCl_4 > SiCl_4$

C. $H_2S > H_2O$

D. $H_2Se > H_2Te$

Answer: D

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52. Strongest $C-H$ bond is observed amongst which of the following molecule?

A. I, II, III are equally strong

B. Only I

C. Only II

D. Only III

Answer: B

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53. Which of the following compound have maximum three identical bond angles?

A. BF_4^{Θ}

B. NH_3

C. PCl_5

D. All are correct

Answer: B

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54. Which of the following pair of species have different hybridisation but equal bond angle?

A. I_3^-, Icl_2^-

B. CO_2, XeF_2

C. I_3^+, Br_3^-

D. $NH_3, COCl_2$

Answer: B

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E.Bond Polarity/Dipole Moment

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

A. XeF_2

B. PCl_3F_2

C. XeF_4

D. All of these

Answer: D

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2. The correct order of dipole moment is :

A. $CH_3F < CH_3Cl < CH_3Br < CH_3I$

B. $CH_3Cl > CH_3F > CH_3Br > CH_3I$

C. $CH_3F > CH_3Cl > CH_3Br > CH_3I$

D. $CH_3Cl > CH_3F > CH_3I > CH_3Br$

Answer: B

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3. Correct order od dipole moment is :

A. 

B. $PCl_3F_2 > PF_3Cl_2$

C. $CH_3F > CH_3Cl$

D. $C_3O_2 > CO > CO_2$

Answer: A

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4. What is the dipole moment of XeO_3F_2?

A. Zero

B. Greater than XeO_3

C. Equal to XeO_3

D. None of these

Answer: A

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5. Find the molecule which is planar and polar.

A. $B_3N_3H_6$

B. $F_2C = C = C = CF_2$

C. BrF_2Cl

D. $F_2C = C = CF_2$

Answer: C

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6. In which type of molecule, the dipole moment may be nonzero (L → Lone pair) :-

A. AB_2L_2

B. AB_2L_3

C. AB_4L_2

D. AB_4

Answer: A

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7. The correct order of dipole moment of HF, HCl, HBr, HI and H_2 is :

A. $H_2 < HF < HCl < HBr < HI$

B. $H_2 < HF < HBr < HCl < HI$

C. $H_2 < HI < HBr < HCl < HF$

D. $H_2 < HI < HBr < HF < HCl$

Answer: C

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8. Which of the following are non-polar and planar?

A. $Cl_2C = C = CCl_2$

B. $Cl_2C = C = C = CCl_2$

C. B_2H_6

D. Al_2Cl_6

Answer: B

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9. The molecule having least dipole moment (Assume benzene molecule to be a regular hexagon) :

A. 

B. 

C. 

D. 

Answer: D

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10. A polar molecule AB have dipole monment 3.2 D (Debye) while the bond length is 1.6Å. Find the percentage ionic character in the molecule.

A. $31\ \%$

B. $41.6\ \%$

C. $39.6\ \%$

D. None of these

Answer: B

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11. The dipole moment of  is 1.5 D. Then, the dipole moment of  is :

(assume benzene ring is a regular hexagon)

A. 0 D

B. 1.5 D

C. 2.86 D

D. 2.25 D

Answer: B

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12. The correct order of dipole moment is :

A. $PCl_3F_2 > PF_3Cl_2$

B. 

C. $CH_3F < CH_3Cl$

D. $SO_2 < SO_3$

Answer: C

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13. Which of the following molecule is polar as well as planar?

A. 

B. 

C. 

D. None of these

Answer: C

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14. Which of the following pair of species : Ist has more dipole moment than IInd?

A. HF, HCl

B. PF_2Cl_3, PF_4Cl

C. CH_3F, CH_3Cl

D. $CHCl_3, CH_2Cl_2$

Answer: A

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15. Which of the following species are planar as well as non-polar ?

A. C_3O_2

B. PCl_5

C. CCl_4

D. SO_4^{2-}

Answer: A

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16. The polar as well as planar compound is

A. ClF_3

B. H_2O_2

C. BF_3

D. SF_4

Answer: A

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17. Which has maximum dipole moment?

A. 

B. 

C. 

D. 

Answer: A

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18. Which of the following statement is true?

A. The dipole moment of NH_3 is zero

B. The dipole moment of NF_3 is less than NH_3

C. The dipole moment of NF_3 is more than NH_3

D. The dipole moment of NH_3 is zero

Answer: B

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19. The geometry of H_2S and its dipole moment are :

A. angular and non zero

B. angular and zero

C. linear and non zero

D. linear and zero

Answer: A

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20. Of the following molecules the one which has permanent dipole moment is:

A. SiF_4

B. BF_3

C. PF_3

D. PF_5

Answer: C

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21. Which of the following has the least dipole moment ?

A. NF_3

B. CO_2

C. SO_2

D. NH_3

Answer: B

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22. Which of the following compounds possesses zero dipole moment ?

A. Benzene $\left(C_6H_6\right)$

B. Carbone tetrachloride

C. Boron trifluoride

D. All of these

Answer: D

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23. CH_3Cl has more dipole moment than CH_3F because :

A. electron affinity of chlorine is greater than that of fluorine

B. the charge separation is larger in CH_3Cl compared to CH_3F

C. the repulsion between the bond pairs and non-bonded pairs of electrons is greater in CH_3Cl than CH_3F

D. chlorine has higher electronegativity than fluorine

Answer: B

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24. Which of the following molecule is polar as well as planar?

A. H_2O_2

B. SO_2

C. CO_2

D. XeF_2

Answer: B

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25. Identify the correct order of dipole moment in the following:

A. $HF > HCl > HBr$

B. $CH_3F > CH_3Cl > CH_3Br$

C. $BF_3 > BCl_3 > BBr_3$

D. $F_2 > Cl_2 > Br_2$

Answer: A

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

A. ClF_3

B. ICl_4^-

C. I_3^-

D. OCN^-

Answer: B

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27. Which of the following molecules has a dipole moment of zero?

A. HCN

B. CH_2Cl_2

C. SO_2

D. CO_2

Answer: D

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28. Moecules with a permanent dipole moment include which of the following?

(P) HCN

(Q) O_3

(R) XeF_2

A. P only

B. P and Q only

C. Q and R only

D. P, Q and R

Answer: B

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29. Which of the following compounds has a non-zero dipole moment/

A. CO_2

B. AsH_3

C. CCl_4

D. PF_5

Answer: B

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30. Which molecule has no permanent dipole moment?

A. BCl_3

B. NCl_3

C. $CHCl_3$

D. PCl_3

Answer: A

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31. Molecules with non-zero dipole moments include which of those listed?

(P) $H_2C = CHCl$

(Q) cis-ClHC=CHCl

(R) trans-ClHC-CHCl

A. P only

B. R only

C. P and Q only

D. P, Q and R

Answer: C

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32. Among the following compounds the one that is polar and has central atom with sp^3 hybridisation is :

A. H_2CO_3

B. SiF_4

C. BF_3

D. $HClO_2$

Answer: D

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33. Which species has a diople moment other than zero?

A. BrF_3

B. CF_4

C. SbF_5

D. SF_6

Answer: A

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34. Which pair of molecules are polar species ?

A. CO_2 and H_2O

B. BF_2 and PCl_3

C. SO_2 and SCl_2

D. CS_2 and NO_2

Answer: C

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35. Which species is non-polar?

A. HCl

B. OCl_2

C. NCl_3

D. CCl_4

Answer: D

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36. Which of the following hydrocarbons has the lowest dipole moment?

A. 

B. $CH_3C \equiv CCH_3$

C. $CH_3CH_2C \equiv CH$

D. $CH_2 = CH - C \equiv CH$

Answer: B

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37. The incorrect statement(s) is/are :

A. NH_3 has higher dipole moment than that of NF_3

B. The pair of $CO_3^{2\ominus}$ and $SO_3^{2\ominus}$ is not isostructeural

C. The shape of XeF_4 is tetrahedral

D. PF_5 contains five bonding pairs and zero lone pair of electrons on phosphorous

Answer: C

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38. Find the molecule having least dipole-moment :

A. CH_3Cl

B. CH_2Cl_2

C. $CHCl_3$

D. CCl_4

Answer: D

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39. Molecule AB has a bond length of $1.617Å$ and a dipole moment of 0.38 D. The fractional charge on each atom (absolute magnitude) is :

$\left(e_0 = 4.802 \times 10^{-10}\text{esu}\right)$

A. 0

B. 1.0

C. 0.5

D. 0.05

Answer: D

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40. Polarity in a molecule and hence the dipole moment depends primarily on electronegativity of the constituent atoms and shape of a molecule. Which of the following has the highest dipole moment?

A. CO_2

B. HI

C. H_2O

D. SO_2

Answer: C

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41. Which of the following is polar and planar molecule?

A. BCl_3

B. CH_4

C. H_2O

D. NH_3

Answer: C

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42. Which has maximum dipole me

A. 

B. 

C. 

D. 

Answer: A

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43. Find out the incorrect order of the dipole moment among the following pair of compound :

A. $NH_3 > NF_3$

B. p-dichloro benzene > o-dichloro benzene

C. $CH_3Cl > CH_2Cl_2$

D. $SiF_4 > SF_4$

Answer: B

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44. Which bond angle, θ would result in the maximum dipole moment for the triatomic molecule XY_2 shown below? ltvegt 

A. $\theta = 90^\circ$

B. $\theta = 120^\circ$

C. $\theta = 150^\circ$

D. $\theta = 180^\circ$

Answer: A

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45. Which of the following species is planar and polar?

A. SO_3

B. $POCl_3$

C. NH_2^-

D. SO_3^{-2}

Answer: C

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46. In a hypothetical molecule of PCl BrF_3, choose the incorrect statement :

A.

$(P\text{ - }F)_{\text{axial bond length}} > (P\text{ - }Br)_{\text{equatorial bond length}} > (P\text{ - }Cl)_{\text{equatorial bond leng}}$

B. Number of planes containing one each of F, Br and Cl are 3

C. Bond angle order :

$\left(F_{\text{equatorial}}\text{ - }P\text{ - }Br\right) > \left(F_{\text{equatorial}}\text{ - }P\text{ - }Cl\right) > \left(F_{\text{axial}}\text{ - }P\text{ - }Cl\right)$

D. It's analogue molecule, PF_5 has dipole moment zero

Answer: A

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47. Magnitude of dipole moment generated in chloro benzene will be same as that of dipole moment generated in :

A. benzene

B. para-dichloro benzene

C. meta-dichloro benzene

D. cannot be similar with any molecule?

Answer: C

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48. Select correct order of dipole moment?

A. $B_3N_3H_6 > C_6H_6$

B. 

C. 

D. trans-1,2-dibromoethene gt cis-1,2-dibromoethene

Answer: C

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49. The observed dipole moment of HI is 0.38D. Calculate the percentage ionic character of the H-I bond distance is 1.61Å.

A. $16.4\ \%$

B. $12\ \%$

C. $5\ \%$

D. $20\ \%$

Answer: C

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50. Which of the following planar molecule has maximum dipole moment?

A. NH_3

B. NF_3

C. BF_3

D. ICl_3

Answer: D

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51. The incorrect statement is :

A. XeO_3 and ClO_3^{Θ} are isostructural

B. Cl_2 has highest bond energy among the halogen

C. each carbon in $C_2(CN)_2$ is sp-hybridised

D. NH_3 is less polar than NF_3

Answer: D

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52. Amongst the trihalides of nitrogen, which one has the highest dipole moment

A. NF_3

B. NI_3

C. NCl_3

D. NBr_3

Answer: B

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53. Which species is polar?

A. CO_2

B. SO_2

C. SO_3

D. O_2

Answer: B

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54. Three monosulphur fluorides are known SF_2, SF_4 and SF_6. Of these, polar species include :

A. SF_2 only

B. SF_4 only

C. SF_2 and SF_4 only

D. SF_2, SF_4 and SF_6

Answer: C

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55. Molecule AX_4 have all bond angles equal and molecule is non-polar also then which of the following conclusion in incorrect?

A. Molecule may be tetrahedral

B. Molecule may be square planar

C. Central atom 'A' must have atleast six valence electrons

D. Central atom 'A' has either zero lone pair oR two lone pairs

Answer: C

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56. What will be the correct formula for super oxide?

A. Cs_2O_2

B. CsO_2

C. KO_3

D. BaO_2

Answer: B

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57. Consider a molecule MX_3 which has three $p\pi$ - $d\pi$ bonds and non-zero dipole moment. Then select the correct statement.

['X' belongs to 'p' block, consider no co-ordinate bond is present in molecule]

A. Molecule is hypovalent

B. Central atom has two lone pairs

C. X' uses it's 'd' orbital for π bond formation

D. Hybridisation of 'M' is sp^3

Answer: D

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F.Resoncance

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

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

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

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

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

Answer: A

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2. Select the correct statement(s) regarding N_3^- ion.

A. All $d_{N\text{-}N}$ bonds are of equal length.

B. It has linear shape.

C. The central nitrogen is sp-hybridised.

D. all of the above

Answer: D

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3. Which option is incorrect for 'A' $NaClO_4$ and 'B' $HClO_4$ among the following?

A. All Cl - O bond length are equal in 'A'

B. All Cl - O bond length are not equal in 'B'

C. All Cl - O bond length are equal in 'B'

D. All Cl - O bond length are equal in 'B'

Answer: D

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4. Which of the following option is correct regarding (I) and (II) structure?

A. P - O bond length of (I) gt (II)

B. P - O bond order of (I) gt (II)

C. (II) is having more resonating structures than (I)

D. all of the above

Answer: A

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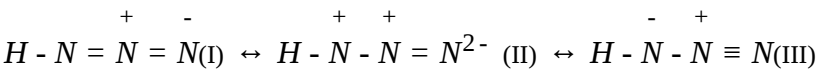
5. For hydrazoic acid, which of the following resonating structure well be least stable?



A. I

B. II

C. III

D. Both (I) and (III)

Answer: B

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6. Which one(s) the following structures cannot represent resonance forms for N_2O (diamagnetic)?

(P) $:\overset{\cdot\cdot}{N}\overset{\cdot\cdot}{.} = N = \overset{\cdot\cdot}{O}:$

(Q) $:N \equiv N - \overset{\cdot\cdot}{O}\overset{\cdot\cdot}{.}:$

(R) $:\overset{\cdot\cdot}{N}\overset{\cdot\cdot}{.} - N \equiv O:$

(S) $:\overset{\cdot\cdot}{N} = O = \overset{\cdot\cdot}{N}:$

(T) $:\overset{\cdot}{N}. = N = \overset{\cdot}{O}.:$

A. P and R

B. R, S and T

C. S and T

D. R and S

Answer: C

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7. Which of the following pair of species have all the bond lengths equivalent? (in individual species)

A. $Cr_2O_7^{2-}$ and SO_4^{2-}

B. SF_6 and PF_5

C. IF_7 and SF_6

D. SF_6 and CO_3^{2-}

Answer: D

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8. The extent of π bonding order in M - O is (M=central atom) :

A. $CO_3^{2-} = NO_3^- = BO_3^{3-}$

B. $CO_3^{2-} > NO_3^- > BO_3^{3-}$

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

D. $NO_3^- > CO_3^{2-} > BO_3^{3-}$

Answer: D

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9. Arrange the following in order of decreasing N - O bond length NO_2^-, NO_2^-, NO_3^-

A. $NO_3^- > NO_2^+ > NO_2^-$

B. $NO_3^- > NO_2^- > NO_2^+$

C. $NO_2^+ > NO_2^+ > NO_2^-$

D. $NO_2^- > NO_3^- > NO_2^+$

Answer: B

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10. When the carbon-oxygen bonds in $H_3COH, H_2CO,$ and HCO_2^- are arranged in order of increasing length, what is the correct order?

A. H_3COH, H_2CO, HCO_2^-

B. HCO_2^-, H_3COH, H_2CO

C. H_2CO, HCO_2^-, H_3COH

D. H_3COH, HCO_2^-, H_2CO

Answer: C

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11. In the dichromate dianion,

A. 4 Cr - O bonds are equivalent

B. 6 Cr - O bonds are equivalent

C. All Cr - O bonds are equivalent

D. All Cr - O bonds are non-equivalent

Answer: B

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12. Select the correct statement regarding $KHSO_5$.

A. All S - O bonds are of equal length.

B. Total three S - O bonds are of equal length.

C. Total two S - O bonds are of equal length.

D. It does not have peroxy linkage.

Answer: B

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13. Which of the following options is correct regarding C - O bond length?

A. $C_3O_2 > CO > CO_3^{2-}$

B. $C_3O_2 < CO < CO_3^{2-}$

C. $CO < C_3O_2 < CO_3^{2-}$

D. $CO = C_3O_2 = CO_3^{2-}$

Answer: C

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14. If bond length is represented by 'x' and 'y', then select the option where $x > y$.

A. CO (C - O bond length = x) and CO_2 (C - O bond length = y)

B. NO_3^- (N - O bond length = x) and NO_2^- (N - O bond length = y)

C. CO (C - O bond length = x) and CO_3^{2-} (C - O bond length = y)

D. CO_2 (C - O bond length = x) and CO_3^{2-} (C - O bond length = y)

Answer: B

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15. In the following there are three carbon-oxygen bonds denoted by x, y and z. $H_3C \overset{x}{-} \overset{O}{\overset{||}{C}} \overset{y}{-} O \overset{z}{-} CH_3$ Their lengths are in order

A. x = y = z

B. x lt y lt z

C. x lt y = z

D. z lt y lt x

Answer: B

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16. Which of the following order is correct with respect to the given property ?

A. $HClO < HClO_2 < HClO_3 < HClO_4$ (acidic strength)

B. $B_2O_3 < Al_2O_3 < Ga_2O_3 < In_2O_3 < Tl_2O$ (acidic nature)

C. $F^- < Cl^- < Br^- < I^-$ (basic nature)

D. H - $F < HCl < HBr < HI$ (thermal stability)

Answer: A

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17. Choose the correct option on the Cl - O bond length in $NaClO_4$.

A. All Cl - O bons are of equal length.

B. Three Cl - O bonds are of equal length and one longer.

C. Two Cl - O bonds are of same length which are longer compound to other two Cl - O bond length.

D. All Cl - O bond lengths are different

Answer: A

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18. The nitrite ion, NO_2^-, may be represented by two major resonance forms. The lengths of the nitrogen-to-oxygen bonds in this ion are expected to be :

A. the same as the length of nitrogen-to-oxygen double bonds.

B. the same as the length of nitrogen-to-oxygen triple bonds.

C. between the lengths of a nitrogen-to-oxygen single bond and a nitrogen-to-oxygen double bond.

D. between the lengths of a nitrogen-to-oxygen double bond and a nitrogen-to-oxygen triple bond.

Answer: C

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19. Which resonance form makes the greatest contribution to the structure of N_2O?

A. $:\overset{\cdot\cdot}{N}\overset{\cdot\cdot}{.}.:\ \mathrm{N}:::\mathrm{O}:$

B. $:\mathrm{N}:::\mathrm{N}:\overset{\cdot\cdot}{O}\overset{\cdot\cdot}{.}.:$

C. $:\overset{\cdot\cdot}{N}::\mathrm{N}::\ \overset{\cdot\cdot}{O}:$

D. $:\overset{\cdot\cdot}{N}::\ \overset{\cdot\cdot}{N}:\overset{\cdot\cdot}{O}:$

Answer: B

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20. For which species are both bonds of equal length?

(P) ClO_2^-

(Q) NO_2^-

A. P only

B. Q only

C. Both P and Q

D. Neither P nor Q

Answer: C

Watch Video Solution

21. The nitrite ion can be represented,

I. $\left[:\ddot{O}-\ddot{N}=\ddot{O}: \right]^-$

$\left[\ddot{O}=\ddot{N}-\ddot{O}: \right]^-$

II. $\left[\ddot{N}=\ddot{O}-\ddot{O}: \right]^-$

Which of the structure represents possible resonance forms of this ion?

A. I only

B. II only

C. Both I and II

D. Neither I nor II

Answer: A

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22. In which species is resonance most useful in explaining the observed bond lengths?

A. NF_3

B. NH_4^+

C. NO_2^+

D. NO_2^-

Answer: D

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

A. 180°

B. 150°

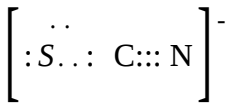
C. 120°

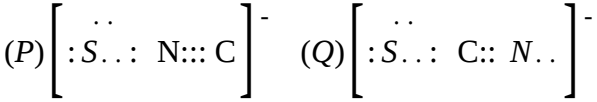
D. 109°

Answer: C

Watch Video Solution

24. Which is a resonance form of the Lewis structure shown here?





A. P only

B. Q only

C. Both P and Q

D. Neither P nor Q

Answer: B

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25. The O - N - O bond angles in the nitrate ion, NO_3^- are best described as being :

A. all 120°

B. all 109.5°

C. all 90°

D. two 90°, one 180°

Answer: A

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26. 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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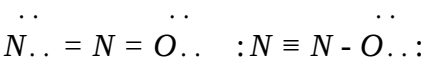
27. What is the relationship between the two species shown below?



They are :

A. geometric isomers

B. enantiomers

C. resonance forms

D. structural isomers

Answer: C

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28. How many stable resonance forms can be written for the oxalate ion, $C_2O_4^{2-}$?

A. Two

B. Three

C. Four

D. Five

Answer: C

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29. The concenpt of resonance is used to describe molecular structures which :

A. oscillate between two structures.

B. have mirror images.

C. can be isolated in several isomeric forms.

D. have more than one possible Lewis structure.

Answer: D

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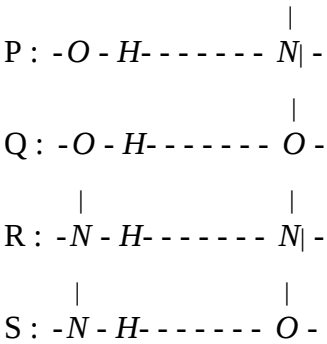
G.Hydrogen Bonding

1. Consider the following set of H-bonds :



The correct order of H-bond strength is :

A. $Q > P > S > R$

B. $R > Q > S > P$

C. $R > S > P > Q$

D. $P > Q > R > S$

Answer: D

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2. Hydrogen bond is not defined in ammonia due to :

A. flipping of ammonia

B. delocalisation of lone pair electrons is more in ammonia

C. more electronegative nature of nitrogen

D. none of the above

Answer: A

Watch Video Solution

3. Intermolecular hydrgoen bond is present in which of the following pair of molecules?

A. SiF_4 and SF_4

B. $CH_3-\overset{\overset{O}{\|}}{C}-CH_3$ and $CHCl_3$

C. $H-\overset{\overset{O}{\|}}{C}-OH$ and $CH_3-\overset{\overset{O}{\|}}{C}-OH$

D. CH_3OCH_3 and H_2O_2

Answer: C

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4. The increasing order of the strength of hydrogen bond in the following mentioned linkage is :

(P) O - H---S

(Q) S - H---O

(R) $F\text{-}H\text{---}F^-$

(S) $F\text{ - }H\text{---}O$

A. P < Q < S < R

B. Q

C. P < Q < R < S

D. Q < P < R < S

Answer: B

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5. Pure phosphoric acid is very viscous, because :

A. It is a strong acid

B. It is tribasic acid

C. It is hygroscopic

D. It has PO_4^{3-} groups which are bounded by many hydrogen bonds

Answer: D

View Text Solution

6. Which of the following is most volatile compound?

A. HF

B. HCl

C. HBr

D. HI

Answer: A

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7. Which of the following exhibits H-bonding ?

A. CH_4

B. H_2Se

C. N_2H_4

D. H_2S

Answer: C

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8. Intermolecular hydrogen bonding increases the enthalpy of a liquid due to the :

A. decrease in the attraction between molecules

B. increase in the attraction between molecules

C. decrease in the molar mass of unassociated liquid molecules

D. increase in the effective molar mass of hydrogen-bonded molecules

Answer: B

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9. Which of the following compounds would have significant intermolecular hydrogen bonding?

HF, CH_3OH, N_2O_4, CH_4

A. HF, N_2O_4

B. HF, CH_4, CH_3OH

C. HF, CH_3OH

D. CH_3OH, CH_4

Answer: C

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10. Which one of the following does not have intermolecular H-bonding ?

A. H_2O

B. o-nitro phenol

C. HF

D. CH_3COOH

Answer: B

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11. The order of strength of hydrogen bond is :

A. Cl - H.... Cl > N - H.... N > O - H.... O > F - H.... F

B. N - H.... N > Cl - H.... Cl > O - H.... O > F - H.... F

C. O - H.... O > N - H.... N > Cl - H.... Cl > F - H.... F

D. F - H.... F > O - H.... O > N - H.... N > Cl - H.... Cl

Answer: D

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12. The hydrogen bond is strongest in :

A. O - H---S

B. S - H---O

C. F - H---F

D. O - H---O

Answer: C

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13. Which of the following can form intermolecular H-bonding between its molecules?

A. CH_3OCH_3

B. CH_3COCH_3

C. CH_3Cl

D. N_2H_4

Answer: D

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14. The most volatile compound is :

A. 

B. 

C. 

D. 

Answer: A

View Text Solution

15. Select compound having maximum solubility in water.

A. 

B. 

C. 

D. 

Answer: A

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16. The correct order of boiling point of the given compounds is :

A. $H_2O_2 > H_2O > NH_3 > HF$

B. $H_2O > H_2O_2 > NH_3 > HF$

C. $H_2O_2 > H_2O > HF > NH_3$

D. $HF > H_2O_2 > H_2O > NH_3$

Answer: C

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17. Acetylene does not form hydrogen bond because :

A. C is less electronegative than hydrogen

B. Electronegativity of C and H are exactly equal

C. Carbon does not have any lone pair of electrons

D. None of the above

Answer: C

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18. Ice made form heavy water is put in container A having normal water and ice made from normal water is put in container B containing heavy water.

The observation are :

A. Ice sinks in both container A and B.

B. Ice floats in both container A and B.

C. Ice sinks in container A and floats in container B.

D. Ice floats in containers A and sinks in container B.

Answer: C

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19. Compound 'X' is used in bordeaux mixture. It has electrovalent, covalent, coordinate as well as H-bonds. In compound X based on the nature of bonds and interaction, the number of types of water molecules is :

A. 1

B. 2

C. 3

D. 4

Answer: C

View Text Solution

20. Which species can form intermolecular hydrogen bonds with other molecules or ions of the same type?

(P) HF

(Q) CH_3F

(R) NH_4^+

A. P only

B. R only

C. P and R only

D. P, Q and R

Answer: A

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21. Which of the following is not correct representation of H-bond?

A. 

B. 

C. 

D. All are correct

Answer: A

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22. Which compound has the lowest normal boiling point?

A. HF

B. HCl

C. HBr

D. HI

Answer: B

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23. Which of these pure substances has the highest normal boiling point?

A. CH_4

B. NH_3

C. SiH_4

D. PH_3

Answer: B

Watch Video Solution

24. Which substance has the loweset boiling point?

A. H_2O

B. H_2S

C. H_2Se

D. H_2Te

Answer: B

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25. On the basic intermolecular force predict the correct order of decreasing bolling point of the compound ?

A. $CH_3OH > H_2 > CH_4$

B. $CH_3OH > CH_4 > H_2$

C. $CH_4 > CH_3OH > H_2$

D. $H_2 > CH_4 > CH_3OH$

Answer: B

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26. When the compounds HF, H_2O, NH_3, and CH_4 are listed in order of increasing boiling point, which order is correct?

A. $CH_4 < NH_3 < H_2O < HF$

B. $NH_3 < CH_4 < H_2O < HF$

C. $HF < CH_4 < H_2O < NH_3$

D. $CH_4 < NH_3 < HF < H_2O$

Answer: D

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27. Which pure compounds form intermolecular hydrogen bonds?

(P) HF

(Q) H_2S

(R) CH_4

A. P only

B. R only

C. P and Q only

D. Q and R only

Answer: A

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28. What is the order of the boiling points (from lowest to highest) for the hydrogen halides?

A. HF < HCl < HBr < HI

B. HI < HBr < HCl < HF

C. HCl < HF < HBr < HI

D. HCl < HBr < HI < HF

Answer: D

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29. Which compound is expected to be the most soluble in water at $25^\circ C$?

A. $N_2(g)$

B. $O_2(g)$

C. $\left(C_2H_5\right)_2NH(l)$

D. $C_2H_5OC_2H_5(l)$

Answer: C

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30. In which of the following compound Cl-atom is involved in H-bonding :

A. m-chlorophenol

B. p-chlorophenol

C. o-chlorophenol

D. hydrochloric acid

Answer: C

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31. Which of the following property will be more in case of molecule having inter molecular hydrogen bonding in comparison to other isomeric molecule having intra-molecular H-bonding:

A. boiling point

B. vapour pressure

C. viscosity

D. both (a) and (c)

Answer: D

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32. In which of the following substances will hydrogen bond be strongest?

A. HCl

B. H_2O

C. HI

D. H_2S

Answer: B

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33. Hydrogen bonds are formed in many compounds e.g. H_2O, HF, NH_3. The boiling point of such compounds depends to a extent on the strength of hydrogen bond and the number of hydrogen bonds. The correct decreasing order of the boiling points above compounds is

A. $HF > H_2O > NH_3$

B. $H_2O > HF > NH_3$

C. $NH_3 > HF > H_2O$

D. $NH_3 > H_2O > HF$

Answer: B

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34. Which of the following molecule have maximum type of bonds?

A. $CuSO_4.5H_2O$

B. $NaClO_4$

C. HF

D. NH_3

Answer: A

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35. Which of the following molecule have intramolecular hydrogen bonding?

A. Boric acid(s)

B. Chloral

C. Orthonitrophenol

D. Ice

Answer: C

Watch Video Solution

36. Which of the reasons cannot be attributed to the low volatility of HF?

A. It's strong covalent bond.

B. It's small molecular mass.

C. Both (a) and (b)

D. It's strong hygrogen bonding.

Answer: C

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37. Urea and phosphoric acid undergo H-bonding in the following manner

:

x_1, x_2 are H-bond length

y_1, y_2 are covalent bond length

Select the only incorrect option :

A. $x_1 < x_2$

B. $y_2 > y_1$

C. $\theta_1 < \theta_2$

D. Number of $p\pi$ - $d\pi$ bonds present in the diagram is one

Answer: C

View Text Solution

38. Which of the following has lower viscosity?

A. Liquid HF

B. Liquid H_2O

C. Liquid H_2SO_4

D. Liquid H_3PO_4

Answer: A

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39. Pure samples of which of the following exhibit hydrogen bonding?

(P) CH_3OH

(Q) CH_3NO_2

(R) CH_3CN

A. P only

B. P and Q only

C. Q and R only

D. P, Q , R

Answer: A

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40. Which of the following property is not related to the hydrogen bonding ?

A. Boric acid is solid at room temperature.

B. Viscous nature of glycerol.

C. Boiling point of hydrocarbon is greater than that of respective fluorocarbon (for higher carbon members).

D. Solubility of C_2H_5OH in water.

Answer: C

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41. Which of the following statements are incorrect?

(P) In HCN liquid, hydrogen bonding is present.

(Q) HBr_2^- does exist.

(R) In $P\left(CH_3\right)_3\left(CF_3\right)_2$ number of maximum atoms may lie in one plane is 6.

(S) In solid PCl_5, the maximum number of equal angles is 12.

A. Q, R, S

B. Q, R

C. R, S

D. S,P

Answer: B

View Text Solution

42. Which statement is wrong about H_2O ?

A. It has high specific heat relative to other liquids or solids (with similar m. wt.) due to strong intermolecular H-bonding.

B. Each H_2O molecule has capacity to form 4 H-bonds.

C. H_2O has open cage like structure due to intermolecular H-bonding which give rise to low density to ice than liquid H_2O.

D. H_2O has maximum density at $4^\circ C$, the intermolecular H-bonding persists more thereby decreasing volume and increasing density

Answer: D

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43. The correct order of viscosity of alcohol, ethylene glycol and glycerol is :

A. alcohol > glycol > glycerol

B. glycerol > glycol > alcohol

C. glycol > glycerol > alcohol

D. alcohol > glycerol > glycol

Answer: B

Watch Video Solution

44. Glacial acetic acid dissolves in :

(P) liquid H_2S, as H_2S is a polar covalent compound

(Q) liquid NH_3, as it can form hydrogen bond

(R) liquid $HClO_4$, as it can protonate acetic acid

The correct option is :

A. only P

B. only Q

C. only R

D. P, Q and R

Answer: D

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45. Cotton fibers consist of cellulose polymers with neighboring polymers chains held together by hydrogen bonds between $-OH$ groups in the glucose units. Due to these hydrogen bonds :

A. cotton is insoluble in water

B. cotton can easily absorb ghee and oils and therefore are used to make wicks in traditional lamps

C. it is easier to iron cotton clothes when they are slightly wet or by applying steam to the clothes

D. cotton clothes have a high wear and tear than other fibers

Answer: C

View Text Solution

46. Which of the following order is correct for strength and extent of H-bonding between H_2O and H_2O_2 respectively:

A. $H_2O > H_2O_2$ and $H_2O_2 < H_2O$

B. $H_2O < H_2O_2$ and $H_2O < H_2O_2$

C. $H_2O > H_2O_2$ and $H_2O_2 > H_2O$

D. $H_2O > H_2O_2$ and $H_2O > H_2O_2$

Answer: C

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47. Which substance will form hydrogen bonds to water molecules but will not will not form hydrogen bonds with its own molecules?

A. HF

B. C_2H_5OH

C. CH_3NH_2

D. CH_3OCH_3

Answer: D

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48. The boiling point of methanol is greater than that of Methyl thiol because

A. There is intramolecular hydrogen bonding in methanol and intermolecular hydrogen bonding in methane thiol.

B. There is intermolecular hydrogen bonding in methanol and no hydrogen bonding in methane thiol.

C. There is no hydrogen bonding in methanol and intermolecular hydrogen bonding in methane thiol.

D. There is intramolecular hydrogen bonding in methanol and no hydrogen bonding in methane thiol.

Answer: B

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49. When compared to most other substances of similar molar mass the values of which properties of liquid H_2O are unusually large?

(P) Boiling point

(Q) Specific heat capacity

(R) Surface tension

A. P only

B. P and Q only

C. Q and R only

D. P, Q and R

Answer: D

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50. Which solute is least soluble in water?

A. 1-butanol

B. Ethanol

C. Methanol

D. 1-propanol

Answer: A

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H. Oxyacids, Naming of Inorganic Compounds, Important Structures

1. When cyclic trimetaphosphoric acid is converted into tripolyphosphoric acid then, which of the following is changed during this conversion?

A. Covalency of phosphorus

B. Oxidation state of phosphorus

C. Total number of P - O - P linkage

D. Total number of P - H bonds

Answer: C

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2. Which of the following has two π bonds and planar structure?

A. CO_2

B. SO_2

C. C_2H_2

D. All of these

Answer: D

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3. Hydrated borax has how many B - O - B linkage?

A. 5

B. 4

C. 3

D. 6

Answer: A

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4. Find the rate of π bond in Marshall's acid to Caro's acid?

A. 2

B. 4

C. 3

D. 8

Answer: A

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5. Which of the following pairs is (are) isostructural?

A. SF_4 and SiF_4

B. SF_6 and SiF_6^{2-}

C. SiF_6^{2-} and SeF_6^{2-}

D. XeO_6^{4-} and TeF_6^{2-}

Answer: B

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6. Which of the following molecule does not have open book structure?

A. O_2F_2

B. H_2O_2

C. S_2Cl_2

D. C_2H_2

Answer: D

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7. Which of the following statements are true about P_4O_6 and P_4O_{10}?

A. Both oxides have a closed cage like structure.

B. Both the oxides contains individual twelve equivalent P - O bonds.

C. (a) and (b) are correct.

D. None of the above.

Answer: C

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8. Which of the following statement(s) is incorrect about P_4O_6 and P_4O_{10} ?

A. Both oxides have a closed cage like structure.

B. Both oxide contains six equivalent P - O - P bonds.

C. Both P_4O_6 and P_4O_{10} molecules have $p\pi$ - $d\pi$ bonds.

D. P - O - P bond length of P_4O_6 is greater than P_4O_{10}.

Answer: C

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9. Which of the following compounds does not have peroxide bond?

A. H_2SO_5

B. $H_2S_2O_7$

C. $H_2S_2O_8$

D. CrO_5

Answer: B

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10. Which of the following will not have cyclic structuregt

A. P_4O_{10}

B. P_4O_6

C. $H_4P_2O_7$

D. $H_3P_3O_9$

Answer: C

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11. In a polythionic series $\left(H_2S_nO_6\right)$ if [n= 4]. Which of the following option is incorrect?

A. Absolute oxidation state of S is $+5$ as well as zero.

B. Number of S - S linkage are three.

C. It has four sp^3 sulphur atom.

D. It has only non-polar bonds.

Answer: D

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12. $\text{Oxoanion} + H_2O \rightarrow \text{oxoacid} + OH^-$ Oxoanion is converted into oxoacid by abstraction of proton from water which is initiated by H-bond formation. The increasing strength of H-bond of the given oxoanion is :

A. $ClO_4^- < SO_4^{2-} < PO_4^{3-} < SiO_4^{4-}$

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

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

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

Answer: A

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13. The compound having S - S linkage is :

A. $H_2S_2O_7$

B. $H_2S_2O_8$

C. $H_2S_2O_6$

D. $\left(SO_3\right)_3$

Answer: C

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14. 2 moles of phosphoric acid

$$-H_2O \rightarrow (X) \xrightarrow{+1 \text{ (Oxygen atom)}} (Y)$$

The number of σ -bonds in compound Y is :

A. 12

B. 13

C. 11

D. 9

Answer: B

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15. In $H_6P_6O_{18}$, P_4O_{10} how many P - O - P bonds are present respectively?

A. 6,6

B. 6,4

C. 6,5

D. 6,2

Answer: A

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16. $2 \times$ sulphuric acid - $H_2O + O \rightarrow X$

$2 \times$ sulphurous acid - $H_2O \rightarrow Y$

Which option is ocrrect for above information?

A. X has S - O - S bond

B. Y has S - O - S bond

C. Y has S - S bond

D. X has S - S bond

Answer: C

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17. Which of the following compound is having maximum number of P - O - P linkage and must have - OH linkage?

A. $H_5P_3O_{10}$

B. $H_5P_5O_{15}$

C. $H_7P_5O_{16}$

D. $H_4P_2O_7$

Answer: B

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18. Select correct statement with respect to pyrosulphuric acid and pyrophosphoric acid.

A. Pyrophosphoric acid has P - P linkage whereas pyrosulphuric acid has S - O - S linkage.

B. Both have same number of acidic hydrogens per unit.

C. Both have same number of $p\pi$ - $d\pi$ bonds.

D. Both have two tetrahedral sharing one corner

Answer: D

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19. Which of the following statement is correct about metaboric acid?

A. It has one hydrogen which is attached with boron atom.

B. Boron has covalency '5'.

C. Orthoboric acid is produced on addition of one mole H_2O to one mole metaboric acid.

D. Metaboric acid is not an oxy-acid.

Answer: C

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20. Which of the following oxoacids has maximum number of hydrogen attached to the central atoms?

A. H_2SO_4

B. H_3PO_3

C. H_3PO_4

D. H_3PO_2

Answer: D

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21. $P_4O_{10} \xrightarrow{2H_2O} H_4P_4O_{12} \xrightarrow{H_2O} H_6P_4O_{13} \xrightarrow{2H_2O} -2H_3PO_4H_4P_2O_7 \xrightarrow{H_2O} 2H_3PO_4$

From the above process, find the total number of $P-O-P$ linkage in $H_6P_4O_{13}$.

A. 5

B. 4

C. 3

D. 2

Answer: C

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22. Choose the correct statement in both acids.

$H_5P_5O_{15}, H_7P_5O_{16}$

A. Both have equal number of P - O - P linkages

B. Both have same basicity

C. Both have equal number of sp^3 hybridised 'P'

D. Both have different number of $p\pi$ - $d\pi$ linkage?

Answer: C

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23. Which of the following does not have peroxy linkage.

A. $H_4P_2O_8$

B. N_2O_5

C. CrO_5

D. HNO_4

Answer: B

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24. Which of the following statement is correct for both $P_2O_8^{4-}$ and $Si_2O_7^{6-}$ ions?

A. Both ions have cyclic structure.

B. Both ions have X - O - X linkage (where 'X' is central atom).

C. Oxidation state of central atom is maximum.

D. Hybridisation of 'P' and 'Si' in respective ions is not same.

Answer: C

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25. Which of the following are linear?

A. $(CN)_2$

B. $(SCN)_2$

C. O_3

D. $HgCl_2$

Answer: A

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26. Which of the following is correct?

A. S_3O_9 - contains no S - S linkage

B. $S_2O_6^{2-}$ - contains no $-O-O-$ linkage

C. $\left(HPO_3\right)_3$ - contains no P - P linkage

D. $S_2O_8^{2-}$ - contains no S - S linkage

Answer: A

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27. Which of the following compounds does not have peroxy linkage?

A. Marshall's acid

B. Caro's acid

C. Perchloric acid

D. Pernitric acid.

Answer: C

Watch Video Solution

28. The molecular formula of sodium hydrgoen phosphate is :

A. NaH_2PO_4

B. Na_2HPO_4

C. NaH_2PO_3

D. Na_2HPO_3

Answer: B

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29. Number of S - O - S linkage in trithionate ion $\left(S_3O_6^{2-}\right)$ is/are :

A. 3

B. 2

C. 0

D. 1

Answer: C

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30. Which of the following compound is having maximum number of P - O - P linkage and must have -OH linkage?

A. $H_5P_3O_{10}$

B. $H_3P_3O_9$

C. $H_4P_2O_7$

D. P_4O_{10}

Answer: B

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31. Which of the following statement is incorrect regarding $H_4P_2O_6$ molecule?

A. It may have P - P linkage

B. It must have P - O - P linkage

C. It's basicity may be three

D. The number of $p\pi$ - $d\pi$ bonds is 2

Answer: B

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32. The oxyacid contains E - O - E types of linkage?

A. $H_4P_2O_5$

B. $H_4P_2O_6$ (hypophosphoric acid)

C. $H_2S_2O_5$

D. $H_2N_2O_2$

Answer: A

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33. Find the number of B - O - B linkage present in anionic part of borax :

A. 4

B. 3

C. 5

D. none of these

Answer: C

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34. Which of the following statement is correct for $H_3P_3O_9$?

A. Trimetaphosphoric acid

B. Tribasic acid

C. Has cyclic structure

D. All the correct

Answer: D

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35. Which of the following is having S - O - S linkage?

A. $H_2S_2O_5$

B. $H_2S_2O_7$

C. $H_2S_3O_6$

D. $H_2S_2O_4$

Answer: B

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36. In which of the following oxyacid basicity may be three?

A. H_3PO_3

B. H_3PO_2

C. $H_4P_2O_6$

D. All of these

Answer: C

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37. Find the ions which do not have X - O - X type of linkage :

A. $S_2O_3^{2-}$

B. $\left(P_3O_9\right)^{3-}$

C. $Si_2O_7^{6-}$

D. $H_2P_2O_5^{2-}$

Answer: A

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38. Find the total number of sigma bonds in $H_nP_nO_{3m}$, where $n > 2$ is :

A. 3n

B. 4n

C. 5n

D. 3 (n - 1)

Answer: C

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39. Which of the following oxoacid does not contain $(S - O - S)$ linkage?

(P) $H_2S_2O_6$

(Q) $H_2S_2O_4$

(R) $H_2S_2O_3$

A. P, Q

B. Q, R

C. P, R

D. P, Q, R

Answer: D

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40. If x,y,z represents the bond length of $P - O$ linkage as in a given ion, then which order is correct in given options?

$$H_2PO_3^- \quad H - \overset{\overset{\displaystyle O}{\|z}}{P}|xOH - y\ O^-$$

A. $x > y > z$

B. $x = y > z$

C. $x > y = z$

D. $x = y = z$

Answer: C

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41. Incorrect statement out of the following is / are :

(P) Ortho-nitrophenol is more volatile than para-nitrophenol

(Q) Basicity of boric acid, $B(OH)_3$ is 3 in aqueous medium

(Q) Molecular formula of calcium dihydrogen phosphate is $Ca\left(H_2PO_4\right)_2$

A. P only

B. Q ony

C. Q, R

D. P, R

Answer: B

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42. Which of the following do not have a peroxy linkage?

(P) O_2F_2

(Q) Perxenic acid

(R) Perchloric acid

(S) Pernitric acid

A. Only R

B. Only P

C. P, Q, R

D. Q, S

Answer: C

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43. Which oxides exist as individual molecules?

(P) Al_2O_3

(Q) SiO_2

(R) P_4O_{10}

A. Q only

B. R only

C. P and R only

D. Q and R only

Answer: B

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44. Which of the following name of compounds are matched correctly against their molecular formula?

A. NaN_3-Sodium nitride

B. $K_2S_2O_7$-Potassium thionate

C. $Na_2P_2O_5$-Sodium pyrophosphate

D. CaS_2O_3-Calcium thiosulphate

Answer: D

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45. Which of the following oxy-acid consists of S - S linkage and both sulphur have difference in oxidation state of 2?

A. $H_2S_2O_3$

B. $H_2S_2O_6$

C. $H_2S_2O_5$

D. $H_2S_2O_4$

Answer: C

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46. Which of the following compounds may have a P - P bond :

A. $H_4P_2O_5$

B. $\left(HPO_3\right)_3$

C. $H_4P_2O_7$

D. $H_4P_2O_6$

Answer: D

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47. Which of the following oxide/oxy-anions does not contain P - O - P linkage?

A. P_4O_{10}

B. HPO_3^{2-}

C. $\left(P_3O_9\right)^{3-}$

D. $H_4P_2O_5$

Answer: B

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48. Which of the following oxyacid/oxysalt/compound does not contain peroxy linkage?

A. H_2SO_5

B. $Na_2S_2O_3$

C. $Na_2H_2P_2O_8$

D. CrO_5

Answer: B

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49. (P) on removal of one mole water produces (Q)

$(P)\text{An oxyacid} - H_2O \rightarrow (Q)\text{An oxyacid}$

Which of the following will not follow the above process?

A. H_3BO_3

B. H_2SO_4

C. H_3PO_2

D. Both (b) and (c)

Answer: D

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50. Oxyacid which have same number of X - H and X - OH bonds is (where X is central atom) :

A. $H_2S_2O_6$

B. $H_4P_2O_5$

C. $H_4P_2O_6$

D. $H_2S_2O_8$

Answer: B

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51. How many valence electrons are in the pyrophosphate ion, $P_2O_7^{4-}$?

A. 48

B. 52

C. 54

D. 56

Answer: D

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52. What is the oxidation of state of S in H_2SO_5 and $H_2S_2O_8$?

A. $+8, \ +7$

B. $+7, \ +7$

C. $+6, \ +5$

D. $+6, \ +6$

Answer: D

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53. The peroxymonosulphate anion, HSO_5^-, has :

A. five sulphr-oxygen bonds and no oxygen-oxygen bonds.

B. four sulphur-oxygen bonds and one oxygen-oxygen bond.

C. three sulphur-oxygen bonds and two oxygen-oxygen bonds.

D. one sulphur-oxygen bond and four oxygen-oxygen bonds.

Answer: B

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54. Which of the acids below has the most number of ionizable hydrogen atoms per molecule ?

(P) H_3PO_4

(Q) H_3PO_3

(R) H_3PO_2

A. P only

B. Q ony

C. R only

D. Each one contains the same number of ionizable H atoms.

Answer: A

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55. Which of the following is incorrect characteristic(s) of calcium phosphite?

A. Formula is $Ca\left(PO_3\right)_2$

B. P - H bond is present

C. Oxidation state of phosphorus is $+3$

D. All O - P - O bond angles are same

Answer: A

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56. Which of the following species has ring structure but not six membered?

A. $\left(B_3O_6\right)^{3-}$

B. $\left[B_2O_4(OH)_4\right]^{2-}$

C. $\left(P_6O_{18}\right)^{6-}$

D. All of these

Answer: C

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57. Which of the following statement is correct?

A. BF_3 and BCl_3 is isostructural but having different bond length and bond angle.

B. In PCl_5 two $d_{P\text{-}Cl}$ bond length are same and less than other three $d_{P\text{-}Cl}$ bond.

C. In C_3O_2, the number of π-bond in the same plane is 4.

D. In S_3O_9, number of S - S linkage is zero.

Answer: D

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58. The correct statement is :

A. There is no S - S linkage in $Na_2S_2O_3$.

B. P_4O_6 contains six P - O - P linkage.

C. Acidic strength of oxoacid of sulphur is $H_2SO_3 > H_2SO_4$.

D. Paranitrophenol is more volatile than ortho nitrophenol.

Answer: B

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59. The total number of σ - bonds in $P_6O_{18}^{6-}$ ion is :

A. 18

B. 20

C. 22

D. 24

Answer: D

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60. Compound which is not an oxyacid is :

A. $B(OH)_3$

B. H_3PO_3

C. $Mg(OH)_2$

D. $HClO_2$

Answer: C

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61. P_4O_{10} has short and long P - O bonds. The number of short P - O bonds in this compounds is

A. 1

B. 2

C. 3

D. 4

Answer: D

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I. Allotropy

1. Inorganic graphite and graphite have many similarties. Choose among the following, the property which is dissimilar.

A. Layered structure, where layers are inter connected by weak van der Waals' forces

B. Slippery nature

C. Hybridisation of all atoms in the layer is sp^2

D. Good conductor of electricity

Answer: D

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2. Which of the following order is incorrect?

A. Graphite gt diamond (C - C bond length)

B. Graphite lt diamond (Thermal conductivity)

C. Graphite gt diamond (Electrical conductivity)

D. Graphite gt diamond (Reactivity)

Answer: A

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3. Which of the following is most thermodynamically stable allotrope of carbon?

A. Graphite

B. Diamond

C. Fullerene

D. None of these

Answer: A

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4. Which of the following phosphorus is the most reactive?

A. White phosphorus

B. Red phosphorus

C. Black phosphorus

D. All of these

Answer: A

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5. Which of the following crystalline allotrope found in given arrangement of atoms?

A. Graphite

B. Black phosphorus

C. Rhombic sulphur

D. Red phosphorus

Answer: B

View Text Solution

6. Select the correct order.

A. Graphite $>$ Diamond : Electrical conductancae

B.

Black phosphorus $>$ Red phosphorus $>$ White phosphorus : Thermodynamic

C. Diamond $>$ Graphite : C - C bond length

D. All of the above

Answer: D

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7. In which allotropic form of phosphorus covalency of each phosphorus is five?

A. White phosphorus

B. Red phosphorus

C. Black phosphorus

D. None of these

Answer: D

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8. Find the molecule which does not have a pie (π) bond.

A. Graphite

B. Fullerene

C. Benzene

D. NOF_3

Answer: D

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9. When a phosphorus atom is converted to a phosphide ion, what happens to the number of unpaired electrons and the total number of electrons around the phosphorus?

		Unpaired electrons	Total electrons
A.	(a)	increases	increases
B.	(b)	decreases	increases
C.	(c)	increases	remains the same
D.	(d)	decreases	remains the same

Answer: B

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10. All these elements have common allotropes except :

A. C

B. O

C. Kr

D. S

Answer: C

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11. Select correct statement .

A. In diamond, graphite and fullerene carbon uses all it's valence electron for bond formation.

B. Water is non-planar molecule in which all hydrogen atoms are in different plane.

C. Distortion in geometry of molecule takes place due to absence of lone pairs generally.

D. More number of resonating structures are formed in NO_3^- in comparison to PO_4^{3-}

Answer: A

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12. The correct increasing order of carbon-carbon bond lengths in benzene, ethane, ethene, acetylene and graphite is :

A. bencene lt ethane lt ethene lt acetylene lt graphite

B. acetylene lt ethene lt benzene lt graphite lt ethane

C. acetylene lt ethene lt graphite lt benzene lt ethane

D. benzene lt graphite lt acetylene lt ethene lt ethane

Answer: B

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13. Choose the correct code for following statement.

(P) In graphite inter layer spacings is more than C - C bond length within the layer.

(Q) Graphite is more reactive compared to diamond.

(R) Graphite is more stable compared to diamond.

(S) Graphite is sufficiently inert compared to other elements.

A. TTFT

B. TFTF

C. TTTT

D. TTFF

Answer: C

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Reasoning Type

1. Assertion : Amongst the oxo acids of halogens, HOCI, HOBr and HOI , the HOI is the most acidic acid.

Reason :The conjugate base stability is $CIO > BrO > IO$.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: D

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2. Statement-1 : Molecular species like SF_6, PF_5, I_3^- and XeF_2 violate the octet rule.

Statement-2 : Compounds with an expanded octet are called hypervalent compounds.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: B

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3. Statement-1 : In tetrahedral hybridisation, i.e., in sp^3 hybridisation all p-orbitals of valence shell are involved and non p-orbitals of valence shell are involved and no p-orbitals is left for forming π - bonds.

Statement-2 :: Central atom cannot form double bonds in the molecules or species having sp^3 hybridisation.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: C

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4. Assertion : All F - S - F angle in SF_4 are greater than 90° but less than 180°.

Reason :The lone pair -bond pair repulsion is weaker than bond pair - bond pair repulsion

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: D

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5. Statement-1 : The bond angles of BrNO, CNO and FNO are approximately 11.45°, 113.3° and 110.1° respectively.

Statement-2 : The hybridisation of central N atom in all three compounds is sp^2.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: B

View Text Solution

6. Assertion : NF_3 has tendency to act as a donor molecule.

Reason : The highly electronegative F atoms atract electron and these moments partly cancel the moment from the lone pair.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: A

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7. Assertion : In IOF_4^- a single lone pair is present an iodine atom trans to oxygen to have minimum repulsion between the $I = 0$ and the lone pair of electrons.

Reason : The VSEPR model consider double and triple bonds to have slightly greater repulsive effect then single bonds bonds because of the repulsive effective π electrons

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: A

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8. Assertion : Molecular having different hybridisation can have same shape.

Reason :The shape of a molecule does not depend on the hybridisation but it depends on the energy factor.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: A

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9. Assertion : Aluminium chloride in acidified aqueous solution from octahedral $\left[AI\left(H_2O\right)_6\right]^{3+}$ ion.

Reason :In $\left[AI\left(H_2O\right)_6\right]^{3+}$ complest ion the $3d$ orbital of al are involved and the hybridisation state of AI is sp^3d^2.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: A

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10. Assertion :SO_2, NO_3^- and CO_3^{2-} are isoelectronic as well as isostructural species.

Reason :The d and f-orbital do not shield the nuclear charge very effectively. Therefore there is signified rediduction in the size of the ions, just after d or f orbital have been completely filled.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: D

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11. Statement-1 : NO_3^- and PO_3^- have similar formula type but differ structurally, i.e., they have different type of hybridisation.

Statement-2 : NO_3^- ion exists as free ion. On the other hand PO_3^- exists as cyclic or linear polymeric structure.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: A

View Text Solution

12. Assertion : Carbon has unique ability to form $p\pi - p\pi$ multiple bonds with itself and with other atomic of small size and high electronegativety.

Reason : Heaviur elements of group $14th$ do not form $p\pi - p\pi$ bonds because their atomic orbital are too large and diffuse to have effective sideways overapping.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: B

Watch Video Solution

13. Statement-1 : In graphite, on increasing the temperature the conductivity decreases along the layers of carbon atoms.

Statement-2 : Graphite cleaves easily, because the force of attraction between the layers is weak van der Wall,s force.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: B

View Text Solution

14. Assertion :A molecule of Buckminsterfullerene exhibita aromatic character.

Reason :All the carbon atom undergo sp^2 hybridisation. Each carbon atom atomic three sigma bonds with other three carbon atom. The remaining electron at each carbon is delocalised in molecular orbitals.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: A

Watch Video Solution

15. Statement-1 : In hydrazine each nitrogen atom is tetrahedrally surrounded by one N, two H and a lone pair. The N - N bond length is 1.45Å (normal N - N bond length).

Statement-2 : The two halves of the molecules are rotated 95° about the N - N bond and adopt gauche (non-eclipsed) conformation.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: A

View Text Solution

16. Statement-1 : The hybridisation of N atom in acetamide is sp^3.

Statement-2 : There occurs delocalisation of lone pair of electrons present on N atom.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: D

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17. Statement-1 : PF_5 keeps trigonal bipyramidal strucure in gas as well as in solid state.

Statement-2 : PCl_5 in gas and liquid state is covalent but in solid state it is ionic and exist as $\left[PCl_4\right]^+$ and $n\left[PCl_5\right]^-$.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: B

Watch Video Solution

18. Statement-1 : Fluoromethane $\left(CH_3F, \mu = 1.85D\right)$ has smaller dipole moment than chloromethane $\left(CH_3Cl, \mu = 1.87D\right)$.

Statement-2 : Fluorine has less electron affinity than that of chlorine.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: B

Watch Video Solution

19. Statement-1 : Allene is a non polar molecule.

Statement-2 : Allene is non planar molecule.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: B

Watch Video Solution

20. Statement-1 : Dipole moment of NF_3 is less than that of NH_3.

Statement-2 : Polarity of N - F bond is less than that of N - H bond.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: C

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21. Statement-1 : The dipole moment of O_2F_2 is not zero.

Statement-2 : All atoms are lying in the same plane.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: C

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22. Statement-1 : In case of persulphuric acid, the $K_1 > > K_2$.

Statement-2 : The anion of persulphuric acid is intermolecular hydrogen bonded.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: C

View Text Solution

23. Statement-1 : Ortho boric acid crystals are hard and cannot be broken easily into the powder form.

Statement-2 : In the solid state $B(OH)_3$ units are hydrogen bonded together into two dimensional sheets.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: D

View Text Solution

24. Assertion :The orystal sturctures of $NaHCO_3$ and $KHCO_3$ both show intermolecule hydrogen bonding but are different.

Reason :In $NaHCO_3$ the HCO_3 ions are linked togather through intermolecular hydrogen bond into an inflate chain white in

$KHCO_3HCO_3^-$ ions form dimerics anions through intermolecular hydrogen bonds.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: A

Watch Video Solution

25. Assertion : Elemental nitrogen exist as a diatomic molecule and phospours as tetratomic molecule.

Reason :Nitrogen does not have vacant d-orbital wheras phosphorus have vacant d-orbital.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: B

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26. Statement-1 : $H_2C = C = C = CH_2$ molecule is planar.

Statement-2 : Nodal planes of all π - bonds are lying in the same plane.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 and Statement-2 both are False.

Answer: D

Watch Video Solution

27. Statement-1 : Dipole moment of H_2O is more than that of OF_2.

Statement-2 : In H_2O, the resultant bond dipole of O - H bond and the resultant lone pair moment are in opposite direction.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: C

Watch Video Solution

28. Statement-1 : Allene is a non polar molecule.

Statement-2 : Allene is non planar molecule.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: B

Watch Video Solution

29. Statement-1 : PCl_5 is covalent in gaseous and liquid state but ionic in solid state.

Statement-2 : The solid state of PCl_5 consists of tetrahderal cation and octahedral anion.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: B

Watch Video Solution

30. Assertion : H_3PO_3 is a diabasic acid.

Reason: There are two H atoms directly attached to P.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: C

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31. Statement-1 : Among chalcogens, tendency of catenation is maximum for sulphur.

Statement-2 : S - S single bond is stronger than O - O single bond.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: A

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32. Statement SO_2 can be used as reductant as well as oxidant.

Explanation The oxidation number of S in $+4$ in SO_2 which lies between its minimum (-2) and maximum $(+6)$ values.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: A

Watch Video Solution

33. Statement-1 : PH_3 and BF_3 both are electron deficient molecule.

Statement-2 : P - H bond length are identical in PH_3 and all B - F bond length are also identical in BF_3.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: D

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34. SiO_2 is solid while CO_2 is gas. Why?

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: B

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35. Assertion (A): Sodium chloride formed by the action of chlorine gas on sodium metal is a stable compound.

Reason: (R) This is because sodium and chloride ions acquire octet in sodium chloride formation.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: A

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36. Assertion (A): Though the central atom of both NH_3 and H_2O molecules are sp^3 hybridised, yet H-N-H bond angle is greater thant that

of H-O-H.

Reason(R): This is because nitrogen atom has one lone pair and oxygen atom has two lone pairs.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: A

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37. Assertion (A): Among the two O-H bonds in H_2O molecule, the energy required to break the first O-H bond and the other O-H bond is the same.

Reason (R) This is because the electronic environment around oxygen is the same even after brekage of one O-H bond.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 and Statement-2 both are False.

Answer: D

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38. Statement-1 : There is no scope of axial and equatrorial position in case of tetraheral and octahedral geometry.

Statement-2 : Both are perfect geometry in which all positions are identical.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: A

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39. Statement-1 : Glycerol is more viscous than methanol.

Statement-2 : This is due to intramolecular H-bonding.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: C

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40. Statement-1 : $F_2C = C = CF_2$ molecule is having all F-atoms in one plane.

Statement-2 : The molecule is non-polar.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: D

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41. Single N - N bond is weaker than the single P - P bond. This is because of :

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: A

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42. Statement-1 : Boric acid is a weak monobasic acid.

Statement-2 : Boric acid has only one replacable H-atom.

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

B. Statement-1 is True, Statement-2 is True, Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is True, Statement-2 is False.

D. Statement-1 is False, Statement-2 is True.

Answer: C

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Multiple Objective Type

1. In which of the following molecule, bonding is taking place in excited state?

A. CH_4

B. BF_3

C. ICI_3

D. PCl_3

Answer: A::B::C

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2. Indicate the wrong statement.

A. A sigma bond has no free rotation along its axis.

B. p-orbitals always have only sidewise overlapping.

C. s-orbitals never form π-bonds.

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

Answer: A::B::D

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3. Which of the following has more than four 90° bond angle among following?

A. PCl_5

B. SF_6

C. IF_7

D. CH_4

Answer: A::B::C

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4. Which of the following species are pyramidal in shape?

A. NH_3

B. XeO_3

C. ClF_3

D. XeF_4

Answer: A::B

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5. Hybridisation of PCl_5 solid is :

A. sp_3

B. sp^3d^2

C. sp^2

D. dsp^2

Answer: A::B

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6. From octahedral geometry of central atom which of the following shape of the molecule/species may be possible?

A. Square pyramidal

B. Square planar

C. Linear

D. Bent

Answer: A::B

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7. Which of the following species has X-O-X linkage? (X = central atom)

A. P_4O_{10}

B. $S_2O_7^{2-}$

C. $S_2O_5^{2-}$

D. S_3O_9

Answer: A::B::D

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8. $Na_2S_4O_6$ and $Na_2S_3O_6$ compounds are different in :

A. absolute oxidation state of sulphur

B. number of S-S linkage

C. average oxidation state of sulphur

D. hybridisation of central atom sulphur

Answer: B::C

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9. In which of the following X-O-X bonds are present? [X = P, S, Cr]

A. $H_4P_2O_7$

B. $H_2S_2O_7$

C. $K_2Cr_2O_7$

D. $H_2S_2O_8$

Answer: A::B::C

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10. d-orbital used by 'S' in SF_6 molecule are :

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

B. d_{xy}

C. d_{yz}

D. d_{z^2}

Answer: A::D

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11. Which of the following d-orbital participates in the hybridization of central atom in the molecule of IF_7 ?

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

B. d_{z^2}

C. d_{xy}

D. d_y

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

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12. Which have linear structure?

A. BeF_2

B. $Ag[CN]_2^-$

C. CO_2

D. XeF_2

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

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13. Correct order regarding bond angle in the following species?

A. $NH_4^+ > NH_3 > NH_2^-$ ($\overset{\Lambda}{HNH}$ bond angle)

B. $NO_2^+ > NO_3^- > NO_2^-$ ($\overset{\Lambda}{ONO}$ bond angle)

C. $OCl_2 > OF_2 > OH_2$ ($\overset{\Lambda}{XOX}$) (X = terminal atom)

D. $BCl_3 > PCl_3 > NCl_3$ ($\text{Cl}\ \overset{\Lambda}{X}\ \text{Cl}$) ($X$ = central atom)

Answer: A::B::D

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14. Which of the following has cyclic structure?

A. $H_2S_4O_6$

B. P_4O_6

C. S_3O_9

D. $H_3P_3O_9$

Answer: B::C::D

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15. In which of the following cases the number of lone pairs on central atom is two?

A. XeF_2

B. XeF_4

C. ICI_2^+

D. SO_2Cl_2

Answer: B::C

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16. The compounds having 8 or more bond angles equal to 90°, are :

A. SF_6

B. IF_7

C. BrF_5

D. XeF_6

Answer: A::B

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17. Consider the structure of $\left(CH_3COOH\right)_2$ given below : 

Select the correct option.

A. $x < y$

B. $w < z$

C. $\alpha < \beta$

D. $u = v$

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

View Text Solution

18. Which of the following have non-zero dipole moment?

A. 

B. 

C. 

D. 

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

View Text Solution

19. Select the compounds which have polyatomic anion in their solid state?

A. PCl_5

B. XeF_6

C. BrF_3

D. N_2O_5

Answer: A::C::D

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20. In which of the following all the hybrid orbitals lie at same angle to one another?

A. sp^3-tetrahedral

B. sp^3d-trigonal bipyramidal

C. sp^2-trigonal planar

D. dsp^2-square planar

Answer: A::C::D

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21. Which of the following statement is/are correct about P_4O_{10} molecule?

A. Each 'P' atom can be considered to be sp^3 hybridized

B. There are six POP bonds in the molecule

C. There are two types of P-O bond lengths

D. POP angle is 180°

Answer: A::B::C

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22. Select the correct statement.

A. Perxenate ion is $\left[XeO_6\right]^{4-}$ with octahedral geometry

B. XeF_2 is linear molecule with 3 lone pairs (l.p.)

C. $XeOF_4$, XeF_4, XeO_2F_2 all containes one lone pair only

D. In XeF_6, Xe has covalency = 7

Answer: A::B

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23. Select the correct statement.

A. XeO_2F_2 and $XeOF_4$ have same number of lone pair(s) of electrons and different structure

B. XeO_2F_2 and XeO_3F_2 have same structure and different number of lone pair(s) of electrons.

C. $XeOF_4$ and XeF_5^+ have same structure and same number of lone pair(s) of electrons.

D. XeF_4 and XeF_5^- have different structure and same number of lone pair(s) of electrons.

Answer: A::C::D

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24. Which of the following compounds contain(s) both ionic and covalent bonds?

A. NH_4Cl

B. KCN

C. $CuSO_4.5H_2O$

D. NaOH

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

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25. To which of the following species in the octet rule not applicable?

A. BrF_5

B. SF_6

C. IF_7

D. CO_2

Answer: A::B::C

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26. In which on the following, molecules central atom involves expansion of octet?

A. PCl_5

B. SO_4^{2-}

C. NO_3^-

D. ClO_3^-

Answer: A::B::D

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27. Which statement is correct about hybridisation?

A. In hybridisation, orbitals take part.

B. In hybridisation, electrons take part.

C. In hybridisation, fully filled, half filled or empty orbitals can take part.

D. Hybridized orbitals only contains bond pair electron.

Answer: A::C

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28. Which is true about OF_2 and Cl_2O?

A. Both have sp^3 hybridized oxygen.

B. Bond angle in OF_2 less than $109^\circ 28'$.

C. Bond angle in Cl_2O is greater than $109^\circ 28$.

D. Bond angle in both cases are $109^\circ 28'$.

Answer: A::B::C

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29. The halogen form compounds among themselves with formula XX', XX'_3, XX'_5 and XX'_7 where X is the heavier halogen. Which of the following pairs representing their structures and being polar and non-polar are correct?

A. XX' - Linear-polar

B. $XX_3^{'}$ - T-shaped-polar

C. $XX_5^{'}$ - Square pyramidal-polar

D. $XX_7^{'}$ - Pentagonal bipyramidal-non-polar

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

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30. Which is true about NH_2^-, NH_3, NH_4^+ ?

A. Hybridization of N is same

B. No. of lone pair of electron on N are same

C. Molecular geometry (i.e., shape) is different

D. Bond angle is same

Answer: A::C

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31. Which is/are in linear shape?

A. NO_2^+

B. XeF_2

C. I_3^-

D. I_3^+

Answer: A::B::C

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32. Which combination of the compounds and their geometry / shape are correct?

A. $HgCl_2$ - Linear

B. XeF_5^+ - Square pyramidal

C. ClF_3 - T - shaped

D. ICl_4^-, Square-planar

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

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33. Incorrect order about bond angle is :

A. $H_2O > H_2S > H_2Se > H_2Te$

B. $C_2H_2 > C_2H_4 > CH_4 > NH_3$

C. $SF_6 < NH_3 < H_2O < OF_2$

D. $ClO_2 > H_2O > H_2S > SF_6$

Answer: A::B::D

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34. Which is(are) true about VSEPR theory?

A. Lone pair-lone pair repulsion is maximum

B. Lone pair and double bond occupy equatorial position in trigonal bipyramidal structure

C. More electronegative atom occupies axial position in trigonal bipyramidal structure

D. Bigger atom occupy axial positions in trigonal bipyramidal structure

Answer: A::B::C

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35. Identify the correct option(s).

A. $NH_4^+ > NH_3 > NH_2^-$ [order of bond angle]

B. $\left(CH_3\right)_3B$ is a trigonal planar molecule (not considering the H-atom on 'C')

C. In NH_4Cl, $'N'$ atom is in sp^3d hybridisation

D. In S_8 molecule, a total of 16 electrons are left on all the 'S' atoms after bonding

Answer: A::B

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36. Which of the following is / are correct statement(s) for dipole moment?

A. Lone pair of electrons present on central atom can give rise to dipole moment

B. Dipole moment is a vecter quantity

C. CO_2 molecule has non-zero dipole moment

D. Different in electrongativity of combining atoms can also lead to dipole moment

Answer: A::B::D

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37. Which of the following are significantly polar ?

A. XeF_4

B. XeF_6

C. $XeOF_4$

D. XeF_5^-

Answer: C

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38. Which of the following statements are correctly matched with their geometries according to the VSEPR theory?

A. BrF_6^+ → octahedral

B. $SnCl_5^-$ → trigonal bipyramidal

C. ClF_2^- → linear

D. IF_4^+ → see-saw

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

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39. Which of the following statements is/are true about the structure of fullerene (Buckminster fullerene) ?

A. All the carbon atoms undergo sp^2 hybridization.

B. Remianing fourth electron at each carbon is delocalised in molecular orbvitals which in turn gives aromatic character to molecule.

C. It has a shape like rugby ball.

D. It contains both single and double bonds and has two C - C distances of 143.5 pm and 138.3 pm respectively.

Answer: A::B::D

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40. Which of the following statements are true for P_4S_3 molecule?

A. It contains six P - S bonds and three P - P bonds

B. It contains six P - S bonds and ten lone pairs

C. It has all atoms sp^3 hybridised

D. It contains six P - P bonds and ten lone pairs

Answer: A::B::C

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41. $p\pi$ - $d\pi$ bonding occurs between oxygen and :

A. phosphorus in P_4O_{10}

B. xenon in XeO_2F_2

C. nitrogen in N_2O_2

D. sulphur in SO_2

Answer: A::B::D

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42. Species in which sulphur has sp^3 hybridisation?

A. SF_4

B. SCl_2

C. SO_4^{2-}

D. H_2S

Answer: B::C

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43. Hypervalent compound is (are) :

A. SO_3^{2-}

B. PO_4^{3-}

C. SO_4^{2-}

D. ClO_4

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

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44. Which of the following statements is /are correct for polythionic acid series?

A. The average oxidation state of S-atom increases with decrease in number of S-atoms.

B. The absolute oxidation state of S-atoms increases with decrease in number of S-atoms.

C. The average oxidation state of S-atom decreases with increase in number of S-atoms.

D. The absolute oxidation state of S-atoms remains same with increase or decrease in number of S-atoms.

Answer: A::C::D

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45. The molecule is/are having N - N bond:

A. N_2O

B. N_2O_3 (unsymm).

C. N_2O_5

D. N_2O_4

Answer: A::B::D

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46. Which molecular geometry are most likely to result, from an octahedral electron geometry?

A. Square planar

B. Square pyramidal

C. Linear

D. V-shaped

Answer: A::B

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47. Which of the following oxyacid/oxysalt/compound contains peroxy linkage?

A. H_2SO_5

B. $Na_2S_2O_7$

C. $Na_2S_2O_8$

D. CrO_5

Answer: A::C::D

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48. Select the correct Lewis dot representation.

A. 

B. 

C. 

D. 

Answer: A::B::C

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49. Which of the following molecules do not follow octet rule?

A. AsF_5

B. BeH_2

C. SF_6

D. BCl_3

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

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50. Select the correct statements.

A. Octet theory does not account for the shape of molecule.

B. It does not explain the relative stability of the molecules being totally silent about the energy of molecule.

C. Octet theory account for the shape of molecule.

D. Octet theory can not be used on hypervalent molecule.

Answer: A::B::D

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51. Define the types of hybridisation of central atom for AX_3 molecule if dipole moment value, $\mu \neq 0$:

A. sp^3

B. sp^2

C. sp^3d

D. sp^3d^2

Answer: A::C

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52. Consider two hydrogen atoms A and B approaching each other having nuclei N_A and N_B and electrons present in them are represented by e_A and e_B. Select the correct statements.

A. When the two atoms are at large distance from each other there is no interaction between them.

B. Attractive forces exist betweeen nucleus of one atom and its own electron that is N_A - e_A and N_B - e_B.

C. Attractive forces arise between nucleus of one atom and electron of other atom that is N_A - e_B and N_B - e_A.

D. Similarly repulsive forces arise between electron of two atoms like e_A - e_B nuclei of two atoms N_A - N_B.

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

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53. Which of the following molecules have coordinate bond in it's Lewis structure?

A. NH_4^+

B. BF_4^-

C. BeF_4^{2-}

D. CO

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

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54. Which of the following molecules are hypovalent in nature?

A. $AlCl_3$

B. BeF_2

C. BF_3

D. AlF_3

Answer: A::B::C

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55. Select the correct statements :

A. C - O bond length of CO molecule is higher than the C - O bond length of CO_2

B. C - O bond length of CO molecule is lower than the C - O bond length of CO_2

C. N - O bond length of NO_3^- molecule is higher than the N - O bond length of NO_2^-

D. N - O bond length of NO_3^- molecule is lower than the N - O bond length of NO_2^-

Answer: B::C

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56. Which of the following property have been changed when all the oxygen atoms are replaced by fluorine atoms from XeO_3 without changing the covalency of xenon?

A. Oxidation state of xenon

B. Total number of lone pairs

C. Hybridisation of Xe in molecule

D. Shape of molecule

Answer: A::C::D

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57. Which of the following are correct characteristics for hybrid orbitals?

A. It is a single lobe orbital.

B. % p-charcter will remain same for similar type of hybrid orbitals.

C. With increase in % s-character, the length of the orbital decreases.

D. Shape of hybrid orbital determines the shape of the molecule.

Answer: B::C

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58. In which of the following process(es) hybridisation of underlined atom does not change?

A. $\underline{N}H_3 + BF_3 \rightarrow H_3N.BF_3$

B. $\underline{Si}F_4 + 2F^- \rightarrow \left[SiF_6\right]^{2-}$

C. 

D. $H_3\underline{B}O_3 \xrightarrow{OH^-} \left[B(OH)_4\right]^-$

Answer: A::C

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59. Select correct statements out of following.

A. Hybrid orbitals formed by the s and p_x orbitals may lie in XY plane or XZ plane.

B. Maximum distance between hybrid orbitals will present in sp^2 hybridisation out of sp, sp^2, sp^3 hybridisation.

C. Lone pair and bond pair occupy different volume around central atom.

D. Central atom is always more electronegative than surrounding atoms in a molecule.

Answer: A::C

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60. Which of the following molecule is /are planar?

A. CH_2Cl_2

B. $B_3N_3H_6$

C. SO_3

D. NF_3

Answer: B::C

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61. Which of the following d-orbital(s) participate in the hybridisation for Xe in the cationic part of $XeF_6(s)$?

A. d_{xy}

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

C. d_{z^2}

D. d_{y^2}

Answer: B::C

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62. Which of the following ion pairs are incorrect for the given substance?

A. $PBr_5(s): \left[PBr_4\right]^+ \left[PBr_6\right]^-$

B. $N_2O_4(s): \left[NO_2\right]^+ \left[NO_2\right]^-$

C. $XeF_6(s): \left[XeF_5\right]^+ \left[XeF_7\right]^-$

D. Common salt : $[Na]^+[Cl]^-$

Answer: A::B

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63. Which of the following statements are incorrect regarding HPO_3^{2-} ion?

A. All HPO bond angles are identical due to resonance

B. All bond lengths are identical due to resonance

C. All bond angles are identical due to resonance

D. All OPO bond angles are identical due to resonance

Answer: B::C

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64. Which of the following statement(s) is/are correct?

A. Between the layers of graphite van der Waal's forces are present.

B. Graphite is thermally more stable than diamond.

C. $S_5O_6^{2-}$ has cyclic structure.

D. C - C bond length is greater in diamond than graphite.

Answer: A::B::D

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65. d_{z^2} orbital is used in hybridisation of :

A. $PCl_5(g)$

B. Cationic part of $PCl_5(s)$

C. Anionic part of $PCl_5(s)$

D. $PCl_3(g)$

Answer: A::C

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66. Which of the following molecule is /are planar?

A. CH_2Cl_2

B. $B_3N_3H_6$

C. SO(3)

D. NF_3

Answer: B::C

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67. Which of the following molecules have bent shape?

[Where A is central atom, B is surrounding atom and E is lone pair]

A. AB_2E_2

B. AB_2E

C. AB_3E

D. AB_2

Answer: A::B

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68. In which of the following compound/ions the $d\pi$ - $p\pi$ is not present?

A. N_3^-

B. NO_2^+

C. SO_2

D. HPO_3^{2-}

Answer: A::B

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69. Which of the following molecule(s) is / are having see-saw geometry?

A. $TeBr_4$

B. BrF_5

C. XeO_2F_2

D. $SeCl_4$

Answer: A::C::D

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70. Which of the following statement is incorrect?

A. XeF_6 has perfect octahedral strucuture

B. XeF_2 and XeF_4 are non polar

C. XeF_2 and XeF_4 are planar

D. XeF_5^- does not exist

Answer: A::D

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71. Which of the following molecule is polar (i.e., has permanent dipole moment)?

A. $H_2C = C = CF_2$

B. $H_2C = C = C = CF_2$

C. $Cl - \overset{H}{\underset{H}{C}} - Cl$

D. SO_2

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

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72. Which of the following closest bond angle order(s) is/are correct?

A. $OSO : SO_3^{2-} < SO_4^{2-}$

B. $FIF\left(IF_5\right) = FXeF\left(XeF_4\right)$

C. $OCO\left(CO_3^{2-}\right) = ONO\left(NO_3^{-}\right)$

D. $FCF\left(CF_3^{-}\right) < \mathrm{ClCCl}\left(\mathrm{CCl}_3^{-}\right)$

Answer: A::C::D

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73. Which of the following bond angle order is/are correct in the following pair?

A. $OF_2 < OCl_2$

B. $Ocl_2 < OBr_2$

C. $H_2S > H_2O$

D. $NF_3 < NCl_3$

Answer: A::B::D

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74. Structure of FXeN $\left(SO_2F\right)_2$ (pale yellow solid) and $FXeOSO_2$ are given below :

Select the correct statements. (It is observed that geometry of nitrogen is planar with respect to its surrounding atom)

A. Maximum seven atoms may lie in one plane in structure (I)

B. 10 atom are sp^3 hybridized in structure (I)

C. 9d-orbitals are involved in bonding in structure (I)

D. S - O bond length of (II) is similar than S - N bond length in (I)

Answer: A::D

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

A. $SO_4^{2-} = NO_3^- = I_3^- = XeF_5^-$ (dipole moment)

B. $p\pi$ - $d\pi$ bond is present in both $POCl_3$ and XeO_3

C. MnO is a basic oxide

D. $HClO_4 > HClO_3 > HClO_2$(acidic strength)

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

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76. If in an allene system, nodal plane of first π - bond and last π-bond are in same plane then select the correct statement.

A. Allene will be non-planar

B. Allene will be planar

C. Total no. of π-bonds will be in odd number

D. Total no. of carbons in allene will be in even number

Answer: B::C::D

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77. An element M forms three types of compounds with fluorine :

Compound (i) polar with complete octet

Compound (ii) polar with expanded octet

Compound (iii) non-polar with expanded octet then element 'M' can't be :

A. P

B. S

C. Xe

D. O

Answer: A::C::D

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78. Select the correct statements.

A. 2nd period element can't form more than four covalent bonds

B. All oxyacids of 'S' has basicity two generally

C. Hybrid orbitals of diamond have more s-character than the hybrid orbitals of graphite

D. Number of covalent bonds formed by a single phosphorus is more in black phosphorus than the white phosphorus

Answer: A::B

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79. Out of two tetrahedral molecules 'X' and 'Y', molecule 'X' has more dipole moment than molecule 'Y', then, select the correct statement.

A. Molecule 'X' must have at least one lone pair

B. Molecule 'Y' can't have zero dipole moment

C. At least one bond angle of molecule 'X' will not be equal to the $109^{\circ}28'$

D. Molecule 'X' can't have perfect tetrahedral molecular geometry

Answer: C::D

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80. Select the correct order.

A. Graphite = fullerene lt diamond (no. of carbon atoms connected per carbon atom with covalent bond only)

B. NaF lt KCl lt RbBr (electrical conductance in aqueous solution)

C. NaF lt MgO lt AlN (lattice energy)

D. $Li^{+}(g) > Mg^{2+}(g) > Be^{2+}(g)$ (hydration enegty)

Answer: A::B::C

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81. Which of the following order is / are incorrect for bond angle?

A. $NH_3 < PH_3 < AsH_3 < SbH_3$

B. $OF_2 < OCl_2 < OBr_2 > H_2O$

C. $BF_3 < BCl_3 < BBr_3 < BI_3$

D. $NO_2^{+} > NO_2^{-} > NO_3^{-}$

Answer: A::C

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82. Which of the following property is / are associated with hydrogen bonding?

A. Slippery nature of graphite

B. Dimerization of CH_3COOH in vapour phase

C. Viscous nature of glycerol

D. Cage like structure of ice

Answer: B::C::D

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83. Which of the following molecules have following :

ionic bond, covalent σ-bond, covalent π-bond ?

A. CaC_2

B. NH_4Cl

C. NH_4NO_3

D. CH_3CN

Answer: A::C

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84. The formal charges possible on three N-atoms in N_3^- molecule is / are : [If N atoms are connected in the sequence N - N - N]

A. $0, +1, -2$

B. $-1, 0, -1$

C. $-1, +1, -1$

D. $-2, +1, 0$

Answer: A::C::D

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85. In the reaction

$NH_3 + BF_3 \rightarrow NH_3 \cdot BF_3$ (Adduct)

Choose the correct statement.

A. Hybridisaton of 'N' in NH_3 changes in adduct

B. Hybridisation of 'N' in adduct is sp^3

C. Here, NH_3 is acting as a Lewis base while BF_3 as a Lewis acid

D. Hybridisation of 'B' in BF_3 changes in adduct

Answer: B::C::D

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86. The correct order of bond angles (smallest first) in H_2S, NH_3, BF_3 and SiH_4 is

A. $NH_3 > H_2S$

B. $BF_3 > SiH_4$

C. $SiH_4 > H_2S$

D. $SiH_4 > NH_3$

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

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87. In which of the following molecules/ions, all bonds are equal?

A. XeF_4

B. BF_4^-

C. SF_4

D. SiF_4

Answer: A::B::D

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88. Select the correct order sequence(s).

A. C - C bond length : 

B. Order of dipole moment : $CO > NH_3$

C. Boiling point : $AsH_3 > NH_3$

D. Bond order of M - O bond (M = central atom) : $CO_3^{2-} > PO_4^{-3}$

Answer: A::D

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89. Which of the following statement is correct for $C_3N_3\left(N_3\right)_3$ (cyanuric triazide)?

A. All carbon and nitrogen atoms are sp^2 hybridised

B. All carbon and nitrogen atoms are in same plance

C. All carbon atoms are sp^2 hybridised

D. Nitrogen atoms which are present in ring, sp^2 hybridised

Answer: B::C::D

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90. Which of the following compound does not consist of inter molecular hydrogen bonding?

A. Chloral hydrate

B. o-chloro phenol

C. o-hydroxy benzaldehyde

D. Acetic acid (liquid)

Answer: A::B::C

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91. Which molecule(s) has the maximum % p-character in the central atom hybridisation?

A. NH_3

B. SF_4

C. PCl_5

D. OF_2

Answer: A::D

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92. Which of the following molecule(s) is/are having sp^3d^2 hybridisation for their central atom?

A. $TeCl_6$

B. XeF_4

C. SF_4

D. XeF_5^+

Answer: A::B::D

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

A. The central carbon atom 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 formation of two separate π-bonds.

D. C_3H_4 is a planar molecule.

Answer: A::B::C

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94. Structure of $Na_2\left[B_4O_5OH\right)_4\Big] \cdot 8H_2O$ contains :

A. two triangular and two tetrahedral units of boron

B. three triangular and one tetrahedral units of boron

C. four identical B - O - B linkages

D. one peroxy linkage

Answer: A::C

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95. P in PCl_5 has sp^3d-hybridisation which of the following statements are correct about PCl_5 structure?

A. All P - Cl bond lengths are identical.

B. Two P - Cl bonds are axial and longer than three P - Cl equatorial bonds.

C. PCl_5 has trigonal bipyramidal geometry with non-polar nature.

D. PCl_5 decomposes into PCl_3 and Cl_2 on heating.

Answer: B::C::D

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96. Which of the following are non-polar?

A. SiF_4

B. XeF_4

C. SF_4

D. BF_3

Answer: A::B::D

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97. Which of the following is not a preferred resonating structure for azide ion N_3^- ?

A. 

B. $\left[:\ddot{N}_{..} - N \equiv N:\right]^-$

C. $\left[:N \equiv N - \ddot{N}_{..}:\right]^-$

D. $\left[:\ddot{N} = N = \ddot{N}:\right]^-$

Answer: B::C::D

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98. Which of the following structures are planar?

A. XeF_4

B. Icl_2^-

C. ClF_3

D. ICl_4^-

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

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99. In which of the following molecules $p\pi$ - $d\pi$ bonds are not present?

A. SO_4^{-2}

B. PO_4^{3-}

C. NO_3^-

D. ClO_4^-

Answer: A::B::D

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100. Which of the following attain the linear structure ?

A. $BeCl_2$

B. NCO^-

C. NO_2

D. CS_2

Answer: A::B::D

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101. CO is isoelectronic with

A. NO^+

B. N_2

C. $SnCl_2$

D. NO_2^-

Answer: A::B

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102. Which of the following species have the same shape?

A. CO_2

B. CCl_4

C. O_3

D. NO_2^-

Answer: A::B

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103. Which of the following statements are correct about CO_3^{2-} ?

A. The hybridisation of central atom is sp^3.

B. Its resonance structure has one C - O single bond and two $C = O$ double bonds.

C. The average formal charge on each oxygen atom is 0.67 units.

D. All C - O bond lengths are equal

Answer: C::D

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104. Which of the following statements are incorrect ?

A. $NaCl$ being an ionic compound is a good conductor of electricity in the solid state.

B. In canonical structures, there is a difference in the arrangement of atoms.

C. Hybrid orbitals form stronger bonds than pure orbitals.

D. VSEPR theory can explain the square planar geometry of XeF_4.

Answer: A::B

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105. Select oxyacid(s) which must have P - H, P - OH and P = O linkage(s) in its structure.

A. H_3PO_3

B. H_3PO_4

C. $H_4P_2O_5$

D. $H_4P_2O_7$

Answer: A::C

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106. Which of following statements are incorrect?

A. X^+ ion is smaller than X^- ion

B. o-nitrophenol has low volatility as compared to m-nitrophenol

C. Dipole moment of OF_2 is greater than H_2O

D. Dipole moment measurement can confirm the shape of the AX_4 molecule

Answer: B::C::D

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107. In which of following molecule/species all angles between adjacent atoms are identical.

A. SF_6

B. NCl_3

C. XeF_5^-

D. SeF_4

Answer: A::B::C

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108. Choose the incorrect match :

	Name	Formula
(a)	Sodium hydrogen pyrophosphate	$Na_2H_2P_2O_7$
(b)	Sodium phosphite	$NaPO_3$
(c)	Ammonium isohypophosphate	$\left(NH_4\right)_3HP_2O_6$
(d)	Sodium manganate	$NaMnO_4$

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109. Some azides are very pure source of nitrogen Identify all the azides.

A. $Ba\left(N_3\right)_2$

B. NaN_3

C. Mg_3N_2

D. Na_3N

Answer: A::B

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110. Which of the following elements can show covalency greater than 4?

A. Be

B. P

C. S

D. B

Answer: B::C

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111. Find the imposible overlapping if z-axis is considered to be intermolecular axis :

A. $s + p_x$

B. $p_z + d_{z^2}$

C. $s + p_z$

D. $d_{x^2-y^2} + d_{z^2}$

Answer: A::D

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Comperhension Type-1

1. Element 'A' having 5 electrons in its valence shell and principle quantum number value for last electron is 3. The 'ic' acid of element 'A' is tribasic acid and its corresponding salts is known as 'atc' salt. The 'ous acid' 'A' is dibasic acid and its corresponding salts is known as 'its' salts.

["For example : The salt of sulphuric acid is sulphate salt " and the salt of sulfurous acid is sulphite salt]

$2 \times$ ' ic' acid of 'A' -H_2O='x'

How many σ bonds are present in 'x'?

A. 10

B. 12

C. 8

D. None of these

Answer: B

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Comperhension Type

1. Element 'A' having 5 electrons in its valence shell and principle quantum number value for last electron is 3. The 'ic' acid of element 'A' is tribasic acid and its corresponding salts is known as 'atc' salt. The 'ous acid' 'A' is

dibasic acid and its corresponding salts is known as 'its' salts.

["For example : The salt of sulphuric acid is sulphate salt " and the salt of sulfurous acid is sulphite salt]

$n \times$ ' ic' acid 'A' - $H_2O = (y)_n$, if n = 3

How many atoms are sp^3 hybridised in 'y' ?

A. 9

B. 10

C. 3

D. 12

Answer: A

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2. Element 'A' having 5 electrons in its valence shell and principle quantum number value for last electron is 3. The 'ic' acid of element 'A' is tribasic acid and its corresponding salts is known as 'atc' salt. The 'ous acid' 'A' is dibasic acid and its corresponding salts is known as 'its' salts.

["For example : The salt of sulphuric acid is sulphate salt " and the salt of sulfurous acid is sulphite salt]

'x' - one oxygen atom = 'z' How many A - A bonds are present in 'z'?

A. 2

B. 1

C. 3

D. 4

Answer: B

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3. A, B, C, and D four compounds.

$'A'$ - $H_2O \rightarrow 'B' \quad 2 \times 'A'$ - $H_2O \rightarrow 'C'$

$C + 'O' \rightarrow 'D' \quad A$ - $'O' \rightarrow H_3PO_3$

'O' is oxygen.

How many P - O - P linkage are present in hexameric form of compound 'B' ?

A. 5

B. 0

C. 6

D. 7

Answer: C

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4. (a) Extent of overlapping $\propto$ strength of chemical bond.

(b) Extent of overlapping depends on two factors :

(i) Nature of orbitals - p, d and f are directional orbitals $\rightarrow$ more overlapping s-orbitals $\rightarrow$ non directional - less overlapping

(ii) Nature of overlapping - *Co*-axial overlapping - extent of overlapping more

Colateral overlapping - extent of overlapping less

order of strength of Co-axial overlapping : p - $p > s$ - $p > s$ - s

The correct order of bond strength of σ bond is :

It two atoms approach each other along x-axis then σ-bond is not formed by :

A. s and p_x

B. p_x and p_x

C. p_y and p_y

D. s and s

Answer: C

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5. Polar covalent molecules exhibit dipole moment. Dipole moment is equal to the product of charge separation, q and the bond length d for the bond. Unit of dipole moment is Debye. One Debye is equal to 10^{-18} esu-cm.

Dipole moment is a vector quantity. It has both magnitude and direction. Hence, dipole moment of a molecule depends upon the relative

orientation of the bond dipoles, but not on the polarity of bonds alone. A symmetrical structure shows zero dipole moment. Thus, dipole moment helps to predict the geometry of a molecules. Dipole moment values can be used to disinguisd between cis- and trans- isomers, ortho-, meta - and para - forms of a substance, etc.

Which of the following pair of species have same diple moment value?

A. 

B. 

C. 

D. Both (a) and (c)

Answer: D

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6. Polar covalent molecules exhibit dipole moment. Dipole moment is equal to the product of charge separation, q and the bond length d for the bond. Unit of dipole moment is Debye. One Debye is equal to 10^{-18}

esu-cm.

Dipole moment is a vector quantity. It has both magnitude and direction. Hence, dipole moment of a molecule depends upon the relative orientation of the bond dipoles, but not on the polarity of bonds alone. A symmetrical structure shows zero dipole moment. Thus, dipole moment helps to predict the geometry of a molecules. Dipole moment values can be used to disinguisd between cis- and trans- isomers, ortho-, meta - and para - forms of a substance, etc.

The dipole moment value of H - X molecule is 1.2 Debye. If the internuclear distance between H - X is 0.8Å then the $\%$ ionic character in H - X molecules is :

A. $31.25\ \%$

B. $50\ \%$

C. $14\ \%$

D. $25\ \%$

Answer: A

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7. Consider the following oxoacids of phosphorus : H_3PO_4, H_3PO_3 and H_3PO_2. All 'P' atoms in the oxoaxids and oxoanions are 4 corrdinate and contain at least one P = O unit. All 'P' atoms in oxoacids have at least one P - OH group which ionises to give H^+ ion. The oxidation state of 'P' is $+5$ only when it is directly attached to 4 oxygen atoms. For every two units decrease in oxidation state of Phosphorus, there is one P - H bond.

The number of acidic hydrogens present in one formula unit of each of NaH_2PO_4, NaH_2PO_3 and NaH_2PO_2 are respectively:

A. 0, 1 and 2

B. 1, 0 and 2

C. 2, 1 and 0

D. 2, 0 and 1

Answer: C

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8. Compound 'X'is 'ic' acid of sulphur (S) :

Note : 'S' stands for Sulphur and 'O' stands for oxygen.

How many S - O - S linkages are present in the strucutre of compound 'I'?

A. 1

B. 2

C. 0

D. 4

Answer: C

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9. Compound 'X'is 'ic' acid of sulphur (S) :

Note : 'S' stands for Sulphur and 'O' stands for oxygen.

Which of the following option is correct? [T for True and F for False]

(P) In the trimer form of 'H' six $p\pi$ - $d\pi$ bonds are preset.

(Q) X and trimer form of 'H' have same type of hybridisation with respect to central atom.

(R) In the trimer form of 'H' six S - S linkages are present.

(S) X and H are planar compound.

A. TTTF

B. TTFF

C. TFTF

D. FTFT

Answer: B

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10. Acids containing oxygen are called oxyacids. Prefix 'Pyro's is used when two units of a parent acid condense together with removal of one water molecule. When one of a parent acid on an average loses a water

molecule producing an acid having at least one acidic hydrogen, the resulting acids is called meta -acid

$2H_2SO_4 - H_2O \rightarrow X$

A. X has one $S - O - S$ linkage

B. X has two $p\pi - d\pi$ bonds

C. Both (a) and (b) are correct

D. X is meta acid

Answer: C

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11. Acids containing oxygen are called oxyacids. Prefix 'Pyro's is used when two units of a parent acid condense together with removal of one water molecule. When one of a parent acid on an average loses a water molecule producing an acid having at least one acidic hydrogen, the resulting acids is called meta -acid

$H_4P_2O_8$ has

A. One P - O - P linkage

B. P - P linkage

C. P - O - O - P linkage

D. P - H bond

Answer: C

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12. An element has 6 electrons in its valence shell and the principal quantum number of last electron is 3. Its trioxide when combines with water gives acid (A). Answer the following questions :

A - 'Oxygen' $\rightarrow$ Y

$2Y$ - H_2O $\rightarrow$ Z

How many S - O - S bonds are present in Z?

A. 0

B. 1

C. 2

D. 3

Answer: A

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13. An element has 6 electrons in its valence shell and the principal quantum number of last electron is 3. Its trioxide when combines with water gives acid (A). Answer the following questions :

$A + \text{'Oxygen'} \rightarrow B$

What is the sum of oxidation state of central atom and number of π bonds present in B?

A. 7

B. 8

C. 6

D. 10

Answer: B

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14. Spin pairing and overlapping theory cannot explain the equal bond length as well as equal bond angles in CH_4 molecule. To explain the above facts we are in need of hybridization theory. Hybridization is the mixing of atomic orbitals of comparable energy and the numbe of atomic orbitals involved is equal to the number of hybrid orbitals formed of equal energy.

The number of axial and equatorial positions in trigonal bipyramidal geometry having sp^3d hybridizaton are respectively :

A. 2, 4

B. 4, 2

C. 3, 3

D. 2, 3

Answer: D

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15. Spin pairing and overlapping theory cannot explain the equal bond length as well as equal bond angles in CH_4 molecule. To explain the above facts we are in need of hybridization theory. Hybridization is the mixing of atomic orbitals of comparable energy and the numbe of atomic orbitals involved is equal to the number of hybrid orbitals formed of equal energy.

Increasing order of the energy of hybrid orbitals is :

A. $sp^3 < sp^2 < sp$

B. $sp^2 < sp^3 < sp$

C. $sp < sp^3 < sp^2$

D. $sp < sp^2 < sp^3$

Answer: D

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16. The trigonal bipyramidal is not a regular shape since the bond angles are not all the same. It therefore follows that the corners are not equivalent in ClF_3 molecule. Lone pairs occupy two of the corners, and F atoms occupy the other three corners. These different arrangements are theoretically possible, as shown in figure below.

(a) The most stable structure will be the one of lowest energy, that is the one with the minimum repulsions between the five orbitals. The greatest repulsions occurs between two lone pairs. Lone pair-bond pair repulsions are next strongest, and bond pair-bond pair repulsions the weakest.

A rule of thumb can be theorised, that the position having minimum repulsion amongst them are occupied at equatorial points. Therefore (3) structure is right.

(b) Since double bond occupies more space compared to single bond therefore it will prefer equatorial position.

(c) More electronegative element will occupy axial position in case of trigonal bipyramidal geometry.

(d) In case of sp^3d^2 hybridization lone pairs should be placed opposite to each other because all the corners are identical.

The shape of SF_5^- can be :

A. I only

B. I and II pnly

C. IV only

D. I, II and III

Answer: D

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17. The trigonal bipyramidal is not a regular shape since the bond angles are not all the same. It therefore follows that the corners are not equivalent in ClF_3 molecule. Lone pairs occupy two of the corners, and F

atoms occupy the other three corners. These different arrangements are theoretically possible, as shown in figure below.

(a) The most stable structure will be the one of lowest energy, that is the one with the minimum repulsions between the five orbitals. The greatest repulsions occurs between two lone pairs. Lone pair-bond pair repulsions are next strongest, and bond pair-bond pair repulsions the weakest.

A rule of thumb can be theorised, that the position having minimum repulsion amongst them are occupied at equatorial points. Therefore (3) structure is right.

(b) Since double bond occupies more space compared to single bond therefore it will prefer equatorial position.

(c) More electronegative element will occupy axial position in case of trigonal bipyramidal geometry.

(d) In case of sp^3d^2 hybridization lone pairs should be placed opposite to each other because all the corners are identical.

Actual shape of the molecule BrF_5 is similar to the molecule:

A. PCl_5

B. XeF_4

C. PCl_4^+

D. none of these

Answer: D

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18. Chemical bonding between two atoms is necessarily associated with an electrical moment arising out of the difference in electroegativity of two atoms. This means that every bond carries with it an electrical moment called the "bond moment". The dipole moment of a molecule is really the vectorial sum of the individual bond moment present in it. To compute the dipole moment it is necessary to find out the values of various bond moment. In the following table, dipole moment of different bonds are as given.

	$\rightarrow$	$\rightarrow$	$\rightarrow$
Bond	H - C	C - Cl	$C = 0$
Bond moments	$0.4D$	$1.5D$	$2.5D$

The group moments of few groups as given

Group	NO_2	OH	CN	CH_3
Direction of dipole	Towards N	Towards O	Towards N	Away from CH_3
Dipole moment	$4D$	$1.6D$	$3.8D$	$0.4D$

In CH_3CCl_3 (I), $CHCl_3(II)$ and $CH_3Cl(III)$ the normal tetragedral bond angle is maintained. Also given $\cos 70.5^\circ = \frac{1}{3}$. Therefore dipole moments of the given compounds are : (given due to $-I$ effect of Cl. The bond moment of H - C bond directed towards the H in $CHCl_3$)

A. I = 1.9D, II = 1.9 D, III = 1.7 D

B. I = 1.9 D, II = 1.7D, III = 1.9D

C. I = 1.9 D, II = 1.7 D, III = 1.7 D

D. I = 1.9 D, II = 1.1D, III = 1.9 D

Answer: D

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19. Chemical bonding between two atoms is necessarily associated with an electrical moment arising out of the difference in electroegativity of two atoms. This means that every bond carries with it an electrical moment called the "bond moment". The dipole moment of a molecule is really the vectorial sum of the individual bond moment present in it. To compute the dipole moment it is necessary to find out the values of various bond moment. In the following table, dipole moment of different bonds are as given.

Bond	$\overrightarrow{H\text{-}C}$	$\overrightarrow{C\text{-}Cl}$	$\overrightarrow{C=0}$
Bond moments	$0.4D$	$1.5D$	$2.5D$

The group moments of few groups as given

Group	NO_2	OH	CN	CH_3
Direction of dipole	Towards N	Towards O	Towards N	Away from CH_3
Dipole moment	$4D$	$1.6D$	$3.8D$	$0.4D$

In the acetone molecule considering the normal planar structure, the observed dipole moment of acetone molecule is :

A. 2.9 D

B. 2.75 D

C. 3 D

D. none of these

Answer: A

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20. The approximate shape of a molecule can often be predicted by using what is called the valence-shell electron-pair repulsion (VSEPR) model. Electrons in bonds and in lone pairs can be thought of a "charge cloud" that repel one another nad stay as far apart as possible, thus causing molecules to assume specific shapes.

The repulsive interactions of electron pairs decrease in the order:

`Lone pair - Lone pair gt Lone pair - Bond pair gt Bond pair - Bond pair

These repulsive effects result in deviations from idealised shapes and alteration in bond angles in molecules.

Which of the following statement is correct with respect ot bond angles?

A. The F - S - F angle in SF_2 is more than $109^\circ 28'$

B. The H - N - N angle in N_2H_2 is approximately 180°

C. The F - Kr - F angle in KrF_4 is 90°

D. The Cl - N - O angle in NOCl is more than 120°

Answer: C

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21. The approximate shape of a molecule can often be predicted by using what is called the valence-shell electron-pair repulsion (VSEPR) model. Electrons in bonds and in lone pairs can be thought of a "charge cloud" that repel one another nad stay as far apart as possible, thus causing molecules to assume specific shapes.

The repulsive interactions of electron pairs decrease in the order:

Lone pair - Lone pair gt Lone pair - Bond pair gt Bond pair - Bond pair

These repulsive effects result in deviations from idealised shapes and alteration in bond angles in molecules.

Molecular shape of XeF_3^+, SF_3^+ and CF_3^+ are :

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

B. Different with 2, 1 and 0 lone pair of electrons respectively

C. Different with 0, 1 and 2 lone pair of electrons respectively

D. The same with 2,0 and 1 lone pair of leectrons respectively

Answer: B

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22. The approximate shape of a molecule can often be predicted by using what is called the valence-shell electron-pair repulsion (VSEPR) model. Electrons in bonds and in lone pairs can be thought of a "charge cloud" that repel one another nad stay as far apart as possible, thus causing molecules to assume specific shapes.

The repulsive interactions of electron pairs decrease in the order:

Lone pair - Lone pair gt Lone pair - Bond pair gt Bond pair - Bond pair

These repulsive effects result in deviations from idealised shapes and alteration in bond angles in molecules.

Which of the following statements is incorrect?

A. In ClF_3, the axial Cl - F bond length is longer than equatorial Cl - F bond length

B. In SF_4, F - S - F equatorial bond angle is not 120° but 104° due to lp-bp repulsions.

C. In $\left[ICl_4\right]^-$ Cl - I - Cl bond angle is 90°

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

Answer: D

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23. The approximate shape of a molecule can often be predicted by using what is called the valence-shell electron-pair repulsion (VSEPR) model. Electrons in bonds and in lone pairs can be thought of a "charge cloud" that repel one another nad stay as far apart as possible, thus causing molecules to assume specific shapes.

The repulsive interactions of electron pairs decrease in the order:

Lone pair - Lone pair gt Lone pair - Bond pair gt Bond pair - Bond pair

These repulsive effects result in deviations from idealised shapes and alteration in bond angles in molecules.

Which among the following molecules have sp^3d hybridization with one lone pair of electron on the central atom?

(P) SF_4

(Q) $\left[PCl_4\right]^+$

(R) XeO_2F_2

(S) $ClOF_3$

A. P, Q and R only

B. P, R and S only

C. P and Q only

D. Q and R only

Answer: B

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24. Hybridization is a concept of mixing or merging of orbitals of same atom with slight differences in energies to redistribute their energies and give new orbitals of equivalent energy called 'Hybrid Orbitals'. Hybridisation is a hypothetical concept and never actually exists.

One should not be confused by a common misconception that hybridization is responsible for particular geometry. Geometry of a molecule is decided by energy factor not by hybridization. It is the orbital (which may be half filled, completely filled or empty) that undergoes hybridization and not the electron. The bond angles in hybridised orbitals are influenced by presence of lone pair, presence of multiple bonds, presence of one electron and electronegativity of atom.

An increase in s-character of hybridised orbitals results in decrease in size of orbitals. This results in decrease in bond length and increase in energy.

Among the following which have the same molecular geometry?

(P) I_3^-

(Q) XeF_4

(R) BrF_4^-

(S) XeO_2F_2

A. P, Q and S only

B. P, Q, R and S

C. P, Q and R only

D. Q, R and S only

Answer: C

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25. Hybridization is a concept of mixing or merging of orbitals of same atom with slight differences in energies to redistribute their energies and give new orbitals of equivalent energy called 'Hybrid Orbitals'. Hybridisation is a hypothetical concept and never actually exists.

One should not be confused by a common misconception that hybridization is responsible for particular geometry. Geometry of a molecule is decided by energy factor not by hybridization. It is the orbital (which may be half filled, completely filled or empty) that undergoes hybridization and not the electron. The bond angles in hybridised orbitals

are influenced by presence of lone pair, presence of multiple bonds, presence of one electron and electronegativity of atom.

An increase in s-character of hybridised orbitals results in decrease in size of orbitals. This results in decrease in bond length and increase in energy.

Which of the following statement is not true?

A. O - F bond length in OF_2 is less than O - F bond length in O_2F_2

B. In HCO_3^-, all C - O bond lengths are not identical

C. In diborane, two different B - H bond lengths are observed although the hybridization of both boron atoms are same.

D. In hydrazine, the N - N bond length is larger than normal N - N bond length.

Answer: D

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26. Oxyacids are the compounds in which they have at least one X - OH bond where X is generally a non-metal. Consider the acids having general formula $H_2S_2O_y$ where y lies between 3 to 7 having even values only.

Total number of S - OH bonds in the compounds is :

A. y - 1

B. $y + 1$

C. 2

D. none of these

Answer: C

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27. Oxyacids are acids that generally contain at least one X - OH bond (where X is generally a non-metal).

(P) one removal of one mole of water produces (Q)

(P)An oxyacid $- H_2O \rightarrow$ (Q)An oxyacid

Which of the following will not follow the above process?

A. H_3BO_3

B. H_2SO_4

C. H_3PO_2

D. Both (b) and (c)

Answer: D

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28. Oxyacids are acids that generally contain at least one $X - OH$ bond (where X is generally a non-metal).

Oxyacid which has same number of $X - H$ and $X - OH$ bonds is (where X is central atom) :

A. $H_2S_2O_6$

B. $H_4P_2O_5$

C. $H_4P_2O_6$

D. $H_2S_2O_8$

Answer: B

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29. Oxiacid are compounds in which X - OH bond is present where X is a non-metal generally.

For which of the following oxyacids all hydrogen atoms are not replaceable in nature?

A. H_2SO_4

B. H_2CO_3

C. H_3PO_3

D. H_3PO_4

Answer: C

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30. The formal charge of an atom in a polyatomic molecule or ion may be defined as the difference between the number of valence electrons of that atom in an isolated or free state and the number of electrons assigned to that atom in the Lewis structure. It is expressed as :

$$\begin{bmatrix}\text{Formal charge [F.C]}\\ \text{on an atom in a Lewis}\\ \text{structure}\end{bmatrix} = \begin{bmatrix}\text{Total number of valence}\\ \text{electrons in the free}\\ \text{atom}\end{bmatrix}$$

$$- \begin{bmatrix}\text{Total number of non-}\\ \text{bonding (lone pair)}\\ \text{electrons}\end{bmatrix} - \left(\frac{1}{2}\right)\begin{bmatrix}\text{Total number of}\\ \text{bonding shared}\\ \text{electrons}\end{bmatrix}$$

Select correct feature about CO_3^{2-} carbonate ion in one of the Lewis structure based on the presence of two single bonds and one double bond between carbon and oxygen atoms.

A. Total number of lone pairs = 8

B. Formal charge on two oxygen = -1 and one oxygen = zero

C. Oxidation number of $C = +4$ and formal charge on C = zero

D. All are correct

Answer: D

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31. 

What is the difference between the oxidation state of phosphorous atom in (A) and (C) ?

A. 0

B. 1

C. 2

D. Can't be predicted

Answer: A

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32. The hydrogen atoms connected in the form of -OH bonds with central atom in an oxyacid is called acidic hydrogen, Oxyacid contains at least one acidic hydrogen.

Number of moles of NaOH required for the complete neutralisation of one mole of acid is maximum for :

A. $H_2S_2O_7$

B. H_3PO_2

C. H_3PO_4

D. $H_4P_2O_5$

Answer: C

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33. Oxyacids are the compounds of hydrogen, oxygen and generally a non-metal in which X - O - H linkage is present.

In which at the following pair(s) $X - O - X$ linkage is present in both species?

A. $\left(Si_2O_7^{6-}, P_2O_7^{4-}\right)$

B. $\left(Cl_2O_6, Cl_2O_7\right)$

C. $\left(S_2O_5^{2-}, S_2O_8^{2-}\right)$

D. $\left(P_4O_{10}, S_3O_9\right)$

Answer: A::D

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34. Hydrogen bond is weak type of electrostatic force, in which hydrogen is connected between two more electronegative elements.

Hydrogen bonding is not responsible for formation of which of the following compound in given form?

A. $CH_4(s)$

B. Ice

C. $HCl(s)$

D. Both (a) and (c)

Answer: D

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35. An allene compound C_nH_y, has three nodal planes of π - bond in the molecular plane.

The value of $(n + y)$ is :

A. 8

B. 10

C. 12

D. 9

Answer: B

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36. The degree of polarity of a covalent bond is given by the dipole moment (μ).

Identify the incorrect order of dipole moment in the following.

A. $NH_3 > NF_3$

B. $CH_3F < CH_3Cl$

C. $HF > HCl$

D. 

Answer: D

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37. Different types of bond are formed in the chemical compound. These bond have different strength and bond energies associated with them. These bond are formed with atoms in different enviroments.

Which of the following overlaping is involved in formation of only σ bond

A. s-p overlapping

B. p-d overlapping

C. d-d overlapping

D. p-p overlapping

Answer: A

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38. Different types of bond are formed in the chemical compound. These bond have different strength and bond energies associated with them. These bond are formed with atoms in different enviroments.

Which of the following hydrides is thermally least stale ?

A. H_2O

B. H_2Te

C. H_2S

D. H_2Se

Answer: B

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39. The molecule in which central atom is associated with more than 8 electrons is known as hypervalent molecule and less than 8 electrons is known as hypovalent molecule.

Which of the following molecule is not having $d\pi$ - $p\pi$ bonding?

A. SO_2

B. P_4O_{10}

C. PO_4^{-3}

D. $B_3N_3H_6$

Answer: D

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40. The molecule in which central atom is associated with more than 8 electrons is known as hypervalent molecule and less than 8 electrons is known as hypovalent molecule.

Which of the following compound does not follow the octet rule?

A. N_2O_5

B. CH_4

C. BeF_4^{2-}

D. PCl_5

Answer: D

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41. The electronic configuration ofhte elements. A, B and C are given below. Answer the question from 14 to 17 on the basis of these configuration.

$A \quad 1s^2 \quad 2s^2 \quad 2p^6$

$B \quad 1s^2 \quad 2s^2 \quad 2p^6 \quad 3s^2 \quad 3p^3$

$C \quad 1s^2 \quad 2s^2 \quad 2p^6 \quad 3s^2 \quad 3p^5$

Stable form of C may be represented by the formula

A. C

B. C_2

C. C_3

D. C_4

Answer: B

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42. The electronic configuration ofhte elements. A, B and C are given below. Answer the question from 14 to 17 on the basis of these configuration.

$A \quad 1s^2 \quad 2s^2 \quad 2p^6$

$B \quad 1s^2 \quad 2s^2 \quad 2p^6 \quad 3s^2 \quad 3p^3$

$C \quad 1s^2 \quad 2s^2 \quad 2p^6 \quad 3s^2 \quad 3p^5$

The molecular formula of the compound formed from B and C will be

A. BC

B. B_2C

C. BC_2

D. BC_3

Answer: D

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43. The electronic configuration ofhte elements. A, B and C are given below. Answer the question from 14 to 17 on the basis of these configuration.

$A \quad 1s^2 \quad 2s^2 \quad 2p^6$

$B \quad 1s^2 \quad 2s^2 \quad 2p^6 \quad 3s^2 \quad 3p^3$、

$C \quad 1s^2 \quad 2s^2 \quad 2p^6 \quad 3s^2 \quad 3p^5$

The bond between B and C will be

A. ionic

B. covalent

C. hydrogen

D. co-ordinate

Answer: B

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44. Read the following short write-up and answer the questions at the end of it.

In certain polar solvents PCl_5 undergoes an ionisation reaction in which Cl^- ion leaves one PCl_5 molecule and attach itself to another.

$2PCl_5 \rightarrow PCl_4^+ + PCl_6^-$

Number of lone pairs around phosphorus in PCl_5, PCl_4^+ and PCl_6^- are respectively :

A. 0, 1, 2

B. 0, 0, 0

C. 1, 2, 3

D. 0, 2, 1

Answer: B

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45. Hybridisation is the mixing of atomic orbital of comparable energy and the number of hybrid orbitals formed is equal to the number of pure atomic orbitals mixed up and hybrid orbitals are occupied by σ-bond pair and lone pair.

"The hybrid orbitals are at at angle of X° to one another". This statement is not valid for which of the following hybridisation?

A. sp^3

B. sp^2

C. sp^3d^2

D. sp

Answer: C

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Comperhension Type-2

1. A, B, C, and D four compounds.

$'A' - H_2O \rightarrow 'B' \quad 2 \times 'A' - H_2O \rightarrow 'C'$

$C + 'O' \rightarrow 'D' \quad A - 'O' \rightarrow H_3PO_3$

'O' is oxygen.

Oxidation state of central atom in compound 'C'?

A. $+5$

B. $+4$

C. $+3$

D. 0

Answer: A

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Comperhension Type-3

1. (a) Extent of overlapping $\propto$ strength of chemical bond.

(b) Extent of overlapping depends on two factors :

(i) Nature of orbitals - p, d and f are directional orbitals $\rightarrow$ more overlapping s-orbitals $\rightarrow$ non directional - less overlapping

(ii) Nature of overlapping - *Co*-axial overlapping - extent of overlapping more

Colateral overlapping - extent of overlapping less

order of strength of Co-axial overlapping : p - p > s - p > s - s

The correct order of bond strength of σ bond is :

The correct order of bond strength of σ bond is :

A. $1s$ - $1s$ > $1s$ - $2p_x$ > $2p_x$ - $2p_x$

B. $2p$ - $2p$ > $1s$ - $2p$ > $1s$ - $1s$

C. $2p$ - $2p$ = $1s$ - $2p$ = $1s$ - $1s$

D. Cant's be predicted

Answer: A

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Comperhension Type-4

1. Polar covalent molecules exhibit dipole moment. Dipole moment is equal to the product of charge separation, q and the bond length d for the bond. Unit of dipole moment is Debye. One Debye is equal to 10^{-18} esu-cm.

Dipole moment is a vector quantity. It has both magnitude and direction. Hence, dipole moment of a molecule depends upon the relative orientation of the bond dipoles, but not on the polarity of bonds alone. A symmetrical structure shows zero dipole moment. Thus, dipole moment helps to predict the geometry of a molecules. Dipole moment values can be used to disinguisd between cis- and trans- isomers, ortho-, meta - and para - forms of a substance, etc.

Among the following, which is a type of non-planar as well as non-polar compound?

A. $H_2C = C = CH_2$

B. ClF_3

C. XeF_4

D. PF_3Cl_2

Answer: A

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Comperhension Type-5

1. The number of P - H bonds (s) in H_3PO_2, H_3PO_3 and H_3PO_4, respectively, is

A. 0, 1 and 2

B. 1, 0 and 2

C. 2, 1 and 0

D. 0, 2 and 1

Answer: A

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Comperhension Type-6

1. Compound 'X'is 'ic' acid of sulphur (S) :

Note : 'S' stands for Sulphur and 'O' stands for oxygen.

Which of the following pair of oxyacid have same basicity ?

A. X and B

B. B and I

C. X and E

D. All of these

Answer: D

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Comperhension Type-7

1. Acids containing oxygen are called oxyacids. Prefix 'Pyro's is used when two units of a parent acid condense together with removal of one water molecule. When one of a parent acid on an average loses a water molecule producing an acid having at least one acidic hydrogen, the resulting acids is called meta -acid

Which of the following is correct for $H_3P_3O_9$?

A. Three P - O - P bonds are present in it.

B. Oxidation state of P is $+5$.

C. Three $p\pi$ - $d\pi$ bonds are present in it.

D. All of the above

Answer: D

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Comperhension Type-8

1. An element has 6 electrons in its valence shell and the principal quantum number of last electron is 3. Its trioxide when combines with water gives acid (A). Answer the following questions :

$2 \times A$ - H_2O + "Oxygen" $\rightarrow$ $'X'$

How may σ bonds are present in 'X'?

A. 11

B. 13

C. 7

D. 5

Answer: A

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Comperhension Type-9

1. Spin pairing and overlapping theory cannot explain the equal bond length as well as equal bond angles in CH_4 molecule. To explain the above facts we are in need of hybridization theory. Hybridization is the mixing of atomic orbitals of comparable energy and the numbe of atomic orbitals involved is equal to the number of hybrid orbitals formed of equal energy.

According to hybridization theory, the $\%\, s$ character in sp^3 hybrid orbitals is :

A. $25\ \%$

B. $33.33\ \%$

C. $20\ \%$

D. $16.66\ \%$

Answer: A

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Comperhension Type-10

1. The trigonal bipyramidal is not a regular shape since the bond angles are not all the same. It therefore follows that the corners are not equivalent in ClF_3 molecule. Lone pairs occupy two of the corners, and F atoms occupy the other three corners. These different arrangements are theoretically possible, as shown in figure below.

(a) The most stable structure will be the one of lowest energy, that is the one with the minimum repulsions between the five orbitals. The greatest repulsions occurs between two lone pairs. Lone pair- bond pair repulsions are next strongest, and bond pair-bond pair repulsions the weakest.

A rule of thumb can be theorised, that the position having minimum

repulsion amongst them are occupied at equatorial points. Therefore (3) structure is right.

(b) Since double bond occupies more space compared to single bond therefore it will prefer equatorial position.

(c) More electronegative element will occupy axial position in case of trigonal bipyramidal geometry.

(d) In case of sp^3d^2 hybridization lone pairs should be placed opposite to each other because all the corners are identical.

Geometry (i.e., arrangement of electron pairs around central atom) of $ClOF_3$ is similar to the :

A. XeF_4

B. $SOCl_2$

C. I_3^-

D. ClO_4^-

Answer: C

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Comperhension Type-11

1. Chemical bonding between two atoms is necessarily associated with an electrical moment arising out of the difference in electroegativity of two atoms. This means that every bond carries with it an electrical moment called the "bond moment". The dipole moment of a molecule is really the vectorial sum of the individual bond moment present in it. To compute the dipole moment it is necessary to find out the values of various bond moment. In the following table, dipole moment of different bonds are as given.

Bond	$\overrightarrow{H\text{-}C}$	$\overrightarrow{C\text{-}Cl}$	$\overrightarrow{C=0}$
Bond moments	$0.4D$	$1.5D$	$2.5D$

The group moments of few groups as given

Group	NO_2	OH	CN	CH_3
Direction of dipole	Towards N	Towards O	Towards N	Away from CH_3
Dipole moment	$4D$	$1.6D$	$3.8D$	$0.4D$

The bond angle in H_2S is 97° and its dipole moment is 1.5 D. The S - H bond distance is 0.15 nm. Therefore, approximate percentrage ionic cjaracter pf S - H bond is (neglect the effect of dipole moment of lone

pair on sulphur atom in H_2S).

(Given : $\left[\cos 97^\circ = -0.121 \text{ and } \sqrt{0.88} = 0.94\right]$)

A. 32 %

B. 16 %

C. 84 %

D. 10 %

Answer: B

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Comperhension Type-12

1. The approximate shape of a molecule can often be predicted by using what is called the valence-shell electron-pair repulsion (VSEPR) model. Electrons in bonds and in lone pairs can be thought of a "charge cloud" that repel one another nad stay as far apart as possible, thus causing

molecules to assume specific shapes.

The repulsive interactions of electron pairs decrease in the order:

Lone pair - Lone pair gt Lone pair - Bond pair gt Bond pair - Bond pair

These repulsive effects result in deviations from idealised shapes and alteration in bond angles in molecules.

Among the following molecules.

(P) XeO_3 (Q)$XeOF_4$

(R) XeO_2F_2 (S)XeF_5

Those having different molecular geometry but same number of lone pairs on Xe are :

A. P, Q and R only

B. P, Q and S only

C. Q. R and S only

D. P, Q, R and S

Answer: D

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Comperhension Type-13

1. Hybridization is a concept of mixing or merging of orbitals of same atom with slight differences in energies to redistribute their energies and give new orbitals of equivalent energy called 'Hybrid Orbitals'. Hybridisation is a hypothetical concept and never actually exists.

One should not be confused by a common misconception that hybridization is responsible for particular geometry. Geometry of a molecule is decided by energy factor not by hybridization. It is the orbital (which may be half filled, completely filled or empty) that undergoes hybridization and not the electron. The bond angles in hybridised orbitals are influenced by presence of lone pair, presence of multiple bonds, presence of one electron and electronegativity of atom.

An increase in s-character of hybridised orbitals results in decrease in size of orbitals. This results in decrease in bond length and increase in energy.

Which of the following statements is true?

A. The state of hybridization of boron and oxygen atoms in boric acid are sp^3 and sp^2 respectively.

B. NH_3 and $\left[BF_4^-\right]$ have same bond angles of $109^\circ 28'$

C. SF_6 and PF_6^- both have undistorted octahedral structures.

D. The hybridization of P in P_4 molecules is the same as in S in SO_3 molecule.

Answer: C

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Comperhension Type-14

1. Oxyacids are the compounds in which they have at least one X - OH bond where X is generally a non-metal. Consider the acids having general formula $H_2S_2O_y$ where y lies between 3 to 7 having even values only.

Total number of oxygen atoms connected directly with sulphur atoms only is :

A. $y + 2$

B. $y - 2$

C. y

D. $\frac{y - 2}{2}$

Answer: C

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Comperhension Type-15

1. Compound which is not an oxyacid is :

A. $B(OH)_3$

B. H_3PO_3

C. $Mg(OH)_2$

D. $HClO_2$

Answer: C

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Comperhension Type-16

1. Oxiacid are compounds in which X - OH bond is present where X is a non-metal generally.

Which of the following oxy-salt does not exist?

A. Sodium hydrogen phosphate

B. Sodium hydrogen hypophosphite

C. Potassium hydrogen sulphite

D. Sodium metaborate

Answer: B

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Comperhension Type-17

1. The formal charge of an atom in a polyatomic molecule or ion may be defined as the difference between the number of valence electrons of that atom in an isolated or free state and the number of electrons assigned to that atom in the Lewis structure. It is expressed as :

$$\begin{bmatrix}\text{Formal charge [F.C]}\\ \text{on an atom in a Lewis}\\ \text{structure}\end{bmatrix} = \begin{bmatrix}\text{Total number of valence}\\ \text{electrons in the free}\\ \text{atom}\end{bmatrix}$$

$$- \begin{bmatrix}\text{Total number of non-}\\ \text{bonding (lone pair)}\\ \text{electrons}\end{bmatrix} - \left(\frac{1}{2}\right)\begin{bmatrix}\text{Total number of}\\ \text{bonding shared}\\ \text{electrons}\end{bmatrix}$$

Find the formula charge on "O" atom in given structure (I) and (II) respectively:

(I) $: \overset{\cdot\cdot}{O}\ldots - C \equiv N:$ (II) $: O\ldots = C = N:$

A. $-1, -1$

B. $-2, 0$

C. $-1, 0$

D. $0, -1$

Answer: C

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Comperhension Type-18

1. 

Metaphosphoric acid exists in polymeric form as $\left(HPO_3\right)_n$, then predict the number of P - O - P linkage in metaphosphoric acid if $(n > 2)$.

A. n

B. $(n - 1)$

C. $(n + 1)$

D. Can't be predicted

Answer: A

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Comperhension Type-19

1. The hydrogen atoms connected in the form of $-OH$ bonds with central atom in an oxyacid is called acidic hydrogen, Oxyacid contains at least one acidic hydrogen.

Select the oxyacid in which number of atoms having maximum oxidation state are highest among the given molecules.

A. $H_4P_2O_6$

B. $H_4P_2O_8$

C. $H_6P_6O_{18}$

D. $H_2S_2O_6$

Answer: C

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Comperhension Type-20

1. Oxyacids are the compounds of hydrogen, oxygen and generally a non-metal in which X - O - H linkage is present.

In which of the following oxyacid(s) X - O - H linkage is not present?

A. H_2SO_5

B. H_3PO_5

C. $HClO_4$

D. HNO_4

Answer: D

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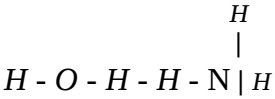
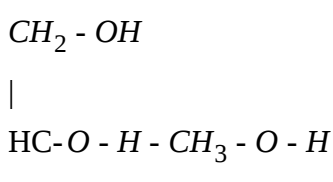
Comperhension Type-21

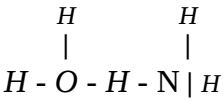
1. Hydrogen bond is weak type of electrostatic force, in which hydrogen is connected between two more electronegative elements.

Select the correct representation of H-bonding :

A. 

B. 

C. 

D. 

Answer: D

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Comperhension Type-22

1. An allene compound C_nH_y, has three nodal planes of π - bond in the molecular plane.

Which statement is correct about the given allene?

A. Nodal planes of two π - bonds will be present in a plane that do not contain σ-bond's electron density.

B. Allene is non-planar.

C. First and last carbon are in different plane.

D. Total five π-bonds are present in the molecule.

Answer: D

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Comperhension Type-23

1. The degree of polarity of a covalent bond is given by the dipole moment (μ).

Which of the following chemical species is non-polar?

A. PF_2Cl_3

B. NH_3

C. $SeCl_4$

D. CH_2Cl_2

Answer: A

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Comperhension Type-24

1. Different types of bond are formed in the chemical compound. These bond have different strength and bond energies associated with them. These bond are formed with atoms in different enviroments.

Which of the following bond has highest bond energy ?

A. σ-bond

B. π-bond

C. Hydrogen bond

D. none of these

Answer: A

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Comperhension Type-25

1. The molecule in which central atom is associated with more than 8 electrons is known as hypervalent molecule and less than 8 electrons is known as hypovalent molecule.

Which of the following ion has complete octet as well as inert gas configuration?

A. B^{+3}

B. Al^{+3}

C. Ga^{+3}

D. Ge^{+4}

Answer: B

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Comperhension Type-26

1. The electronic configuration ofhte elements. A, B and C are given below.

Answer the question from 14 to 17 on the basis of these configuration.

$A \quad 1s^2 \quad 2s^2 \quad 2p^6$

$B \quad 1s^2 \quad 2s^2 \quad 2p^6 \quad 3s^2 \quad 3p^3$

$C \quad 1s^2 \quad 2s^2 \quad 2p^6 \quad 3s^2 \quad 3p^5$

Stable form of A may be represented by the formula.

A. A

B. A_2

C. A_3

D. A_4

Answer: A

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Comperhension Type-27

1. Read the following short write-up and answer the questions at the end of it.

In certain polar solvents PCl_5 undergoes an ionisation reaction in which Cl^- ion leaves one PCl_5 molecule and attach itself to another.

$2PCl_5 \rightarrow PCl_4^+ + PCl_6^-$

Select incorrect statement(s).

A. PCl_5 has sp^3d^2 hybridisation

B. Hybridisation changes from sp^3d to sp^3d^2 in $\left(PCl_6^-\right)$ and to sp^3 in $\left(PCl_4^+\right)$

C. Structure changes from trigonal bipyramidal to tetrahedral in $\left(PCl_4^+\right)$ and octahedral in $\left(PCl_6^-\right)$

D. ClPCl (in PCl_4^+) $<$ ClPCl (largest angle in PCl_6^-)

Answer: A

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Comperhension Type-28

1. Hybridisation is the mixing of atomic orbital of comparable energy and the number of hybrid orbitals formed is equal to the number of pure atomic orbitals mixed up and hybrid are occupied by σ-bond pair and lone pair.

Which of the following geometry is most likely to not form from sp^3d hybridisation of the central atom.

A. Linear

B. Tetrahedral

C. T-Shaped

D. See-Saw

Answer: B

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Match the Column Type

1. Match the following columns :

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2. Match the following columns :

View Text Solution

3. Match the following columns :

View Text Solution

4. Match the following columns :

View Text Solution

5. Match the following columns :

View Text Solution

6. Match the following columns :

View Text Solution

7. Match the following lists :

View Text Solution

8. Match the following lists :

View Text Solution

9. Match the following columns :

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Subjective Type

1. The gaseous potassium chloride molecule has a measured dipole moment of $10.0D$, which indicates that it is a very polar molecule. The

separation between the nuclei in this molecule is 2.67×10^{-8}cm. Calculate the percentage ionic character in KCl molecule.

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2. Find out the ratio of sigma and π - bond in $C_2(CN)_4$.

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3. Number of lone pairs of electrons in P_4 molecule = ...

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4. How many of the following molecules do not contain peroxide linkage?

$H_2S_2O_5$, H_2SO_5, $H_2S_2O_8$, $H_4P_2O_8$, H_3PO_5, $H_2S_2O_6$

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5. How many $109^{\circ}28'$ bond angles in CH_4 molecules?

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6. Find the number of $p\pi$ - $d\pi$ bonds in N_2O.

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7. Find the total number of polar molecules

$SF_4, PCl_5, PCl_3F_2, SF_6, XeF_2, NO_2^+, BF_2Cl, BF_3, PF_3Cl_2$

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8. Find the number of molecules having two Ione pair of electrons on central atom.

$I_3^+, XeF_2, XeF_4, H_2O, NH_2^-, H_2S, H_2SO_4, NF_3$

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9. Find the number of species having more than 4 bond angles.

CH_4, CCl_4, $CHCl_3$, XeF_6, XeF_4, CO_2, SO_2, $SOCl_2$, $POCl_3$

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10. Find the sum of number of excited state in each molecule during the formation of the following.

SO_3, CH_4, OF_2, SF_2, XeF_4, $POCl_3$

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11. Find the number of sp^3d hybridised species.

$[XeF_4]^{2+}$ $[ClF_4]^{+}$

$[SF_5]^{+}$ $[IF_2]^{-}$

$[SiF_5]^{-}$ $[XeF_2]$

$[SF_2]^{2-}$ $[PF_2]^{3-}$

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12. Find the number of acids which have tetrahedral shape w.r.t. central atom.

$H_3PO_4, H_2SO_4, H_3PO_3, H_3PO_2, H_3BO_3, HClO_4, HClO_3, H_2CO_3$

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13. Find the number of compounds having zero dipole moment :

$BF_3, CCl_4, XeF_6, SF_6, PCl_2F_3, PClF_4, CHCl_3, HF, SO_3, SO_2$

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14. Calculate $p\pi$ - $d\pi$ bonds present in SO_4^{2-}, NO_3^- and trimer of SO_3.

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15. 2 moles of sulphuric acid $\xrightarrow{-H_2O}$ $'X'$ $\xrightarrow{[O]}$ $'Y'$.

Calculate the difference between oxidation state of sulphur in between compounds 'X' and 'Y'.

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16. How many molecules have two lone pairs on the central atom ?

$H_2O, SF_4, I_3^-, XeF_5^-, XeOF_4, PCl_3, NCl_3, ClF_3, XeF_2, NO_2^-, CO_3^{2-}$

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17. Find the number of planar molecules.

(a) BF_3 (b) BCl_3

(c) CO_3^{2-} (d) SO_3

(e) NH_3 (f) NCl_3

(g) PCl_3 (h) PF_3

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18. Find the number of compounds having sp^3 hybridised central atom among the following species:

$[PCl_4]^-, [XeF_5]^-, SF_4, PCl_5, Cl_2O_6, Cl_2O_7, Cr_2O_7^{2-}, S_2O_7^{2-}, SO_2Cl_2, SOCl_2$

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19. Find the number of species having bond angle less than $109^\circ 28'$

$NH_3, PH_3, SiH_4, NH_4^+, PF_3, NH_2^-, SO_3, NO_2^+, CCl_4, H_2O, H_2S, SO_4^{2-}$

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20. How many of the elements given below use their atomic orbitals in their excited state for hybridisation forming their stable compounds with hydrogen. Coordination number of central atom is less than or equal to 4.

C, Si, N, O, P, Be

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21. Find the number of $p\pi$ - $d\pi$ bonds in $\left(NH_4\right)_2SO_4$.

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22. Find the number of molecules having peroxy linkage.

(*a*) Marshall's shell (*b*) Caro's acid

(*c*) Perchloric acid (*d*) Chloric acid

(*e*) $H_4P_2O_7$ (*f*) H_3PO_5

(*g*) K_3CrO_8 (*h*) CrO_5

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23. How may of the following molecules have a definite geometry?

$CCl_4, NH_3, CHCl_3, BF_2Cl, SO_3, SF_6, OSF_4, PCl_5, ClF_3$

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24. Select number of molecules/ions in which central atom uses its d_{z^2} orbital in hybridisation.

$XeF_6, SOF_4, NO_3^-, ClO_3^-, BrF_3, IF_4^-, COCl_2, PCl_6^-$

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25. Find the value : $\frac{\text{total number of } \sigma \text{ bond}}{\text{total number of } \pi \text{ bond}}$ for P_4O_{10}.

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26. Find the number of σ bond and lone pair respectively in hydrated borax.

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27. Find the total number of non-polar compounds among the following.

$BCl_2F, BF_3, SF_6, SOCl_2, COCl_2, B_3N_3H_6, PCl_3F_2, PF_3Cl_2$

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28. Find the total number of species which are planar.

$I_3^+, XeF_4, SF_4, C_2F_4, H_2O_2, BrF_4^-, SO_3, NOCl, ClF_3, F_2CO, XeF_5^-$

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29. Find the number of acid(s) from the following in which X - H bond is/are present? [X = central atom]

$H_3PO_2, H_5P_3O_{10}, H_4P_2O_7, H_3PO_3, H_2S_2O_6, H_4P_2O_5, H_3BO_3, H_2SO_4$

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30. Find the number of species having two $p\pi$ - $d\pi$ bonds.

$SO_2, SO_3, XeOF_4, XeO_2F_2, POCl_3, CO_3^{2-}, NO_3^-$

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31. Find the number of compounds containing X - X linkage, where 'X' is the central atom.

$Na_2S_2O_3$, $Na_2S_4O_6$, N_2O_4, N_2O_3 (unsymmetrical),

Cl_2O_7, P_4O_{10}. $H_2S_2O_8$, $H_4S_2O_7$, $H_2S_2O_5$

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32. Find the maximum number of identical bond angles in CH_2F_2, CCl_4, XeF_4 and ClF_3 respectively.

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33. If the oxoacid, $H_4P_2O_6$ contains P - O - P linkage, find the difference in oxidation state of two phosphorus atoms.

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34. $2H_3PO_4 - H_2O \xrightarrow{-[O]} X \rightarrow Y$

How many π bonds are present in Y ?

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35. Which of the following contains peroxy linkage?

$H_4P_2O_8, H_2S_2O_8, H_2SO_5, H_3PO_5, HNO_4, HClO_4, HIO_4, HClO_3$

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36. Total number of 60° bond angles present in P_4 are :

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37. How many molecules or ions have minimum two lone pairs on the central atom ?

H_2O SF_4 I_3^- XeF_5^-

XeF_4 XeO_2F_2 ClF_3 NO_3^-

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38. How many molecules or ions are linear in shape ?

$BeCl_2$ XeF_2 ClF_2^- I_3^-

I_3^+ BF_3 $SnCl_2$

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39. Find the number of species where $d_{x^2-y^2}$ orbital participate in hybridisation .

XeF_6 SF_6 IF_7 XeO_3

PCl_5 PF_5

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40. find the total numbers of compounds which contain S-S linkage.

$H_2S_2O_3, H_2S_2O_5, H_2S_4O_6, H_2S_2O_7, H_2S_2O_8, H_2S_2O_6$

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41. Find the total number of σ bonds in CCl_4 (Carbon tetra chloride).

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42. Find the total number of compounds or ions having different bond lengths between identical atoms.

$PF_2Cl_3, PF_3Cl_2, SF_4, BrF_5, SbF_5^{2-}, SF_6, IF_7$

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43. Find the total number of species having linear shape.

$C_2H_2, CO_2, SnCl_2, HgCl_2, HCN, O_3, OF_2, XeF_2$

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44. find the total number of compounds having non-zero dipole moment.

1,4-cyanobenzene,1,2-dihydroxy bezene, 1,4-dichlorobenzene,

$H_2O_2, O_2F_2, Cl_2O_2, PF_2Cl_3, PF_3Cl_2, CHCl_3, SF_6, XeF_4, NO_2, SO_2$

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45. find the total number of compounds containing X-O-X linkage. (where X is the central atom)

$N_2O_4, N_2O_5, P_4O_{10}, H_2S_2O_8, H_4P_2O_8, C_3O_2, Cr_2O_7^{2-}, Cl_2O_7, \left(HPO_3\right)_3, \left(SO_3\right)$

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46. Find the number of molecules which are planar

(a) ClF_3 (b) SF_4

(c) XeF_6 (d) XeF_2

(e) XeF_4 (f) H_2O

(g) H_2S (h) NH_3

(i) PH_3 (j) PCl_5

(k) PCl_3 (l) OCl_2

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47. Amongst the following oxygen containing species, mark those which have X - O - X linkage.

$\left(BO_2^-\right)_3, Cl_2O_7, P_4O_6, P_4O_{10}, N_2O_5, S_3, O_9, H_2S_2O_8$

The number of such species are :

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48. Find the sum of triangular BO_3 unit and BO_4 tetrahedral unit in borax.

[If your answer is $6BO_3$ unit and $3BO_4$ unit then write 6+3=9]

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49. Total number of CN^- ion that are present in ICN(liq.) {Hint : ICN(l) is the empirical formula.]

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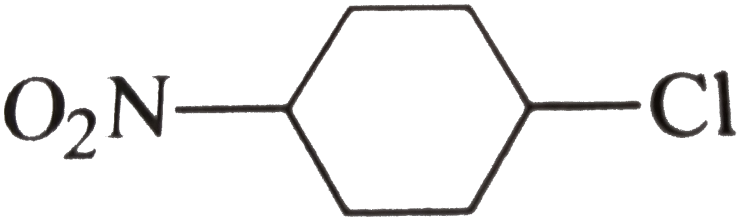
50. The dipole moment of HBr is $2.6 \times 10^{-30} Cm$ and interatomic spacing is $1.41A$ What is the percent ionic character of HBr

(b) A diatomic molecule has $\mu = 1.2D$ Its bond distance is $1.0A$ What fraction of electronic charge exists on each atom?

(c) In water, $(H - O - H)$ bond angle is 105° The distance between $(O - H)$ is $0.94A$. μ of $H_2O = 1.85D$ Determine the magnitude of the charge on the oxygen atom in water molecule and hydrogen atom

(d) BI_3 is a symmetrical planar molecule, all the $(B - 1)$ bonds lie at 120° of each other. The distance between the I atoms is 3.54 A the radius of covalently bonded I atom is $1.33A$ Estimate the covalent radius of boron

(e) Calculate the dipole moment of the following compounds



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51. Find out the total number of species containing, E - $E\left(N - \frac{N}{P} - P\right)$ linkage.

$\left(N_2O, , N_2O_3(\text{sym}),\right), \left(N_2O_4, , N_2O_5,\right), \left(H_2N_2O_2, , H_4P_2O_5,\right), \left(P_4O_6, , P_4O_{10}\right)$

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52. The number of water molecule(s) directly bonded to the metal centre in $CuSO_4.5H_2O$ is-

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53. Based on VSEPR theory, the number of 90 degree F-Br-F angles in BrF_5, is

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54. Number of peroxy linkage in a $H_2S_2O_8$ (Marshall acid) molecule is :

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55. Answer the following questons about the strucute of the dimer of phosphorous pentaoxide

(a) The number of P - O linkage which have bond length equal to 1.43Å .

(b) The number of covalent bonds which have bond length equal to 1.60Å

.

(c) The number of P - O - P linkage.

(d) The number of lone pair(s) of electrons on each phosphorous atom.

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56. Give the number of characteristic bond(s) found in the various oxy-acids of phosporous as given below.

(a) Number of P - O - P bond(s) in tricyclometaphosphoric acid.

(b) Number of P - P bond(s) in hypophosphoric acid

(c) Number of P - OH bond(s) in pyrophosphoric acid.

(d) Number of P - H bond(s) in hypophosphorous acid.

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57. For a given molecule :

$CF_2 = C = C = C = CH$ - CH_3 ltbrrgt find the maximum number of atoms which may lie in the same plane.

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58. How many cidic hydrogen is/are present in CsH_2PO_2?

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59.

Monomeric meta phosphoric acid $+H_2O\downarrow \quad (X) \xrightarrow{+[O]} (Z')2(X) \xrightarrow{-H_2O} (Y) \xrightarrow{+[O]} (Z)$

How many $'\pi'$ bonds are present in (Z') and (Z) ?

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60. Two molecules of oil of vitriol (ic-acid of sulphur) $-H_2O + O \rightarrow (X)$.

How many sp^3 hybridised atoms are present in compound (X)?

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61. Find the number of σ bond and π bonds present in Marshall's acid?

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62. The number of species which consists of sp^3d hybridised central atom for the underlined atoms in the following species/molecules is/are :

$\underline{X}eF_4, \underline{I}CI_2^{\Theta}, \underline{X}eO_3, F_2, \underline{P}Cl_4^{\oplus}, \underline{P}Cl_6^{\Theta} \underline{S}F_4, \underline{S}OF_4, \underline{X}eOF_4$

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63. The number of molecules is/are pyramidal in shape :

$XeO_3, NCl_3, ClF_3, P\left(SiH_3\right)_3, N\left(SiH_3\right)_3$

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64. Find the difference of the oxidation state of S-atoms in sodium pyrosulphite.

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65. Among the following, find the number of acid(s) which are having hypo prefix in it's name from the following.

$H_3PO_4, H_3BO_3, H_3PO_3, H_3PO_2, HClO_3, HClO, (HNO)_2, H_4P_2O_6$

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66. $P_4O_{10} \xrightarrow{2H_2O} H_4P_4O_{12} \xrightarrow{H_2O} H_6P_4O_{13} \xrightarrow{2H_2O} -2H_3PO_4H_4P_2O_7 \xrightarrow{H_2O} 2H_3PO_4$

From the above process, find the total number of P - O - P linkage in $H_6P_4O_{13}$.

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67. Find the number of dibasic oxyacids in the following:

$H_2CO_3, H_2SO_3, H_3PO_2, H_3PO_3, H_3BO_3$

Dibasic oxo-acids are H_2CO_3, H_2SO_3 and H_3PO_3.

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68. Total number of per or peroxy acids containing X - O - O - X linkage (where X is central atom)

$HClO_4, H_2N_2O_2, H_2S_2O_8, H_2SO_5, H_4P_2O_7$

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69. Number of orbitals of 3^{rd} shell that are used by central atom in hybridisation in the formation of SF_6

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70. Total number of sp^3 hybridised atom(s) in given hydrocarbon.

$\left(CH_3 - CH = CH - CH_2 - C = CH(\ |), \left(CH_3\right): \right\}$

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71. Identify the species having ionic bond as well as $p\pi$ - $d\pi$ type of bonds

$CsClO_4$, Na_2SO_4, $RbNO_3$,

SO_3, $KHCO_3$, $CaCO_3$,

$AlCl_3$

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72. Find number of planar species out of SF_2, SF_4, SF_6, SO_2, SO_3.

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73. Find the number of species in which $d\pi$ - $p\pi$ bonds are present?

ClO_3^-, PO_4^{3-}, SO_3, NO_3^-

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74. The species $\left[ML_x\right]^-$ is planar with 7 pairs of electrons around 'M' in the valence shell. The value of 'x' is :

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75. Find the number of species which have net zero dipole moment

$PCl_5, SF_4, H_2O, SnCl_2, Cl_2$

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76. Find the maximum number of plane having maximum number of atoms in CH_4.

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77. How many of the following tetraatomic molecule or ions are planar or non-planar as well as polar?

$HClO_3, B_3N_3H_6, SF_6, H_3O^+, SO_3, SnCl_3^-$

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78. Find the maximum number of planes having maximum number of all same atoms in SF_6.

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79. The maximum number of planes having maximum number of identical atoms in PCl_5 will be.

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80. Find the number of S - S linkage in polythionic acid and having formula of $H_2S_9O_6$.

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81. How may type of following bonds are present in solid $NaHSO_4$?

(a) Hydrogen bond

(b) Ionic bond

(c) $d\pi$ - $p\pi$ bond

(d) $p\pi$ - $d\pi$ bond

(e) σ-bond (sp^3 - s type of overlap)

(f) σ-bond (sp^3 - sp^2 type of overlap)

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82. Find the minimum number of identical angles in IF_7.

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83. The maximum number of $d\pi$ - $p\pi$ can be formed by Xe in its compound is :

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84. Find the number of oxide(s) which are more acidic than SO_3.

$SO_2, Cl_2O_7, P_2O_5, CaO, Al_2O_3$

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85. Find the number of non-planar and polar chemical species(s) in the following :

$SF_6, BrF_3, TeF_6, PCl_6^-, XeO_6^{4-}$

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86. FN_3 is one of the most explosive and thermally unstable covalent azide known.

$$HN_3 + F_2 \xrightarrow{\text{low pressure}} FN_3$$

Find the maximum number of atoms in one plane of FN_3.

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87. Find the total number of atoms present in a compound of xenon where oxygen and fluorines are present in $1:2$ ratio and compound is non-polar.

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88. Find the total number of statements which are incorrect?

(a) Due to hydrogen bonding HI have higher boiling point than HCl.

(b) If a molecule is planar than it will be non-polar always.

(c) Among O, Si, Cl and F, fluorine has highest I.E_1.

(d) In diamond, fullerene and graphite each carbon has equal covalency.

(e) Orbitals which are non-directional can only form pie bond.

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89. How many pairs out of following have equal number of lone pairs on central atom?

XeF_5^+, SO_2Cl_2, NH_2^-, XeF_4

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90. If in XeO_2F_2, two oxygen atoms are replaced with fluorine atoms, then, number of properties which will be changed out of following : (covalency of xenon remaining same)

(a) Geomery of molecule

(b) Bond angles

(c) Hybridisation of molecule

(d) Number of lone pairs on xenon

(e) Total number of σ bonds

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91. If x is the number of C - C sigma bonds in C_{60} (fullerene) and y is number of pentagonal rings in C_{60} then final out the value of $(x + y)$.

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92. Find the total number of compounds/species which have all the atoms in one plane.

$SOF_4, BF_3, CH_4, NH_3, CH_3^{\oplus}$

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93. Find the number of properties which are changed for the $CH_3^{\oplus} \rightarrow CH_3^{\ominus}$

(a) Hybridisation

(b) Bond angle

(c) Shape of ions

(d) Total number of electrons

(e) Total number of atoms present in an ion

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94. Total number of oxyacids in which, the central atom is in it's maximum oxidation state?

Phosphoric acid, sulphuric acid, Caro's acid, dithionic acid, Marshall's acid.

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95. Find the number of chemical species which are planar and 'd' orbital of underlined atom participate in hybridisation as well.

$\underline{S}nCl_2, \underset{3}{\underline{I}}^{-}, \underset{3}{\underline{I}}^{+}, X\underline{e}F_4 X\underline{e}F_5^{+}, \underline{I}(CN)_2^{\Theta}$

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96. Number of water molecule in $CuSO_4 \cdot 5H_2O$ which do not form coordinate bond.

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97. Find the total number of species where octet rule is not applicable.

$BrF_5, SF_6, IF_7, CO, BeCl_2, BF_3, N_2O$

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98. Count the total number of unshared electrons on $I_3^- = 3$

Count the total number of $p\pi$ - $d\pi$ bonds in $PO_4^{3-} = y$

Count the total number of lone pairs in $XeF_4 = z$

Hence, find the value of x - z - y

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99. Find the number of planar chemical species in which d_{z^2} orbital of the underlined atom participate in bonding

$\underline{O}_3, \underline{S}F_4 \underline{S}NF_4, \underline{S}OF_4, \underline{I}_3^-, \underline{I}Cl_3, Cl_3$

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100. Total number of planes in CCl_4 which contain 3 atoms in a plane where one atom is carbon.

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101. IF molecular axis is X then which of the following overlapping will form π bond?

$p_z + p_z, p_x + p_x, p_x, p_y, s + p_z, p_y + p_y$

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102. The number of $d\pi$ - $p\pi$ bonds in Lewis structure of HPO_3^{2-} is ..

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103. Out of given six species find number of species which Intramolecular Hydrogen-bonding

(a) 

(b) cis : $\begin{matrix} CH(COOH) \\ \| \\ CH\left(COO^-\right) \end{matrix}$

(c) $H_3BO_3(s)$

(d) o-nitrophenol

(e) p-hydroxybenzaldehyde

(f) Tetramethyl ammonium hydroxide

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104. Evaluate the type of hybridisaton of carbon atoms marked with star.

(a) $\overset{*}{C}H_2 = CH - \overset{*}{\underset{\underset{O}{\|}}{C}} - O - H$

(b) $CH_3 - \overset{*}{C}H_2 - OH$

(c) $CH_3 - CH_2 - \underset{\underset{O}{\|}}{\overset{*}{C}} - H$

(d) $\overset{*}{C}H_3 - CH = CH - CH_3$

(e) $CH_3 - \overset{*}{C} \equiv CH$

Number of carbon atoms of hybridisation :

Type-I = x

Type-II = y

Type-III = z

If x gt y gt z, then find xy - z

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105. $XO_n(OH)_m$ is a formula of oxyacid then find the value of (n+m) if oxyacid has basicity 5 and central atom has covalency seven.

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106. Find the ratio of sp^3 and sp^2 hybridised atoms which are present in ring in following molecule.

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107. $Xe + 2O_2F_2 \rightarrow X + 2O_2$

If X is planar compound of Xe then find the number of lone pairs on central atom of X.

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108. Hypothetical scheme is given below for one molecule of acids.

$$H_2O_2 \xrightarrow{SO_3} H_2SO_5 \xrightarrow{SO_3} (X) \downarrow \text{Peroxomonosulphuric acid} \quad H_2O_2 \xrightarrow{SO_2} H_2S_2O_3 \xrightarrow{SO_3} (Y) \downarrow \text{Thiosulphuric aci}$$

Find the sum of peroxylinkage in X,Y and Z.

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109. Find the number of ions/molecules which are isoelectronic with O_3^{2+}.

$N_2^{2-}, F_2^{2+}, NO^+, \overset{\Theta}{C}N, CO$

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110. No. of P - O - P bonds present in pentamer of cyclometaphosphoric acid are :

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111. Find the number of chemical species having P - H linkage as well as - OH linkage.

$H_4P_2O_5, H_3PO_2, H_3PO_3, H_4P_2O_7, H_4P_2O_8, H_3PO_5$

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112. Find the number of compounds of Xe which is/are associated with 180° bond angles.

$XeF_2, ICI_2^-, I_3^-, XeF_4, XeO_6^{4-}, XeO_4, XeCl_4, TeCl_4$

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113. Total number of species in which each atom is connected with ≥ 2 atoms

Diamond, Fullerene, Carborundum, Graphite

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114. Find the number of P - O - P linkages in P_4O_{10}, B - O - B linkages in $Na_2B_2O_7 \cdot 10H_2O$, Si - O - Si linkages in $H_6Si_3O_9$ and S - O - S linkages in S_3O_9 respectively.

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115. How many of the following having regular tetrahedral geometry?

CCl_4, $CHCl_3$, SO_3, SiF_4, BF_4^-, NH_3, H_2O, SiO_4^{4-}

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116. Find the total number of correct statements out of following.

(a) Orbitals having large energy difference of an element can participate in hybridisation

(b) In XeO_2F_2 all bond lengths are not identical

(c) Dipole moment of CCl_4 is more than NF_3

(d) All allotropes of carbon have same hybridisation of each carbon atom

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117. Find the number of chemical species which are planar and d_{xy} orbital of central atom participates in hybridisation :

$XeF_5^-, XeF_5^+, XeF_6, XeF_4, SF_4, ICl_4^-$

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118. Which of the following has X - O - X linkage?

(a) $H_2S_2O_6$ (b) $H_6P_6O_{18}$

(c) P_4O_{10} (d) $Na_2B_4O_5(OH)_4 \cdot 8H_2O$

(e) $Na\left[B_5O_6(OH)_4\right]$ (f) $Na_2S_2O_8$

(g) $K_2S_2O_7$ (h) $K_2Cr_2O_7$

(i) $Na_4P_2O_8$ (h) $K_2Cr_2O_7$

(i) $Na_4P_2O_8$ (j) $Na_2B_2O(OH)_6$

(k) Hypophosphoric acid (tribasic)

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119. The covalency of sulphur in second excited state will be :

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120. Following statements are given about fullerenes.

Find the number of correct statements :

(a) Fullerenes are made by the heating of graphite in an electric arc in the presence of inert gases such as helium or argon.

(b) fullerenes are the purest form of cabon because they have smooth structure, having dangling bonds.

(c) C_{8o} fullerenes have 12, five membered rings and 30-six membered rings.

(d) Fullerenes have aromatic character.

(e) In C_{60} fullerences six membered ring is fused with six of five but a five membered ring can only use fuse with six membered rings.

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