CHEMISTRY

BOOKS - P BAHADUR CHEMISTRY (HINGLISH)

CHEMICAL BONDING

Exercise

1. The energy needed for $Li_g \rightarrow Li_g^{3+} + 3e$ is $1.96 \times 10^4 kJmol^{-1}$. If the first ionisation energy of Li is $520 kJmol^{-1}$. Calcuate the second

ionisation energy of Li .

(Given : IE_1 for $H = 2.2.18 \times 10^{-18} kJ \text{atom}^{-1}$

).

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2. The first IP lithium is $5.41eV$ and electron gain enthalpy of Cl is $-3.61eV$. Calculate ΔH in $KJmol^{-1}$ for the reaction:

$Li_g + Cl_g \rightarrow Li_g^{=} + Cl_g^{-}$.

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3. You are given Avogadro's no . Of X atoms . If half of the atoms of X transfer one electron to the other half of X atoms $409kJ$ must be added . If these X^- ions are subsequently converted to X^+, and additional $733kJ$ must be added . Calculate IP and EA of X in eV Uses $\left(1eV = 1.602 \times 10^{-19}J\right.$ and $\left.N_a = 6.023 \times 10^{23}\right)$.

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4. How many Cl atosm can you ionise in the process $Cl \rightarrow Cl^{+} + e$, by the energy liberated for the process $Cl + e \rightarrow \ \rightarrow Cl^{-}$ for one Avogadro's number of atoms ? (Given : $IP = 13.0eV$ and $EA = 3.60eV$) .

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5. The elecron affinity of chlorine is $3.7eV$. How much energy in kcal is released when $2g$ chlorine is completely converted to cl^{-} ion in a gaseous

state ?

$\left(1eV = 23.06kcal\text{mol}^{-10}\right)$.

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6. Electron gain enthalpy value for oxygen is negative $(-142kJ \text{ mol } e^{-1})$ while sum of electron gain enthaplies of O and (O^{-}) respectively si positive is $\left(702kJ\text{mol}^{-1}\right)$ .Explain the reason for opposite sign for two values . Also calcularte EA_2 value .

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7. How many Cs atoms can be converted to Cs^+ ions by 1 joule energy , If IE_1 for Cs si $376kJmol^{-1}$?

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8. A mixture contains F and Cl atoms . The removal of an electron form each atom of the sample requires $28kJ$ while addition of an electron to each atom of mixture releases $68.8kJ$ energy .Calcualte the % composition of mixture .Given IE per atoms for F and Cl are

$27.91 \times 10^{-22} kJ$ and $20.77 \times 10^{-22} kJ$.

Electron gain enthaply for F and Cl are $-5.31 \times 10^{-22} kJ$ and $-5.78 \times 10^{22} kJ$ respectivley

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9. Using the data given below,predict the nature of heat changes for the reaction .

$Mg_g + 2F_g \rightarrow Mg_g^{2+} + 2F_g^-$

IE_1 and IE_2 of Mg_g are 737.7 and $451 kJ \text{mol}^{-1}$.

EA_1 for F_g is $-328 kJ \text{mol}^{-1}$.

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10. Calculate the effective nuclear charge at the periphery of nitrogen atom when an extre electron is added in the formation of anion . Also calculate the effective nuclear charge of N-atom.

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11. The IE_1 of Li is $5.4eV$ and IE_1 of H is $13.6eV$. Calculate the charge acting on the outermost electron of Li atom.

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12. Calculate electronegativity of carbon at Pauling scale Given that :

$E_{H-H} = 104.2 kcal \text{mol}^{-1} E_{C-C} = 83.1 kcal \text{mol}^{-1}$

,

$E_{C-H} = 98.8 kcal \text{mol}^{-1}.$

Electronegativity of hydrogen $= 2.1.$

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13. Electronegativity of F on Pauling scale si 4.0 Calculate its value on Mulliken scale .

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14. Calculate the electronegativity of fluorine form the following data :

$E_{H-H} = 104.2$ kcal mol^{-1}, $E_{C-C} = 83.1$ kcal mol^{-1}.

$E_{C-H} = 9.8.\ s$ kcal mol^{-1}

Electronegativity of $H = 2.1.$

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15. Ionisation paotential and electron affinity of fluorine are 17.42 and $3.45eV$ respectively

.Calculate the electronegativity of fluorine on Mulliken scale and Pauling scale .

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16. Calculate the electonegativity of silicon using Allred -Rochow method .(Covalent radius of silicoan $= 1.175\text{Å}$).

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17. Covalent radius of $._{82}Pb$ is 1.53Å. Calculate its electroneagitity at Allred -Rochow sale .

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18. Atomic radius and ionic radius of F_g and F_g^- are 72 and 136 pm prespectivley. Calculate the ratio and percentage increase in terms of volume during formation of F_g^- form F_g .

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19. Calculate the theoretical value of bond length in $H-F$, if f_H and r_F are -0.37Å respectively.

Electronegativites of F and H are 4.0 and 2.1 respectively .

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20. X_{Be} and S_{Cl} are 1.6 and 3.2 respectively. Calculate Delta H_f for $BeCl_2$ molecule .

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21. Diatomic molecule has a dipole moment of $1.2D$ If its bond 1.0Å what fraction of an electronic charge exists on each atom ? .

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22. The dipole moment of LiH is $1.964 \times 10^{29} C - m$ and the interatomic diatance between Li and H in this molceule is $1.596 Å$ .What is the per cent ionic character in LiH.

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23. Calcaulate the molecular weight of HF, if density of HFgas is $3.17 g/L$ at $300 K$ and $1.0 atm$. Comment of the result .

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24. The experimental dipole moment of water molecule is $1.84D$. Calculater the bond angle $H-O-H$ in water molecule if dispole moment of OH bond is $1.5D$.

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25. The $H-O-H$ bond angle in the water molecule is 105° , the$H-O$ bond distance being

$0.94Å$, The dipole moment for the moelcule is $1.85D$. Calculate the charge on the oxygen atom .

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26. Estimate the lattice energy of $CaCO_3$ if $r_{ca^+} = 114 \pm$ and $r_{CO_3^{2-}} = 185pm$.

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27. Suppose a gaseous mixtures of $He, NeAr$ and Kr is irradiated with photons fo frequency

appropriate to ionize Ar, What ions will be present in the mixture ?

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Exercise 2 A

1. Which of the following molecule consists of numlticentre pi-bonding ?

A. Ethene

B. Butane

C. Benzene

D. None of thes

Answer: C

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2. The hybrid state of postively charged carbon in vinyl $\left(CH_2 = CH^+\right)$ cation is :

A. sp^2

B. sp

C. sp^3

D. unpredictable

Answer: B

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3. In which of the following species the hybrid state of the central atom is same ?

A. SO_2, SO_3

B. SO_3, SO_4^{2-}

C. SO_2, SO_2^{2-}

D. CH_4HCOOH

Answer: A

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4. The correct roder of electrongativity regardig the hybrid orbitals of carbnon is :

A. $sp < sp^2 < sp^3$

B. $sp < sp^2 < sp^3$

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

D. $sp^3 < sp^2 < sp$

Answer: D

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5. A sigama-bonded moelcuar MX_3 is T-shaped .

The number of lone paris of electons around M is

:

A. zero

B. 2

C. 1

D. unpredictable

Answer: B

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6. Two ice cubse are pressed over each other and unite to form one cube . Which ofrce is responsible of holidng them togther ?

A. van der Waals forces

B. Covalent attraction

C. Hydrogen bond formation

D. Dipole -dipole attraction

Answer: C

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7. Which of the following has fractional nond order ?

A. O_2^{2+}

B. O_2^{2-}

C. $F_{2^{2-}}$

D. H_2^-

Answer: D

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8. Carbon atoms in $C_2(CN)_4$ are :

A. sp-hybridsed

B. sp^2 – hybrdised

C. sp and sp^2-hybridesed

D. sp, sp^2 and sp^3 -hubridesed

Answer: C

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9. The correct order of dipole moment is :

A. $CH_4 < NF_3 < NH_3 < H_2O$

B. $NF_3 < CH_4 < nH_3 < H_2O$

C. $NH_3 < NF_3 < CH_4 < H_2O$

D. $H_2O < NH_3 < NF_3 < CH_4$

Answer: A

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10. The bond angle in PH_3 is :

A. much lesser than NH_3

B. equal to NH_3

C. much greater than NH_3

D. slightly more than NH_3

Answer: A

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11. The bond length in O_2^+, O_2, O_2^- and O_2^{2-} follows the order :

A. $O_2^{2-} > O_2^{-1} > O_2 > O_2^+$

B. $O_2^{2-} > O_2^{-1} > O_2 > O_2^+$

C. $O_2^{2-} > O_2^{-1} > O_2 > O_2^+$

D. $O_2^{2-} > O_2^{-1} > O_2 > O_2^+$

Answer: A

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12. The species which does not show paramagetism is :

A. O^{2-}

B. O_2^+

C. O_2^{2-}

D. H_2^+

Answer: C

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13. H-B- H bond angel in BH_4^- is :

A. 180°

B. 120°

C. 109°

D. 90°

Answer: C

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14. The bond angel and hybridisation in ether (CH_3OCH_3) is :

A. $106^\circ 51, sp^3$

B. $104^\circ 31', sp^3$

C. $110^\circ, sp^3$

D. None of these

Answer: C

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15. The shape of a molecule which has 3 bond paires and one lone pair is :

A. octahedral

B. pyramidal

C. triangular planar

D. tetrahedral

Answer: B

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16. PCl_5 exists but NCl_5 does not because :

A. nitrogen has no vacant $2d-$ orbitals

B. NCl_5 is unstable

C. nitrogen atoms is much smaller than phosphorus

D. nitrogen is highly inert

Answer: A

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17. In dry ice , there are :

A. ionic bond

B. covalent bond

C. hydrogen bond

D. none of these

Answer: B

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18. Which moleucle is T-shaped ?

A. BeF_2

B. BCl_3

C. NH_3

D. ClF_3

Answer: D

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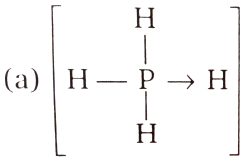
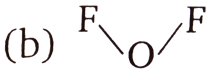
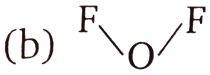
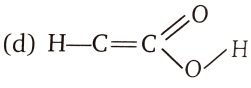
19. Which fomulae does not correctluy represents the bonding capacity of the atom involued ?

A. 

B. 

C. 

D. 

Answer: D

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20. CO_2 has the same geometry as :

A. A and C

B. B and D

C. A and D

D. C and D

Answer: C

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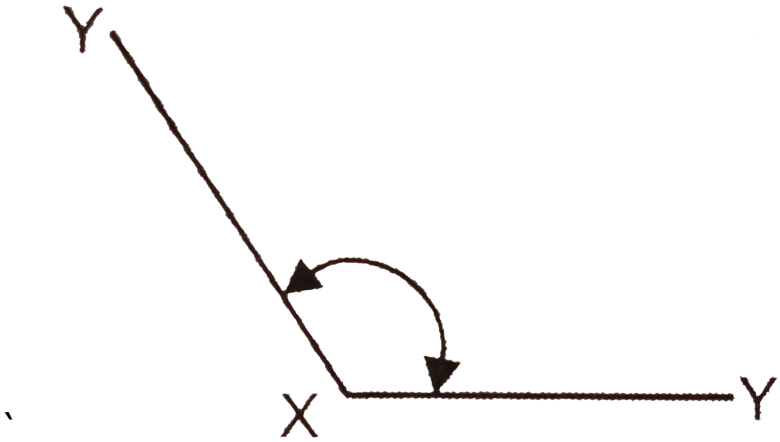
21. Which bond angel θ would result in the maximum dipole moment for the triatomic

molecule XY_2 shown below ?



A. $\theta = 90^\circ$

B. $\theta = 120^\circ$

C. $\theta = 150^\circ$

D. $\theta = 180^\circ$

Answer: A

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22. Dipole moment is highest for:

A. $CHCl_3$

B. CH_4

C. CHF_3

D. $C - Cl_4$

Answer: C

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23. The molecules having dipole moment are :

A. $2, 2 -$ dimethylpropane

B. trans $- 3 -$ hexene

C. trans $- 2 -$ pentene

D. $2, 2, 3, 3 -$ tetramethylbutane

Answer: C

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24. Bond angle between two hybrid orbitals is 106° Hybride charcter in orbital is :

A. between $20 - 21\ \%$

B. between $20 - 21\ \%$

C. between $20 - 22\ \%$

D. between $20 - 23\ \%$

Answer: D

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

A. C

B. N

C. both C and N

D. resonate between C and N

Answer: D

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26. Which statement is correct about $HCHO$?

A. It has $sp^2 -$ hybridised carbon

B. The bond angles $\angle HCH$ and $\angle HCO$ are 116° and 122° respectively

C. It involves multiple bond pair -bond pair repulsion

D. All of these

Answer: D

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27. Which of the following halides is not oxidised by Mno_2 ?

A. F^-

B. Cl^-

C. Br^-

D. I^-

Answer: A

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28. The enolic form of acetone contains:

A. 9σ, 1 pi bond and 2 lone pairs

B. 8σ, 1 pi bond and 2 lone pairs

C. 10σ, 1 pi bond and 1 lone pairs

D. 9σ, 2 pi bond and 1 lone pairs

Answer: A

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29. Amongst $LiCl$, $RbCl$, $BeCl_2$ and $MgCl_2$, the compounds whith the greatrest and the least ionic character respecitely are :

A. $LiCl$ and $RbCl$

B. $RbCl$ and $BeCl_2$

C. $RbCl$ and $MgCl_2$

D. $MgCl_2$ and $BeCl_2$

Answer: B

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30. The total number of valence electrons in $4.2g$ of N_3^- ion are :

A. $2.2N$

B. $4.2N$

C. $16N$

D. $3.2N$

Answer: C

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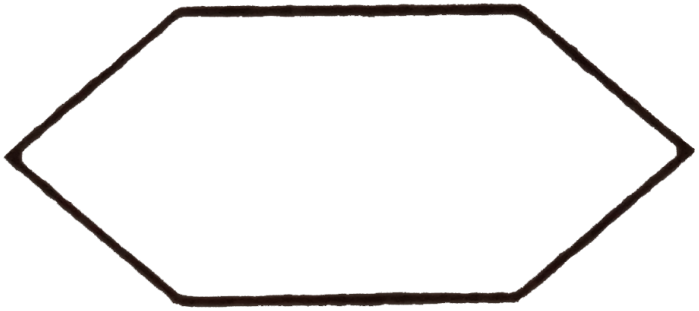
31. In piperdine



.

$N - H$, N atom has hybridisation :

A. sp

B. sp^2

C. sp^3

D. dsp^2

Answer: C

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32. One among the following is the incrorrect order of increasing ionisation energy :

A. $Cl - > Ar > K^+$

B. $K < Ca < Se$

C. $Au < Ag < Cu$

D. $Cs < Rb < K$

Answer: C

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33. $CuSO_4$. 5H_2 O` is represented as :

A. $\left[Cu(H_2O)_5SO_4\right.$

B. $\left[Cu(H_2O)_3SO_4\right].2H_2O$

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

D. $\left[Cu(H_2O)_5\right]SO_4$

Answer: C

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34. The correct order of increasing electropositive character among Cu . Fe and Mg is :

A. $Cu \approx Fe > Mg$

B. $Fe > Cu > Mg$

C. $Fe > Mg > Cu$

D. $Mg > Fe > Cu$

Answer: D

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

A. NH_3 combines with H^+

B. AlH_3 combines with H^-

C. in both cases

D. in none cases

Answer: B

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36. When temperature is lowered NO_2 dimerises .

It is accompanised by :

A. an increase in pressure

B. darkening in colour

C. decrease in paramangetism

D. increase in paramagetism

Answer: C

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37. The dipole moment of NF_3 is very much less compatred to that of NH_3 because :

A. the size of N atom is much less than that of H atom

B. F atom is more electronegative than N atoms whereas H atoms is less electronegative tha N atom

C. unshared electron pair is not present in NF_3

D. no. of lone pairs in NF_3 is nuch greater than in NH_3

Answer: B

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38. In $HCHO$, there are X no-bonding electron pairs Y sigama -bonds and Z pi-bonds , X, Y and Z are :

A. $1, 1, 3$

B. $2, 3, 1$

C. $1, 2, 3$

D. none of these

Answer: B

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39. For compounds ,

A : Tetracuanoethern

B : Carbon dioxide

C: Benzene

D : 1 , 3-Butaidene .

Ratio of σ and π bonds is in order :

A. A: Tetracynoethene

B. B: Carbon dioxide

C. C:Benzene

D. D , 1, 3 -Butadiene

Answer: A

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40. Hypervalent compound is :

A. $A = B > C > D$

B. $A = B > B > D > C$

C. $a = B = C = D$

D. $C > D > A > B$

Answer: A

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41. Which set contains par of elements that do not belong to same froup but show chemical resemblaces ?

A. Hf,Zr

B. K, Rb

C. Be ,Al

D. B,Al

Answer: C

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42. An element of p-block in which last electron enters into s-orbital of valence shell insteatd of p-orbital is :

A. As

B. Ga

C. Te

D. He

Answer: D

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43. Covelant radius of $Li$is $123 \pm$ .The crystal radius of Li will be:

A. $> 123 \pm$

B. $< 123 \pm$

C. $= 123 \pm$

D. $= \frac{123}{2} \pm$

Answer: A

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44. A molecule which cannot exist theoretcally is :

A. SF_4

B. PF_2

C. OF_4

D. O_2F_2

Answer: C

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45. Which are true statements among the following ?

A. , 13

B. 1, 2, 5

C. 1, 35

D. 1, 2, 4

Answer: B

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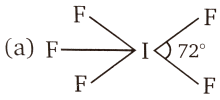
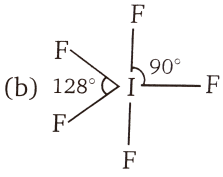
46. The structure of IF_4 can be best desribed by :

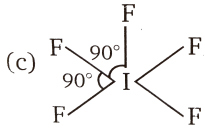
A.



B.



C.



D. none of these

Answer: C

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47. The solublity of KCl is relatively more in :

A. $C_6H_6(D=0)$

B. $(CH-3)_2CO(D=2)$

C. $CH_3OH(D=32)$

D. $CCl_4(D=0)$

Answer: C

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48. Which of the following possess lowest bond energy ?

A. $C - C$

B. $N - N$

C. $H - H$

D. $O - O$

Answer: D

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

A. $I - Cl$ bond is stronger than $Br - Br$ bond

B. ionisation enrgy of I gt ionisation enrgy of Br

C. ICl is polar whereas Br_2 is non-plar

D. size of I is larger than Br

Answer: C

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50. The pair of species having identical shape is :

A. CF_4, SF_4

B. PCl_3, BF_3

C. XeF_2, CO_2

D. PF_5, IF_3

Answer: C

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51. The molecule having three fold axid of symmetry is :

A. NH_3

B. C_2H_4

C. CO_2

D. SO_2

Answer: A

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52. Which of the following phenomenon will occure when tow atoms of an element with same spein of electron approach each other ?

A. Orbitals overlap will occur

B. Orbitals overlap will not occur

C. Bonding will occur

D. A diatomic molecule will be formed

Answer: B

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53. Structrue of ICO_2^- is :

A. trigonal

B. distorted trigonal bipyramid

C. octahedral

D. square planar

Answer: B

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54. The most suitable method of separation of a mixture of ortho and para nitrophernol in the

ratio $1:1$ is :

A. distillation

B. crystallisation

C. vaporisation

D. colour spectrum

Answer: A

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55. In the formation of N_2^+ the electron is lost form a :

A. σ-orbital

B. $\pi -$ orbital

C. σ^x -orbital

D. $\pi^x -$ orbital

Answer: A

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56. The bond order in O_2^+ is the same as in :

A. N_2^+

B. CN^-

C. CO

D. NO^+

Answer: A

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57. The correct increasing bond angles order is :

A. $BF_3 > NF_3 > PF_3 > CIF_3$

B. $BF_3 > NF_3 > PF_3 < CIF_3$

C. $BF_3 > NF_3 < PF_3 < CIF_3$

D. $BF_3 > NF_3 > PF_3 > CIF_3$

Answer: B

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58. In which element shielding efferct is not possible ?

A. H

B. Be

C. B

D. N

Answer: A

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59. The higher values of specific heat of water than other liquids has been accounted in terms of :

A. hight dielectric constant

B. Polarity

C. H-bonding

D. None of thes

Answer: C

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60. Which are isostructural species ?

A. CH_3^- and CH_3^+

B. NH_4^+ and NH_3

C. SO_4^{2-} and BF_4^-

D. NH_2^- and BeF_2

Answer: C

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61. The species having octahedral shape is :

A. SF_6

B. BF_4^-

C. PCl_5

D. BO_3^{3-}

Answer: A

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62. The correct order of increaisng bond angles is

:

A. $PF_3 < PCl_3 < PBr_3 < PI_3$

B. $PF_3 > PBr_3 < PC_3 < \ > PI_3$

C. $PI_3 > PBr_3 > PCl_3 > PF_3$

D. $PF_3 < pCl_3 > PBr_3 > PI_3$

Answer: D

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63. The hybridisation of P in phosphate ion $\left(PO_4^{2-}\right)$ is the same as in :

A. I in ICl_4^-

B. S in SO_3

C. N in NO_3^-

D. S in SO_3^{2-}

Answer: D

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64. The diamagnetic molecules are :

A. B_2, C_2, N_2

B. O_2, N_2, F_2

C. C_2, N_2, F_2

D. B_2, I_2^{2-}, N_2

Answer: C

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65. The correct order in which the $O-O$ bond length increases in the following :

A. $H_2O_2 < O_2 > O_3$

B. $O_3 < H_2O_2 < O_2$

C. $O_2 > H_2O_2$

D. $O_2 < O_3 < H_2O_2$

Answer: D

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66. Heterolytic bond fission in C_2H_6 gives carbonium and carbonion ions . The hybridisation of carbon atoms in these ions is :

A. sp^3

B. sp^2

C. sp

D. sp^3, sp^2

Answer: D

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67. Maleic acid is stronger than fumaric acid because :

A. fumaric acid shows intermolecular H-bonding

B. fumaric acid shows intramolecular H-bonding

C. maleic acid is dibasic acid

D. maleic acid shows chelation

Answer: B

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68. The correct order for bond angles is :

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

B. $No_2^+ > NO_2^- > NO_2$

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

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

Answer: A

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69. The correct order for bond angles is :

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

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

C. $NH_4^+ > NH_2^{-1} > NH_3$

D. $NH_3 > NH_2^{-1} > NH_4^+$

Answer: A

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70. The pair with more ionic nature and less m.pt. respectively in lithium halides :

A. LiF, LiI

B. $LiCl, LiF$

C. $LiBr, LiI$

D. $LiF, LiCl$

Answer: A

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71. The correct nond order for CO and CO^+ are respectively :

A. $3, 5/2$

B. $3, 2$

C. $3, 7/2$

D. $4/2, 3$

Answer: C

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72. The correct stability order for N_2 and its given ions is :

A. $N_2 > N_2^+ > N_2^{-1} > N_2^{2-}$

B. $N_2 < N_2^+ < N_2^{-1} < N_2^{2-}$

C. $N_2 > N_2^+ < N_2 > N_2^2$

D. $N_2 > N_2^+ = N2^- > N_2^{2-}$

Answer: A

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73. N_2 and O_2 are converted to mono cations N_2^+ and O_2^+ respectively, which statement is wrong ?

A. in N_2^+ , the $N - N$ bond weakens

B. In $O - 2^+$, the $O - O$ bond order increase

C. in O_2^+ , the paramagnetism decrease

D. N_2^+ become diamagnetic

Answer: D

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74. The $O - O$ bond length in O_2, $O_2[AsF_4]$ and $K[O_2]$ is :

A. $O_2[AsF_4] < O_2 < K[O_2]$

B. $O_2[AsF_4] > K[O_2$

C. $O_2 > O_2[AsF_4] > K[O_2]$

D. $K[O_2] < O_2 < O_2[AsF_4]$

Answer: A

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75. Which statement is incorrect for OSF_4 ?

A. S-atom has sp^3 d-hybridisation

B. OSF_4 have distorted trigonal pyramidal 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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76. Which pair is isostructivral and possesses same number of bone pair of electron on central atom ?

A. IF_5 and $XeOF_4$

B. NH_3 and ClO_3^-

C. $SnCl_4$ and Cl_4^-

D. $AlCl_3$ and SO_2

Answer: A

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77. The species having diamagnetic nature and bond order 1.0 is :s

A. O_2^{2-}

B. O_2^+

C. O_2^{2-}

D. O_2

Answer: A

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78. P in PCl_5 has sp^3d hybridisation. Which of following statement is wrong about PCl_5 structure ?

A. Two $P-Cl$ bonds are strongest and three $P-Cl$ bonds weaker

B. Two $P - Cl$ bonds are axial and larger than three $P - Cl$ equatorial bonds

C. PCl_5 has trigonal bipyramidal geometry with bond-polar nature

D. All of these

Answer: A

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79. Which statement is wrong about H_2O ?

A. It has high specific heat relative to other liquids or solids due to strong intermolecular H-bonding

B. H_2O molecule has capaity to form $4H$-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 $4^\circ C$ since upto $4^\circ C$ the intermolecular H-bonding

persists more and thereby decreasing volume and increasing density .

Answer: D

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80. The correct order for triple bond energy in CO, N_2, CN and $C \equiv C$ is ,

A. $C \equiv O > N \equiv N > C \equiv N > C \equiv C$

B. $N \equiv N > C \equiv O > C \equiv C > C \equiv N$

C. $N \equiv N > C \equiv O > N \equiv C > C \equiv C$

D. $N \equiv N > C \equiv O > C = C > C \equiv C$

Answer: A

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

A. $2, 2$

B. $3, 1$

C. $1, 3$

D. $4, 0$

Answer: D

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82. Which of the following molecule froms linear polymeric structure due to H-bonding ?

A. HCl

B. HF

C. NH_3

D. H_2O

Answer: B

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83. The correct roder o fincreasing $C - O$ bond lengths in CO, CO_3^{2-} and CO_2 is :

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

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

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

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

Answer: D

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84. Among the following which has resonating structure ?

A. BF_3

B. PCl_5

C. SF_6

D. IF_7

Answer: A

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85. For which crystalline substance does the solubility in water increase upto $312^{\circ}C$ and then decrease readily ?

A. $1CaCl_2.\ 2H_2O$

B. $Na_2SO_4.10H_2O$

C. $FeSO_4.4H_2O$

D. Alums

Answer: B

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86. Which among the following is true ?

A. Bond order $\propto \frac{1}{Bond \leq n > h} \propto$ Bond energy

B. Bond ordr $\propto$ Bond length $\propto \frac{1}{Bonde \neq rgy}$

C. Bond order $\propto \frac{1}{Bond \leq n > h} \propto \frac{1}{\text{Bond energy}}$

D. Bond order $\propto$ Bond length $\propto$ Bond energy `.

Answer: A

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87. During the formation of a molecular orbital from atomic orbitral , the electron density is :

A. minimum in nodal plane

B. maximum in nodal plane

C. zero in nodal plane

D. zero on the surface of lobe

Answer: C

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88. The shapes of PCl_4^+, PCl_4^- and $AsCl_4$ are respectively :

A. square planar , tetrahedral , see -saw

B. tetrahedral , see-saw , trigonal bipyramidal

C. tetrahedral, square planar and pentagonal bipyramidal

D. trigonal bipyramidal tetrahedral and square pyramidal

Answer: B

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89. Which of the following paires of elements for oxideas of polyanions and polycations respectively ?

A. Si and Al

B. Cu and Si

C. Al and B

D. Ti and As

Answer: A

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90. $N-O-N$ bond andle is maximum in :

A. NO_2^+

B. NO^2

C. NO_3^{-1}

D. $N-2O_3$

Answer: B

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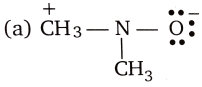
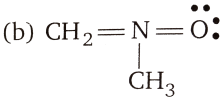
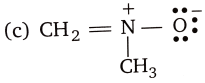
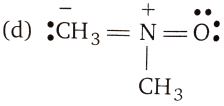
91. Which is not a permissible resonating structure ?

A. 

B. 

C. 

D. 

Answer: B

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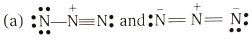
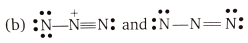
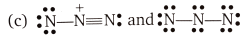
92. Which pair represents canonical from ?

A. 

B. 

C. 

D. All of these

Answer: A

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93. Which of the following would have permanent dipple moment ?

A. SF_4

B. XeF_4

C. SiF_4

D. BF_3

Answer: A

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94. The correct order of increasing covalent charactre is :

A. $NaCl > LiCl < BeCl_2$

B. $BeCl_2 < NaCL > LiCl$

C. $BeCl_2 < LiCl > NaCl$

D. $LiCl < NaCl < BeCl_2$

Answer: A

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95. Which one of the following orders is not correct in accordance whith the property stated against is ?

A. Electronegativity : $F_2 > Cl_2 > Br_2 > I_2$

B. Bond dissociation energy : $F_2 > Cl_2 > Br_2 > I_2$

C. Oxidsi ing power : $F_2 > Cl_2 > Br_2 > I_2$

D. acidic nature in water : $Hl > HBr > HCl > HF$

Answer: B

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96. The electronegaivity difference between N and F is greater than that between N and H yet

the dipole moment of NH_2 (1 .5 D) is larger than that of $NF_3(0.\ 2D)$. This is because :

A. in NH_3 as wellas NF_3 the atomic dipose and bond dipole are in opposite directions

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

C. I NH_3 as well as in NF_3 the atomic dipole and bond dipole are in the saem direction

D. in NH_3 the atomic dipole and bond dipole are in the same direction wheras in NF_3 these are in opposite directions .

Answer: D

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97. In which of the following moleucles are all the bonds not equal ?

A. AlF_3

B. NF_3

C. ClF_3

D. BF_3

Answer: C

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98. Which of the following is not a correct statement ?

A. Every AB_5 molecule does in fact have square pyramind sructure

B. Multiple bonds are always shorter than corresponding single bonds

C. The electron-deficient molecules can act as Lewis acids

D. The canonical structures have non real existence

Answer: A

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

A. NO_2^+

B. O_3

C. NO_3^-

D. SO_2

Answer: A

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100. Which of the following is not isostructural with $SiCkl_4$?

A. PO_4^{3-}

B. NH_4^{+1}

C. SO_2

D. SO_4^{2-}

Answer: C

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101. The number of unpaired electrons in a parmamagnetic diatomic molecyle of an element with atomic number 16 is :

A. 4

B. 1

C. 2

D. 3

Answer: C

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Exercise 2 B

1. Which of the following has //have identical nond order ?

A. CN^-

B. O_2^-

C. NO^+

D. CN^+

Answer: A::C

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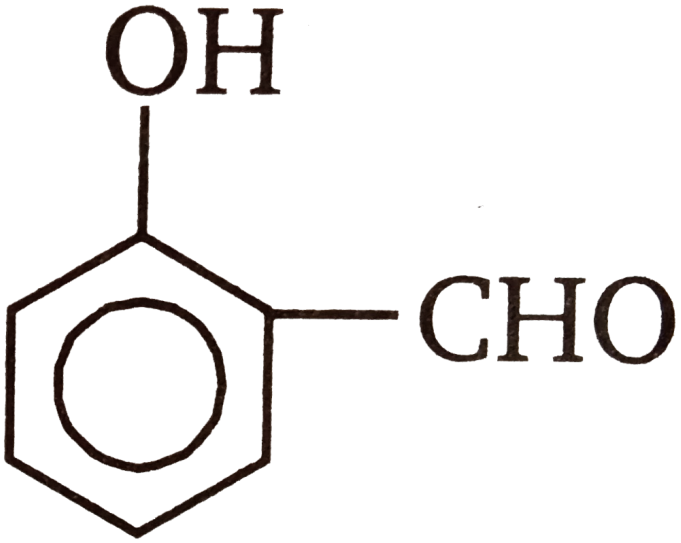
2. The molecule ,



A. has intermolecular H-bondings

B. has intramolecular H-bonding

C. reduces Tollens reagent

D. is steam -volatile

Answer: B::D

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3. Dipole moment is shown by :

A. 1, 4 -dichlorobenzene

B. cis-1, 2- dichloroethene

C. trans -1-2-dichloroethene

D. trans -1-2dichloro -2-pentene

Answer: B::D

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4. The species that does not contain peroxied bond is //are :

A. PbO_2

B. H_2O_2

C. MnO_2

D. BaO_2

Answer: A::C

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5. Resonace sturcetures of a molecule should have :

A. identical arrangement of atoms

B. nearly the same energy content

C. the same number of paired electrons

D. identical bonding

Answer: A::B

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6. Electron deficent compound s is (are) :

A. B_2H_6

B. AlF_3

C. NO

D. C_3^{4-}

Answer: A::B::C

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7. The linear struture is assumed by :

A. $SnCl_2$

B. NCO^-

C. CS_2

D. NO_2^+

Answer: B::C::D

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8. Pick out the isoelectronic structures from the following .

$ICH_3^+(II)H_3O^+, (III)NH_3, (IV)CH_3^-$:

A. I and II

B. III and IV

C. I and III

D. II, III and IV

Answer: B::D

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9. Ionic radii of :

A. $Ti^{4+} < Mn^{7+}$

B. $.^{35}Cl^- <^{37} Cl^-$

C. $K^+ < Cl^-$

D. $P^{3+} > p^{5+}$

Answer: D

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10. Which hass //have magnetic moment ?

A. $\left[Fe(H_2O)_6\right]^{2+}$

B. $\left[Ni(CN)_4\right]^{2-}$

C. $[Fe(CN)_6]^{3-}$

D. O_2

Answer: A::C::D

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11. Which of the following statements is (are) correct ?

A. CH_3^+ shows sp^2 -hybridization whereas CH_3^- shows Sp^2 -hybridiszation

B. NH_4^+ has a regular tetrahedral geomety

C. sp^2 -hybridiszed orbitals have eqwual s and p- character

D. Hybridized orbitals always form sigma-bonds

Answer: A::B::D

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12. Which statement$s$ is (are) correct ?

A. A pi- bond is weaker than sigma-nond

B. A sigma-bond is weaker than pi-bond

C. A (double) bond stronger than single bond

D. A covalent bond is stronger than H-bond

Answer: A::C::D

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13. IE_2 for an element are invariable bhygher thab IE_1 because :

A. the size of cation is smaller than its atom

B. it is difficult of remove e form cation

C. IE is endothermic

D. All of these

Answer: A::B

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14. Which of the following statement (s) is (are) correct ?

A. The peroxide ion has a bond order of 1 while the oxygen molecule has a bond order of 2

B. the peroxide ion has a longer and weaker bond than theoxygen molecule

C. The peroxid ion as the oxygen molecule are paramagnetic

D. The bond length of peroxide ion is greater than that of the oxygen molecule

Answer: A::B

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15. Which of the following statements is (are) correct ?

A. PH_5 and $BiCl_5$ does Not exist

B. $p\pi -$ d pi bonds are present in $SO-2$

C. SeF_4 and CH_4 has same shape

D. I_2^+ has bent geometry

Answer: A::B::D

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16. Which possess fractional bond order ?

A. O_2^+

B. O_2^-

C. H_2^+

D. N_2

Answer: A::B::C

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17. Resonance occurs due to the :

A. delocalization of a lone pair of electrons

B. delocalization of a sigma-electrons

C. delocalizatioon pi pi - electrons

D. migration of protons

Answer: A::C

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18. Which of the following conditions apply to resonating structrues ?

A. The contributing structures should have shimilar energies

B. the contributing structures should vbe preeseted such that unlike charges reside on atoms that are far apart

C. The electropositive element showld always have positive charge and the electronegative element negative charge

D. Hybridization is the mizing of atomic orbitals prior to their combining into molecular orbitals

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

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19. Which of the following statement s is (are) true ?

A. sp^2 – hybride orbitals are at 120° to one another

B. dsp^2 – Hybride orbitals are directed towards the corners of a regular tetrahedron

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

D. sp^3d^3 – hybrid orbitls are directed towards the corners of a regular octahedron

Answer: A::B::D

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20. In which , central atom s has have one lone pair of electron ?

A. Cl_2

B. NH_3

C. PCl_3

D. XeF_6

Answer: A::B::C

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21. Ionization energy is influenced by :

A. size of atom

B. charge on the nucleus

C. electrons present in inner shells

D. None of these

Answer: B::C::D

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22. Which statement s is are true ?

A. PF_3 has higher bond angle than PCl_3

B. Dipole moment of NH_3 is more than NF_3

C. I^+ is smaller than I^- ion

D. I^- is smaller than I^+ ion

Answer: A::B::C

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23. The type of bond s present in ammonium chloride is (are) :

A. $ionic$

B. covalent

C. co-ordinate

D. None of these

Answer: A::B::C

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24. Which of the following compounds possesses zero diple moment ?

A. H_2O

B. C_6H_6

C. CCl_6

D. BF_3

Answer: B::C::D

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25. Intermolecular H-bonding in HF makes it :

A. high, b pt. liquid

B. capable of forming two series of salt

C. dibasic

D. capable of forming acid salt

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

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Exercise 3

1. In XeF_2, XeF_4 amnd XeF_6, the number of lone pair of electrons on Xe are respectively :

A. $2, 3, 1$

B. $1, 2, 3$

C. $4, 1, 2$

D. 3,2,1

Answer: D

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2. The correct order of bond strength is :

A. $O_2^- < O_2 < O_2^+ < O_2^{2-}$

B. $O_2^{2-} < O_2^{-1} < O_2 < O_2^+$

C. $O_2^- < O_2^{2-} < O_2 < O_2^+$

D. $O_2^+ < O_2 < O_2^- < O_2^{2-}$

Answer: B

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3. In which of the following pairs , bond angle is $109^\circ 28'$?

A. $[NH_4]^+, [BF_4^-]$

B. $NH_4^+, [BF_3]$

C. $NH_3, [BF_4^-]$

D. $[NH_3], [BF_3]$

Answer: A

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4. In which of the following sepcies , is the underlined carbon has sp^3 -hybridisation ?

A. $CH_3\underline{C}OOH$

B. $CH_3\underline{C}H_2OH$

C. $CH_3\underline{C}OOH_3$

D. $CH_2 = \underline{C}H - CH_3$

Answer: B

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

A. 6

B. 7

C. 17

D. 16

Answer: D

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6. Which of the following statement is true ?

A. HF is less polar than HBr`

B. Absolutely pure water does not contain any ions

C. Chemical bond formation taken place when forces of attraction overcome the forces of repulsion

D. In covalence transfer of electrons takes place

Answer: C

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7. An ether is more volatile then alcohol having same molecular fromula . This is due to :

A. intermolecular H-bonding in ethers

B. intermolecular H-bonding in alcohols

C. dipolar character of ethers

D. resonance structure in alcohols

Answer: B

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8. Which among the following has smallest bond angle ?

A. H_2S

B. NH_3

C. SO_2

D. H_2O

Answer: A

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9. Which pair of moecules will have permanent dipole moment for both members ?

A. NO_2 and O_3

B. SiF_4 and CO_2

C. SiF_4 and NO_2

D. NO_2 and CO_2

Answer: A

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10. The pair of species having identical shape of both species :

A. BF_3, PCl_3

B. PF_5, IF_5

C. CF_4, SF_4

D. XeF_2, CO_2

Answer: D

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11. In the anion $HCOO^-$, the carbon-oxygen bonds are found to be of equal length. This is due to :

A. the anion $HCOO^-$ has two resonating structure

B. the anion is obtained by removal of a proton form the acid molecule

C. electronic orbitals of carbon are hybridised

D. the $C = O$ bond is weaker than the $C - O$ bond

Answer: A

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12. The correct order of nond angles is :

A. $H_2S < NH_3 < BF_3 < SiH_4$

B. $NH_3 < H_2S < SiH < BF_3$

C. $H_2S < NH_3 < SiH_4 < BF_3$

D. $H_2S < SiH_4 < NH_3 < BF_3$

Answer: C

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13. The states of hybridisation of borom and oxygen atoms in boric acid (H_3BO_3) are respecitivelty :

A. sp^3 and sp^3

B. sp^2 and sp^3

C. sp^3 and sp^2

D. sp^2 and sp^2

Answer: B

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14. Which has regular terrahedral gementory ?

A. SF_4

B. BF_4^-

C. XeF_4

D. $\left[Ni(CN)_4\right]^{2-}$

Answer: B

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15. The maximum number of 90° angles hetween bond pair -bond pair of elecrron is observed in :

A. sp^3d^2- hybridisation

B. sp^3d-hybridisation

C. dsp^2 -hybridisation

D. `dsp^3 -hybridisation

Answer: A

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16. The bond order in NO is 2.5, while that in NO^+ is 3 Which statement is true ?

A. Bond length is unpredictable

B. Bond length is NO is greater than in NO^+

C. Bond length in NO^+ is equal to that in NO

D. Bond length in NO^+ is greater than in NO

Answer: B

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17. Which one of the following sepcies is diamagnetic in nature ?

A. He_2^+

B. H_2

C. H_2^+

D. H_2^-

Answer: B

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18. Lattice energy of an ionic compound depedns upon :

A. charge on the ions only

B. size of the ions only

C. packing of the ions only

D. charge and size of the ions

Answer: D

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19. Which of the following does not contain isoellectonic speices ?

A. $PO_4^{3-}, SO_4^{2-}, ClO_4^-$

B. CN^-, N_2, C_2^{2-}

C. $SO_3^{2-}, CO_3^{2-}, NO_3^-$

D. $BO_3^{3-}, Co_3^{2-}, NO_3^-$

Answer: C

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20. Which of the following moelcules /ions does not contian upaired electrons ?

A. O_2^{2-}

B. B_2

C. N_2^+

D. O_2

Answer: A

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21. A metal, M from chaloride in its $+2$ and $+4$ oxidation states . Which of the following statement about thes chalorides si correct ?

A. MCl_2 is more volatile than MCl_4

B. MCl_2 is more soluble in anhydrous ethanol than MCl_4

C. MCl_2 is more ionic than MCl_4

D. MCl_2 is more easily hydrolysed than MCl_4

Answer: C

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22. In which of the following molecules /ions , are all the bonds not equal ?

A. SF_4

B. SiF_4

C. XeF_4

D. BF_4^-

Answer: A

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23. The incrasing order of the first ionisation enthaplies of th elecments B, P, S and F (lowest first) is :

A. $F < S < F < P$

B. $P < S < B < F$

C. $B < P < S < F$

D. $B < S < P < F$

Answer: D

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24. The dercreasing valuers of bond angles from $NH_3(106^\circ)$ to $SbH_3(101^\circ)$ down the group 15 of the peridic table is due to :

A. increase in bp-bp repulsion

B. increase in p-orbital character in sp^3

C. decrease in-pp repulsion

D. decrease in electrongativity

Answer: D

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25. Which of the following species exhibits the diamangetic behaviour ?

A. O_2^{2-}

B. O_2^+

C. O_2

D. NO

Answer: A

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26. In which of the following ionixation processes , the bond order has increased and the magnetic behaviour has changed ?

A. $C_2 \rightarrow C_2^+$

B. No $\rightarrow NO^+$

C. $O_2 \rightarrow O_2^+$

D. $N_2 \rightarrow N_2^+$

Answer: B

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27. Which of the following hydrogen bonds is the strongest ?

A. $O - H \ldots\ldots N$

B. $F - H \ldots\ldots F$

C. $O - H \ldots O$

D. $O - H \ldots\ldots F$

Answer: B

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28. The charge /size ratio of a cation dermines its polarizing power. Which one of the following sequences represents the increasing order of the polarixing power of the cationic species , $K^+, Ca^+, Mg^{2+}, Be^{2+}$?

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

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

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

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

Answer: C

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29. Which one of the following pairs of species have the same bond order ?

A. CN^- and NO^+

B. CN^- and CN^+

C. O_2^- and CN^-

D. NO^+ and CN^+

Answer: A

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30. Which one of the following constitutes a group of the is electronic species ?

A. C_2^{2-}, O_2^-, CO, NO

B. $No^+, C_2^{2-}, CN^-, N-2$

C. $CN^-, N_2, O_2^{2-}, C_2^{2-}$

D. N_2, O_2^-, NO^+CO

Answer: B

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31. Using MO theory predict which of the following sepcies has the shortest bond length ?

A. O_2^{2+}

B. O_2^{+}

C. O_2^{-}

D. O_2^{2-}

Answer: A

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32. Which is not easily preciptated for a queous soultion ?

A. Cl^-

B. SO_4^{2-}

C. NO_3^-

D. CO_3^{2-}

Answer: C

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33. Number of paired electrons in O_2 molecules is

:

A. 7

B. 8

C. 16

D. 14

Answer: C

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34. Which one is most ionic ?

A. P_2O_5

B. CrO_3

C. MnO

D. Mn_2O_7

Answer: B

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35. The following compounds have been arranged in order of their increasing thermal statbilties . Identify the correct order .

$K_2CO_3(I)$ $MgCO_3(II)$

$CaCO_3(III)$ $BeCO_3(IV)$

A. $I < II < III < IV$

B. $IV < II < III < I$

C. $IV < II < I < III$

D. $II < IV < III < I$

Answer: C

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36. KF combines with to form KHF_2. The compound contains the species :

A. K^+, F^{-0} and H^+

B. K^+, F^- and HF

C. K^+ and $[HF_2]^-$

D. $[kHF]^+$ and F^-

Answer: C

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37. Which of the following statements is correct for $CsBr_3$?

A. It is a covalent compound

B. It contains Cs^{3+} and Br^- ions

C. It contains Cs^+ and Br_3^- ions

D. It contains Cs^+, Br^- and lattice Br_2 molecule

Answer: C

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38. Among the following species , identify the isostrouctral pairs .

$NF_3, NO_3^-, BF_3, H_3O^+, HN_3$

A. $\left[NF_3, NO_3^-\right]$ and $\left[BF_3, H_3O^+\right]$

B. $[NF_3, HN_3]$ and $\left[NO_3^-, BF_3\right]$

C. $\left[NF_3, H_3O^+\right]$ and $\left[NO_3^-, BF_3\right]$

D. $\left[NF_3, H_3O^+\right]$ and $[HN_3, BF_3]$

Answer: C

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39. The tow carbon atoms in calcium carbide are held by which of following bonds ?

A. Three sigma bonds

B. Ioinic bonds

C. Two pi and one sigma bonds

D. Ionic and covalent bonds

Answer: B

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40. Arrange the following compounds in order of increasing dipole moment .

Toluene (I) m-dichlorobenxene (II)

o-dichlorobebncene (III) . P-dichlorobennzebe (IV) .

A. $I < IV < II < III$

B. $IV < I < II < III$

C. $IV < I < III < II$

D. $IV < II < I < III$

Answer: C

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41. Among ko_2, AlO_2^- Bao_2 and NO_2^+ unpaired electron is present in :

A. NO_2^+ and BaO_2

B. KO_2 and AlO_2^-

C. KO_2 only

D. BaO_2 only

Answer: C

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42. Which contain both polar and non-polar bonds ?

A. NH_4Cl

B. HCN

C. H_2O_2

D. CO

Answer: B

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43. Which has sp^2-hybridization ?

A. CO_2

B. SO_2

C. N_2O

D. CO

Answer: D

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44. The critical temperatures of water is highe than that of O_2 becausee the H_2O molecule has :

A. fewer electrons than O_2

B. two covalent bonds

C. V-shape

D. dipole moment

Answer: B

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45. The geometry and the type of hybrid orbitals present about the central atom in BF_3 is :

A. linear ,sp

B. trigonal planar , sp^2

C. tetrahedral sp^3

D. pyramidal , sp^3

Answer: A

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46. The geometry of H_2S and its moment are :

A. angular and non-zero

B. angular and zero

C. linear and non-zero

D. linear and zero

Answer: B

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47. In compounds of type ECI_3, where $E = BP$, As or B, the angles $CI - E - CI$ for different E are in the order

A. $B < P > As = Bi$

B. $B > P > As > Bi$

C. $B < P = As = Bi$

D. $B < P < As > Bi$

Answer: D

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48. In the compound

$$\overset{1}{C}H_2 = \overset{2}{C}H - \overset{3}{C}H_2 - \overset{4}{C}H_2 - \overset{5}{C} \equiv \overset{6}{C}H$$

the $\overset{2}{C} - \overset{3}{C}$ bond is of the type :

A. $sp - sp^2$

B. $sp^3 - sp^3$

C. $sp - sp^3$

D. $sp^2 - sp^3$

Answer: D

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49. Molecular shape of SF_4, CF_4 and XeF_4 are :

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

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

C. differebnt with $0, 1$ and 2 lone pairs of electron respectively

D. different with $1, 0$ and 2 lone pairs of electron respectively

Answer: D

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50. The hybridisation of atomic orbitals of nitrogen in NO_2^+, NO_3^- and NH_4^+ are :

A. sp, sp^3 and sp^2 respectively

B. sp, sp^2 and sp^3 respectvely

C. sp^2, sp and sp^3 respectively

D. sp^2, sp^3 and sp respectively

Answer: B

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51. Amongst H_2O, H_2S, H_2Se and H_2Te, the one with the highest biling point is :

A. H_2O because of H-bonding

B. H_2Te because of higher mole . wt.

C. H_2S because of H -bonding

D. H_2Se because of lower mol . Wt .

Answer: A

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52. The correct order of hybridisation of the central atom in the offliwng secies $NH_3[PtCl_4]^{2-}$, PCl_5 and BCl_3 is :

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

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

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

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

Answer: B

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53. The common features anong the species CN^-, CO and NO^+ are :

A. bond order 3 and isoelectronics

B. bond order (3) and weak field ligands

C. bond order 2 pi-acceptor

D. isoelectric and weak field ligands

Answer: A

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54. Specify the co-ordination geometry around and hybridisation of N and B complex of NH_3 and BF_3,

A. N : tetrahedral , sp^3 , B : tetrahedral ,sp^3

B. N : Pyramidal, sp^3 , : Pyramidal , sp^3

C. N : Pyramidal , sp^3 , : Pyramidal , sp^3

D. N : tetrahedral , sp^3 , B : tetrahedral , sp^3

Answer: A

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55. The least stable in amongst the following is :

A. Li^-

B. Be^-

C. B^-

D. C^-

Answer: B

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56. Which of the following molecualr species has unpaired electrons ?

A. N_2

B. F_2

C. O_2^-

D. O_2^{2-}

Answer: C

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57. The nodal plane is the pi -bond of ethene is located in :

A. the molecular plane

B. a plane parallel to moelcular plane

C. a plane perpendicular to the molecular plane which bisects the carbon -carbon sigma bond at right angles

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

Answer: A

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58. Among the following, the molecule with the highest dipole moment is :

A. CH_3Cl

B. CH_2Cl_2

C. $CHCl_3$

D. CCl_4,

Answer: A

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59. Which of the following are isoelectronics and isostructural ?

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

B. SO_3, NO_3^-

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

D. CO_3^{2-}, SO_3

Answer: A

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60. Which of the following respresents the given mode of hybridisation $sp^2 - sp^2 - sp - sp$ from left to right ?

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

B. $CH \equiv C - C \equiv CH$

C. $CH_2 = CH - C = CH_2$

D. $CH_2 = CH - CH = CH_2$

Answer: A

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61. Total number of lone pair of electrons in $XeOF_4$ is :

A. 0

B. 1

C. 2

D. 3

Answer: B

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62. Which statement is correct about O_2^+ ?

A. Paramagnetic and bond order $< O_2$

B. Paramagnetic and bond order $> O_2$

C. Diamagnetic and bond order $< O_2$

D. Diamagnetic and bond order $> O_2$

Answer: B

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63. Which species has the maximum number of lone pair of electrons on the central atom ?

A. $[ClO_3]^-$

B. XeF_4

C. SF_4

D. $[I_3]^-$

Answer: D

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64. The species having bond order differnet from that in CO is .

A. NO^-

B. NO^+

C. CN^-

D. N_2

Answer: A

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65. Among the following , the paramagnetic compound is :

A. Na_2O_2

B. O^3

C. N_2O

D. KO_2

Answer: D

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66. Hyperconjugation involves the overlapping of the following orbitals :

A. $\sigma - \sigma$

B. $\sigma - p$

C. $p - p$

D. $\pi - \pi$

Answer: B

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67. Both $\left[Ni(CO)_4\right]$ and $\left[Ni(CN)_4\right]^{2-}$ are diamagnetic The hybridisations of nickel in these complexes , respectively are :

A. sp^3, sp^3

B. sp^3, dsp^2

C. dsp^2, sp^3

D. dsp^2, dsp^2

Answer: B

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68. The correct stability order of the following resonance structrue is :

$H_2C = \overset{+}{N} = \overline{N}$

$H_2\overset{+}{C} = (N) = \overline{N}$

$H_2\overline{C} - \overset{+}{N} \equiv N$

$H_2\overline{C} - \overset{+}{N} \equiv N.$

A. $(I) > (II) > (IV) > (III)$

B. $(I) > (III) > (II) > (IV)$

C. $(II) > (I) > (III) > (IV)$

D. $(III) > (I) > (IV) > (II)$

Answer: B

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69. The hybridisation of atomic orbitals of nitrogen in NO_2^+, NO_3^- and NH_4^+ are :

A. sp, sp^2, sp^3

B. sp^2, sp, sp^2

C. sp, sp^3, sp^2

D. sp^2, sp^3, sp

Answer: B

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70. Geometrical shapes of the complexes fromed by the reaction of Ni^{2+} with CN^- and H_2O, respecitively , are :

A. octahedral , trtrahedral and square planar

B. tetrahdral , square planar ad octaheral

C. square planar , tetrahedral and octaherdreal

D. octahedral , square phanar and octahedral

Answer: B

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Exercise 5

1. How many sigma-bonds are present in $CH_3 - CH_3$?

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2. Find the bond order of B_2

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3. Find the bond order of Be_2

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4. Find the bond order of N_2

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5. Find the bond order of CO

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6. How many line paire of electrons are present in outer shell of Cl^- ?

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7. How many unpaired of electron are present in O_2^-

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8. How many π-bonds are present in $C_2(CN)_4$?

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9. How many line pair of electrons are present in xeF_4 ?

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10. A planar moelcule has AB_x structrue with six paires of electrons around A and one lone pair . Find the value of x .

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11. How many P= O bonds are in P_4O_{10}?

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12. How many $S-O-S$ bonds are in S_2O_9 ?

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13. Find the formal charge of the O-atoms in $\left[:\ddot{O}=N=\ddot{O}:\right]^{+}$ ion .

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14. How many π-bonds are in $H_2S_2O_6$?

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15. Based on $VSEPR$ theory , the number of 90° $F=Br-F$ angles in BrR_5 is :

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16. The value of n in the molecular fromula $Be_nAl_2Si_6O_{18}$.

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Exercise 6

1. PCl_5 in solid state exists as PCl_4^+ and PCl_6^- .

Also in some solvents it undergoes dissoctation

as $2PCl_5 \Leftrightarrow PCl_2^+ + PCl_6^-$.

The geometry and hybridisation of PCl_5 is :

A. trigonal bipyramid , sp^3d

B. tetrahedral , sp^3

C. octahderal , sp^3d^2

D. octahedral , sp^3d^2

Answer: A

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2. PCl_5 in solid state exists as PCl_4^+ and PCl_6^-

Also in some solvents it undergoes dissoctation as $2PCl_5 \Leftrightarrow PCl_2^+ + PCl_6^-$.

The geometry and hybridisation of PCl_4^+ is :

A. tetrahedral , sp^3

B. octahedral , sp^3d^2

C. trigobal pyramid , sp^3d

D. see - saw , sp^3d

Answer: A

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3. PCl_5 in solid state exists as PCl_4^+ and PCl_6^-

Also in some solvents it undergoes dissoctation as $2PCl_5 \Leftrightarrow PCl_2^+ + PCl_6^-$.

The geometry and hybridisation of PCl_6^- is :

A. octahedral , sp^3d^2

B. tetrahedral , sp^3

C. trigobal pyramid , sp^3d

D. see - saw , sp^3

Answer: A

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4. PCl_5 in solid state exists as PCl_4^+ and PCl_6^-

Also in some solvents it undergoes dissoctation as $2PCl_5 \Leftrightarrow PCl_2^+ + PCl_6^-$.

The oxidation number of P in PCl_5. PCl_4^+ and PCl_6^- are respectively :

A. $5, 4, 4$

B. $5, 5, 5$

C. $4, 5, 5$

D. $4, 4, 4$

Answer: B

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5. PCl_5 in solid state exists as PCl_4^+ and PCl_6^-

Also in some solvents it undergoes dissoctation as $2PCl_5 \Leftrightarrow PCl_2^+ + PCl_6^-$.

The van't Hoff factor for diassociation of PCl_5 is (if α is its degree of disssociation) :

A. $i = 1$

B. $1 + \alpha$

C. $1 + \frac{\alpha}{2}$

D. $1 - \alpha$

Answer: A

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6. PCl_5 in solid state exists as PCl_4^+ and PCl_6^-

Also in some solvents it undergoes dissoctation as $2PCl_5 \Leftrightarrow PCl_2^+ + PCl_6^-$.

Which statement is wrong ?

A. In PCl_5, all the $P - Cl$ bonds are of same energy

B. PCl_5 has no lone pair of electron

C. PCl_5 is a white solid which melts at $167^\circ C$

D. PCl_5 gives white fumess with moist air

Answer: A

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7. Lewis concept of covalency of an element involved octet rule .Later on it was found that many elements in their compoinds $e.g., BeF_2, BF_3$ etc . Have incomplete octet whereas PCl_5, SF_6 etc , have expanded octet .

This classical conept also failed in predicting the geometry of molecules .Modern concept of covalence was propsed in terms of valence bond theory proposed by Heitler and London and later on modified by Pauling nad Slater . Hybridisation concept alongwith valence bond theory although successfully explained the geometry of various molecules but failed in many molecules . the geometry of such molecules was explained by VSEPR concept . Finally molecular orbital theory was porosed by Hund -Mulliken to explain many other anomalies .

Which are true statements among the following ?

(1) I_3^+ has bent structure

(2) $p\pi - dx$ bons are present in SO_2

(3) SeF_4 and CH_4 has same shape

(4) XeF_2 and CO_2 has same shape

(5) SF_4 is see-saw structure wherear ICl_3 is T shaped

A. $1, 2, 4, 5$

B. $1, 2, 3, 4$

C. $2, 3, 4, 5$

D. $1, 3, 4, 5$

Answer: A

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8. Lewis concept of covalency of an element involved octet rule .Later on it was found that many elements in their compoinds $e.g, BeF_2, BF_3$ etc . Have incomplete octet whereas PCl_5, SF_6 etc , have expanded octet . This classical conept also failed in predicting the geometry of molecules .Modern concept of covalence was propsed in terms of valence bond theory proposed by Heitler and London and later on modified by Pauling nad Slater . Hybridisation concept alongwith valence bond theory although successfully explained the geometry of various

molecules but failed in many molecules . the geometry of such molecules was explained by VSEPR concept . Finally molecular orbital theory was porosed by Hund -Mulliken to explain many other anomalies .

Ratio of lone pair-bond pair electrons on central atom in i_3^- and XeF_4 are respectively :

A. $2.\ 66, 0.\ 5$

B. $1.\ 5, 0.5$

C. $2, 0.\ 5$

D. $05, 2$

Answer: A

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9. Lewis concept of covalency of an element involved octet rule .Later on it was found that many elements in their compoinds $e.g, BeF_2, BF_3$ etc . Have incomplete octet whereas PCl_5, SF_6 etc , have expanded octet . This classical conept also failed in predicting the geometry of molecules .Modern concept of covalence was propsed in terms of valence bond theory proposed by Heitler and London and later

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The bond angles NO_2^+, NO and NO_2^- are respectivley :

A. $180^\circ, 134^\circ, 115^\circ$

B. $115^\circ, 134^\circ, 180^\circ$

C. $134^\circ, 180^\circ, 115^\circ$

D. $115^\circ, 180^\circ, 124^\circ$

Answer: A

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10. Lewis concept of covalency of an element involved octet rule .Later on it was found that many elements in their compoinds $e.g., BeF_2, BF_3$ etc . Have incomplete octet whereas PCl_5, SF_6 etc , have expanded octet . This classical conept also failed in predicting the

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Which statements are correct ?

(1) Bond angle of $PF_3 > PCl_3$.

(2) Bond angle of $PCl_3 < PBr_3$

(3) $(CH_3)_3N$ is pyramidal whereas $(SiH_3)_3N$ is planar but both shows sp^3 -hybridisation.

(4) Multiple bonds also influence the geometry of molecule and thus C_2H_2 has $\angle HCH = 160^\circ$ and $\angle HCO = 122^\circ$

(5) PCl_5 is super-octet molecule

A. $1, 3, 4, 5$

B. $1, 2, 34$

C. $2, 3, 4, 5$

D. $2, 5$

Answer: B

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11. Lewis concept of covalency of an element involved octet rule .Later on it was found that many elements in their compoinds $e.g, BeF_2, BF_3$ etc . Have incomplete octet whereas PCl_5, SF_6 etc , have expanded octet . This classical conept also failed in predicting the geometry of molecules .Modern concept of covalence was propsed in terms of valence bond theory proposed by Heitler and London and later on modified by Pauling nad Slater . Hybridisation concept alongwith valence bond theory although

successfully explained the geometry of various molecules but failed in many molecules . the geometry of such molecules was explained by VSEPR concept . Finally molecular orbital theory was porosed by Hund -Mulliken to explain many other anomalies .

Which statements are correct for CO^+ and N_2^+ according to molecular orbital theory ?

(1) Both have same configuration

(2) Bond order for CO 、$(+)$ and N_2^+ are 3.5 and 2.5

(3) Bond order for CO^+ and N_2^+ form N_2, the bond length increase

(5) During the formation of CO^+ from CO the bond length decrease .

A. $2, 4, 5$

B. $1, 3, 4, 5$

C. $1, 3$

D. $1, 2, 3$

Answer: A

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12. Lewis concept of covalency of an element involved octet rule .Later on it was found that many elements in their compoinds $e.g, BeF_2, BF_3$ etc . Have incomplete octet whereas PCl_5, SF_6 etc , have expanded octet . This classical conept also failed in predicting the geometry of molecules .Modern concept of covalence was propsed in terms of valence bond theory proposed by Heitler and London and later on modified by Pauling nad Slater . Hybridisation concept alongwith valence bond theory although successfully explained the geometry of various molecules but failed in many molecules . the

geometry of such molecules was explained by VSEPR concept . Finally molecular orbital theory was porosed by Hund -Mulliken to explain many other anomalies .

Which of the following statements are true ?

(1) O_2, O_2^- and O_2^- are paramangetic species

(2) Correct bond order is : $O_2^+ > O_2^- > O_2$

(3) Bond lenght is shortest for O_2^+ among the species O_2, O_2^- , O_2^{2-} , O_2^+ and O_2^{2+}

(4) Bond length is maximum for O_2^{2-} among the species O_2, O_2^- , O_2^{2-} , O_2^+ and O_2^{2+}

(5) B_2 has two unpaired electron and thus parmagnetic .

A. $1, 2, 3, 5$

B. $1, 3, 4, 5$

C. $1, 2, 5$

D. $1, 4, 5$

Answer: D

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13. Lewis concept of covalency of an element involved octet rule .Later on it was found that many elements in their compoinds

$e.g., BeF_2, BF_3$ etc . Have incomplete octet whereas PCl_5, SF_6 etc , have expanded octet . This classical conept also failed in predicting the geometry of molecules .Modern concept of covalence was propsed in terms of valence bond theory proposed by Heitler and London and later on modified by Pauling nad Slater . Hybridisation concept alongwith valence bond theory although successfully explained the geometry of various molecules but failed in many molecules . the geometry of such molecules was explained by VSEPR concept . Finally molecular orbital theory was porosed by Hund -Mulliken to explain many other anomalies .

Selcet the cirrect statements .

(1) Bond order for N_2^+ and N_2^- are same

(2) Bond energy of $N_2^+ < N_2^-$

(3) Bond lenght of $N_2^+ < N_2^-$

(4) C_3F_4 is a non -palar molecular

(5) XeF_2 hat two (F) atoms in axial position whereas XeF_4 has four (F) atoms in equatiorial position .

A. $2, 3, 4, 5$

B. $1, 4, 5$

C. $1, 5$

D. $1, 2, 4, 5$

Answer: D

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14. Lewis concept of covalency of an element involved octet rule .Later on it was found that many elements in their compoinds $e.g, BeF_2, BF_3$ etc . Have incomplete octet whereas PCl_5, SF_6 etc , have expanded octet . This classical conept also failed in predicting the geometry of molecules .Modern concept of covalence was propsed in terms of valence bond theory proposed by Heitler and London and later

on modified by Pauling nad Slater . Hybridisation concept alongwith valence bond theory although successfully explained the geometry of various molecules but failed in many molecules . the geometry of such molecules was explained by VSEPR concept . Finally molecular orbital theory was porosed by Hund -Mulliken to explain many other anomalies .

Which statements are correct ?

(1) $C(CN)_4$ and $C_2(CN)_4$ have ratio of σ and π bonds same

(2) Propanal and propanone have same ratio of σ and π bonds

(3) CO_2 and BeF_2 both are linear and possess

sp-hybridisation

(4) XeF_4 and SF_4 both are square planar and possess sp^3d-hybridisation

(5) $Cl - Cl$ bond is stronger than $Br - Br$

A. $1, 3, 5$

B. $1, 2, 4, 5$

C. $1, 2, 3, 5$

D. $1, 4, 5$

Answer: C

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15. To explain the abnormality in some molecules , the conecpt of H-bonding was introduced , Hydrogen bonding is defined as the phenomenon in which H-bonding beteen two molecules is called intermolecular H-bonding between two molecules is called intermolecular H-bonding .Hbonding within a molecule is called intramolecular H-bonding or within a molecule is called intramolecular H-bonding or chelation .Intermolecular H-bonding favoure for cluster formation whereas intramolecular H-bnding prevents the cluster formation

Which of the following statement is wrong ?

A. H-bonding never involves more than two atoms

B. The H-bond order is :

$$H-F\ldots H > H-O\ldots H > H-N\ldots H$$

C. All the three atoms $\underset{\text{F—H}\cdots\text{F—H}}{\text{F—H}\cdots\text{F—H}}$ involved in H -bonding lie in one plane

D. Bond energy of H-bonding is about $1/2$ of covalent bond

Answer: D

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16. To explain the abnormality in some molecules , the conecpt of H-bonding was introduced , Hydrogen bonding is defined as the phenomenon in which H-bonding beteen two molecules is called intermolecular H-bonding between two molecules is called intermolecular H-bonding .Hbonding within a molecule is called intramolecular H-bonding or within a molecule is called intramolecular H-bonding or chelation .Intermolecular H-bonding favoure for cluster formation whereas intramolecular H-bnding prevents the cluster formation

HF_2^- exists in solid state and in liquid HF but bot in aqueous solution because :

A. $HF_2^- + H_2O \rightarrow H_3O^+ + 2F^-$

B. $HF + H_2O \rightarrow H - 2F^+ + OH^-$

C. $HF_2^- + H_2O \rightarrow H_2F_2 + OH^-$

D. none of these

Answer: A

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17. To explain the abnormality in some molecules , the conecpt of H-bonding was introduced , Hydrogen bonding is defined as the phenomenon in which H-bonding beteen two molecules is called intermolecular H-bonding between two molecules is called intermolecular H-bonding .Hbonding within a molecule is called intramolecular H-bonding or within a molecule is called intramolecular H-bonding or chelation .Intermolecular H-bonding favoure for cluster formation whereas intramolecular H-bnding prevents the cluster formation

The correct repesentation of H-bonding beteen NH_3 and H_2O is :

A. $H_2N - H \ldots . OH_2$

B. $H_3N \ldots . H - OH$

C. $H_2N - H \ldots . H - OH$

D. $H_2N \ldots ON_2$

Answer: B

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18. To explain the abnormality in some molecules , the conecpt of H-bonding was introduced , Hydrogen bonding is defined as the phenomenon in which H-bonding beteen two molecules is called intermolecular H-bonding between two molecules is called intermolecular H-bonding .Hbonding within a molecule is called intramolecular H-bonding or within a molecule is called intramolecular H-bonding or chelation .Intermolecular H-bonding favoure for cluster formation whereas intramolecular H-bnding prevents the cluster formation

Which molecule does not show intramolecular H-bonding ?

A. Salicylakdehyde

B. Chloralhydrate

C. Ethanol

D. Nickel dimethyl glyoximate

Answer: C

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19. To explain the abnormality in some molecules , the conecpt of H-bonding was introduced , Hydrogen bonding is defined as the phenomenon in which H-bonding beteen two molecules is called intermolecular H-bonding between two molecules is called intermolecular H-bonding .Hbonding within a molecule is called intramolecular H-bonding or within a molecule is called intramolecular H-bonding or chelation .Intermolecular H-bonding favoure for cluster formation whereas intramolecular H-bnding prevents the cluster formation

Which statement is wrong ?

A. Helical structure of proteins is stabilized due to H -bonding

B. Ethyl acetroacetate gives blue colour with aq. $FeCl_3$ due to the presence of enolic gp. Inspite of Intramolecualar H - bonding

C. Alcohols having carbon atoms $>$ 3 are insoluble in water because of hydrophobic chain prodominates of H - bonding

D. Glycerol is more viscous than diols and alochols because of more bindig sites available for H -bonding

Answer: C

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Exercise 7

1. Statement : IE_1 for is maximum and EA_1 for Cl is more than EA_1 of (F) .

Explanation : He possess paired electrons in $1s$ subshell , clsest to nucleus , wherease electron density in F is maximum which exers more electron -electron repulsion.

A. S is correct by E is wrong .

B. S is wrong but E is wrong .

C. Both S and E are correct and E is correct explanation os S .

D. Both S and E are conrrect and E is correct explanation os S.

Answer: C

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2. Statement : If difference of electronegtivity beteen two atoms is zero , the resultant molecule will be non-plar covalent .

Explanation : The shared pair of electron lies just in the middled of two atoms .

A. S is correct but E is wrong .

B. S is wrong but E is wrong .

C. Both S and E are correct and E is correct explanation os S .

D. Both S and E are conrrect and E is correct explanation os S.

Answer: C

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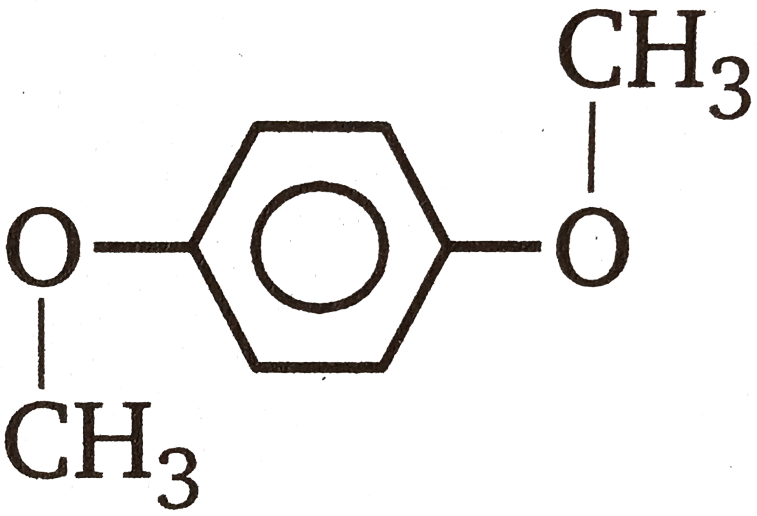
3. Statement : p-dimethoxy benzene is polar molecule .

Explanation : The two methoxy gps . At para psositions are located as



A. S is correct by E is wrong .

B. S is wrong but E is wrong .

C. Both S and E are correct and E is correct explanation os S .

D. Both S and E are conrrect and E is correct explanation os S.

Answer: A

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4. Statement : The lattice energy of silver halids is $AgF > AgCl > AgBr > AgI.$

Explanation : AgF is water soluble .

A. S is correct by E is wrong .

B. S is wrong but E is wrong .

C. Both S and E are correct and E is correct explanation of S .

D. Both S and E are correct and E is not correct explanation of S.

Answer: D

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5. Statement : The molecule cis-1-chloropropene is nore polar than trans-1-chooropropene .

Explanation : The magnitude of resultant vector in chloropropene is non-zero.

A. S is correct by E is wrong .

B. S is wrong but E is wrong .

C. Both S and E are correct and E is correct explanation os S .

D. Both S and E are conrrect and E is correct explanation os S.

Answer: B

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6. Statemet : IF_7 is super-ociet molecule .

Explanation : central atom of I in IF_7 has 14 electrons .

A. S is correct by E is wrong .

B. S is wrong but E is correct .

C. Both S and E are correct and E is correct explanation of S.

D. Both S and E are correct and E is not correct explanation of S.

Answer: C

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7. Statement : $FeCl_2$ is more covalent than $FeCl_3$

Explanation : Higher is the charge on cation more

is deformation of anion , more is covalent character .

A. S is correct by E is wrong .

B. S is wrong but E is wrong .

C. Both S and E are correct and E is correct explanation os S .

D. Both S and E are conrrect and E is correct explanation os S.

Answer: B

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8. Statement : MO configuration of CO is :

$\sigma 1s^2, \sigma^* 1s^2, \sigma 2s^2, \sigma 2p_x^2, \pi 2p_y^2, \pi 2p_z^2, \sigma^* 2s^2$

Explanation : the energy level $\sigma^* 2s^2$ possesses higher energy because then only higher bond length in CO that CO^+ can be explained .

A. S is correct by E is wrong .

B. S is wrong but E is wrong .

C. Both S and E are correct and E is correct explanation os S .

D. Both S and E are conrrect and E is correct explanation os S.

Answer: C

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9. Statement : The dipole moment of NH_3 is less than NF_3 .

Explanation : The lone pair preesent on N shows additive nature to $N-H$ vector whereas it is subtractive to $N-F$ vectro .

A. S is correct by E is wrong .

B. S is wrong but E is wrong .

C. Both S and E are correct and E is correct explanation os S .

D. Both S and E are conrrect and E is correct explanation os S.

Answer: B

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10. Statement : The bond energy of $P - Cl$ bond in PCl_3 and PCl_5 different .

Explanation : In $PCl_3 sp^3 - p$ overlapping whereas in $PCl_5 sp^3 d - p$ overlapping in noticed .

A. S is correct by E is wrong .

B. S is wrong but E is wrong .

C. Both S and E are correct and E is correct explanation os S .

D. Both S and E are conrrect and E is correct explanation os S.

Answer: C

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11. Statement : SF_4 has lone pair of electron at equatorial position in preference to axial position in the overall trigonal bipyramidal geometry .

Explanation : If lone pair is at equatorial position , then only repulsion is minimum .

A. S is correct by E is wrong .

B. S is wrong but E is wrong .

C. Both S and E are correct and E is correct explanation os S .

D. Both S and E are conrrect and E is correct explanation os S.

Answer: C

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