

Chemical Bonding And Molecular Structure

Question1

Identify the correct answer.

[NEET 2024]

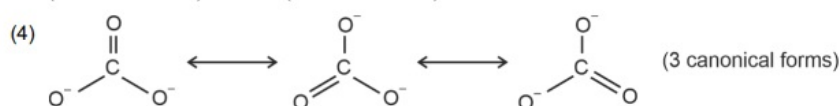
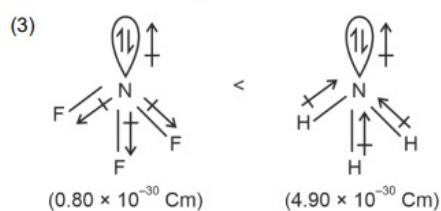
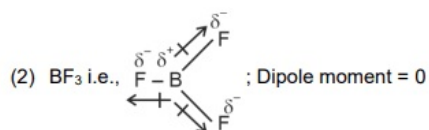
Options:

- A. Three resonance structures can be drawn for ozone
- B. BF_3 has non-zero dipole moment
- C. Dipole moment of NF_3 is greater than that of NH_3
- D. Three canonical forms can be drawn for CO_3^{2-} ion

Answer: D

Solution:

(1) In ozone; there are two resonating structures.



Question2

Which of the following molecules has "NON ZERO" dipole moment value?

[NEET 2024 Re]

Options:

- A. CCl_4
- B. HI
- C.

CO₂

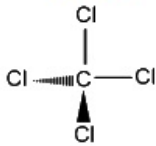
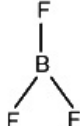
D.

BF₃

Answer: B

Solution:

Dipole moment of a molecule depends both on shape and bond dipole.

Molecule	Shape	μ (Debye)
CCl ₄		0
HI	H — I	0.38
CO ₂	O = C = O	0
BF ₃		0

Question3

Identify the incorrect statement about PCl₅.

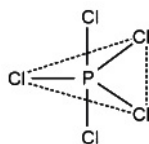
[NEET 2024 Re]

Options:

- A. PCl₅ possesses two different Cl — P — Cl bond angles
- B. All five P — Cl bonds are identical in length
- C. PCl₅ exhibits sp³ d hybridisation
- D. PCl₅ consists of five P — Cl (sigma) bonds

Answer: B

Solution:



It is sp³d hybridised with axial to equatorial angle of 90° and equatorial bond angles of 120°. It has five P — Cl sigma bonds. Axial bonds are longer than equatorial bonds.

Question4

Match List-I with List-II:

List-I	List-II
--------	---------

	(Molecule)		(Bond enthalpy (kJ mol ⁻¹))
A.	HCl	I.	435.8
B.	N ₂	II.	498
C.	H ₂	III.	946.0
D.	O ₂	IV.	431.0

Choose the correct answer from the options given below:

[NEET 2024 Re]

Options:

A.

A-III, B-IV, C-I, D-II

B.

A-IV, B-I, C-III, D-II

C.

A-IV, B-III, C-II, D-I

D.

A-IV, B-III, C-I, D-II

Answer: D

Solution:

(Molecule)	(Bond enthalpy (kJ mol ⁻¹))
HCl	431.0
N ₂	946.0
H ₂	435.8
O ₂	498

Question5

List I (Molecule)		List II (Number and types of bond/s between two carbon atoms)	
A.	ethane	I.	one α -bond and two π -bonds
B.	ethene	II.	two π -bonds
C.	carbon molecule, C ₂	III.	one σ -bond
D.	ethyne	IV.	one σ -bond and one π -bond

Choose the correct answer from the options given below:

[NEET 2024]

Options:

A.

A-I, B-IV, C-II, D-III

B.

A-IV, B-III, C-II, D-I

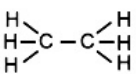
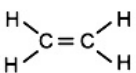
C.

A-III, B-IV, C-II, D-I

D.



Answer: C**Solution:**

A.	Ethane 	III.	one (C – C) σ bond
B.	Ethene 	IV.	one (C – C) σ and one (C – C) π bond
C.	C_2	II.	two (C – C) π bonds
D.	Ethyne $H-C \equiv C-H$	I.	two (C – C) π bonds and one (C – C) σ bond

Question6

Given below are two statements:**Statement I: The boiling point of hydrides of Group 16 elements follow the order $H_2O > H_2Te > H_2Se > H_2S$.****Statement II: On the basis of molecular mass, H_2O is expected to have lower boiling point than the other members of the group but due to the presence of extensive H - bonding in H_2O , it has higher boiling point.****In the light of the above statements, choose the correct answer from the options given below:****[NEET 2024]****Options:**

- A.
Both Statement I and Statement II are true
- B.
Both Statement I and Statement II are false
- C.
Statement I is true but Statement II is false
- D.
Statement I is false but Statement II is true

Answer: A**Solution:****Statement I** is correct, because boiling point of hydrides of group 16 follows the order $H_2O > H_2Te > H_2Se > H_2S$.**Statement II** due to intermolecular H -bonding H_2O shows higher boiling point than respective hydrides of group 16.

(Both Statement are true)

Order from H_2Te to H_2S is due to decreasing molar mass.

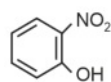
Question7

Intramolecular hydrogen bonding is present in

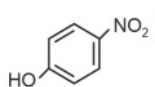
[NEET 2024]

Options:

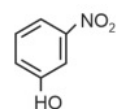
A.



B.



C.



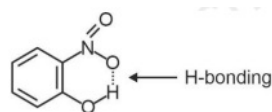
D.

HF

Answer: A

Solution:

In o-nitrophenol intramolecular H-bonding is present.



Question8

Match List I with List II.

	List I (Compound)		List II (Shape/geometry)
A.	NH ₃	I.	Trigonal Pyramidal
B.	BrF ₅	II.	Square Planar
C.	XeF ₄	III.	Octahedral
D.	SF ₆	IV.	Square Pyramidal

Choose the correct answer from the options given below:

[NEET 2024]

Options:

A.

A-I, B-IV, C-II, D-III

B.

A-II, B-IV, C-III, D-I

C.

A-III, B-IV, C-I, D-II

D.

Answer: A**Solution:** $\text{NH}_3 \Rightarrow sp^3$ hybridised with 1 lone pair.

Structure will be Trigonal Pyramidal.

 $\text{BrF}_5 \Rightarrow sp^3d^2$ hybridised with 1 lone pair.

Structure will be Square Pyramidal.

 $\text{XeF}_4 \Rightarrow sp^3d^2$ with two lone pairs.

Structure will be Square Planar.

 $\text{SF}_6 \Rightarrow sp^3d^2$ with no lone pair.

Structure will be Octahedral.

A-I, B-IV, C-II, D-III

Question9**The correct order of energies of molecular orbitals of N_2 molecule, is****[NEET 2023]****Options:**

A.

$$\sigma 1s < \sigma^* 1s < \sigma 2s < \sigma^* 2s < \sigma 2p_z < (\pi 2p_x = \pi 2p_y) < (\pi^* 2p_x = \pi^* 2p_y) < \sigma^* 2p_z$$

B.

$$\sigma 1s < \sigma^* 1s < \sigma 2s < \sigma^* 2s < \sigma 2p_z < \sigma^* 2p_z < (\pi 2p_x = \pi 2p_y) < (\pi^* 2p_x = \pi^* 2p_y)$$

C.

$$\sigma 1s < \sigma^* 1s < \sigma 2s < \sigma^* 2s < (\pi 2p_x = \pi 2p_y) < (\pi^* 2p_x = \pi^* 2p_y) < \sigma 2p_z < \sigma^* 2p_z$$

D.

$$\sigma 1s < \sigma^* 1s < \sigma 2s < \sigma^* 2s < (\pi 2p_x = \pi 2p_y) < \sigma 2p_z < (\pi^* 2p_x = \pi^* 2p_y) < \sigma^* 2p_z$$

Answer: D**Solution:**For molecules like B_2 , C_2 , N_2 etc. the increasing order of energies of various molecular orbitals is

$$\sigma 1s < \sigma^* 1s < \sigma 2s < \sigma^* 2s < (\pi 2p_x = \pi 2p_y) < \sigma 2p_z < (\pi^* 2p_x = \pi^* 2p_y) < \sigma^* 2p_z$$

Question10**Amongst the following the total number of species NOT having eight electrons around central atom in its outermost shell, is** NH_3 , AlCl_3 , BeCl_2 , CCl_4 , PCl_5 :**[NEET 2023]****Options:**

A.

2

B.

4

C.

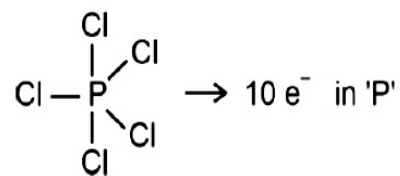
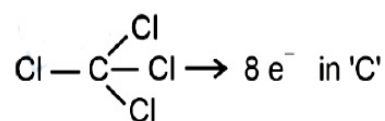
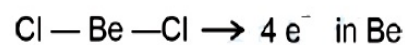
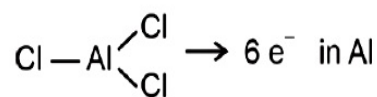
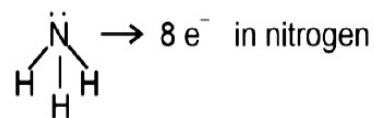
1

D.

3

Answer: D

Solution:



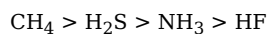
Question 11

The correct order of dipole moments for molecules NH_3 , H_2S , CH_4 and HF , is:

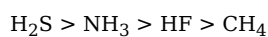
[NEET 2023 mpr]

Options:

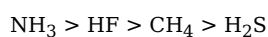
A.



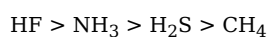
B.



C.

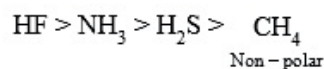


D.



Answer: D

Solution:



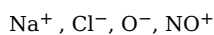
Question 12

Which one of the following represents all isoelectronic species?

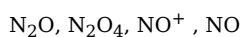
[NEET 2023 mpr]

Options:

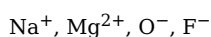
A.



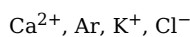
B.



C.



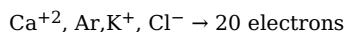
D.



Answer: D

Solution:

Total numbers electrons are same



Question 13

Which one of the following statements is incorrect related to Molecular Orbital Theory?

[NEET 2023 mpr]

Options:

A.

The π^* antibonding molecular orbital has a node between the nuclei.

B.

In the formation of bonding molecular orbital, the two electron waves of the bonding atoms reinforce each other.

C.

Molecular orbitals obtained from $2P_x$ and $2P_y$ orbitals are symmetrical around the bond axis.

D.

A π -bonding molecular orbital has larger electron density above and below the internuclear axis.

Answer: C

Solution:



In the formation of BMO, the two electron waves of the bonding atoms reinforce each other due to constructive interference.

Molecular orbitals obtained from $2P_x$ and $2P_y$ orbitals are 'unsymmetrical' around bond axis.

Question14

Given below are two statements:

Statement I :

Hydrated chlorides and bromides of Ca, Sr and Ba on heating undergo hydrolysis.

Statement II :

Hydrated chlorides and bromides of Be and Mg on heating undergo dehydration.

In the light of the above statements, choose the correct answer from the options given below :

[NEET 2023 mpr]

Options:

A.
Statement-I is correct but Statement-II is false.

B.
Statement-I is incorrect but Statement-II is true.

C.
Both Statement-I and Statement-II are true.

D.
Both Statement-I and Statement-II are false.

Answer: D

Solution:

Hydrated chlorides and Bromides of Ca, Sr and Ba are Ionic so undergo dehydration after heating. Hydrated chlorides and Bromides of Be and Mg are covalent so undergo hydrolysis on Heating.

Question15

List - I (molecules)	List - II(shape)
(a) NH_3	(i) square pyramidal
(b) ClF_3	(ii) trigonal bipyramidal
(c) PCl_5	(iii) trigonal pyramidal
(d) BrF_5	(iv) T-shape

Choose the correct answer from the options given below :
[NEET Re-2022]

Options:

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

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



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

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

Answer: C

Solution:

$\text{NH}_3 \rightarrow$ Trigonal pyramidal

$\text{ClF}_3 \rightarrow$ T-shape

$\text{PCl}_5 \rightarrow$ Trigonal bipyramidal

$\text{BrF}_5 \rightarrow$ Square pyramidal

Question 16

**The correct order of bond angles in the following compounds/ species is :
[NEET Re-2022]**

Options:

A. $\text{CO}_2 < \text{NH}_3 < \text{H}_2\text{O} < \text{NH}_4^+$

B. $\text{H}_2\text{O} < \text{NH}_3 < \text{NH}_4^+ < \text{CO}_2$

C. $\text{H}_2\text{O} < \text{NH}_4^+ < \text{NH}_3 < \text{CO}_2$

D. $\text{H}_2\text{O} < \text{NH}_4^+ = \text{NH}_3 < \text{CO}_2$

Answer: B

Solution:

$\text{CO}_2 \rightarrow 180^\circ$

$\text{NH}_4^+ \rightarrow 109.5^\circ$

$\text{NH}_3 \rightarrow 107^\circ$ (N atom has lone pair)

$\text{H}_2\text{O} : \rightarrow 104.5^\circ$ (oxygen atom has two lone pairs)

Due to lone pair-lone pair repulsions the bond angle in water decreases more.

Question 17

**Four gas cylinders containing He, N_2 , CO_2 and NH_3 gases separately are gradually cooled from a temperature of 500K. Which gas will liquify first ?
(Given T_c in K – He : 5.3, N_2 : 126, CO_2 : 304.1 and NH_3 : 405.5)**

[NEET Re-2022]

Options:

A. NH_3

B. He

C. N_2

D. CO_2

Answer: A

Solution:

Ease of Liquefaction \propto Critical Temperature

So, NH_3 will liquify first.

Question18

A vessel contains 3.2g of dioxygen gas at STP (273.15 K and 1 atm pressure). The gas is now transferred to another vessel at constant temperature, where pressure becomes one third of the original pressure. The volume of new vessel in L is:

(Given - molar volume at STP is 22.4L)

[NEET Re-2022]

Options:

A. 67.2

B. 6.72

C. 2.24

D. 22.4

Answer: B

Solution:

$$\text{Moles of oxygen} = \frac{3.2}{32} = 10^{-1} \text{ mole}$$

$$\text{Volume at STP} = 10^{-1} \times 22.4 = 2.24\text{L}$$

$$P_1 = 1 \text{ atm } V_1 = 2.24\text{L}$$

$$P_2 = \frac{1}{3} \text{ atm } V_2 = ?$$

$$P_1 V_1 = P_2 V_2$$

$$1 \times 2.24\text{L} = \frac{1}{3} \times V_2$$

$$V_2 = 3 \times 2.24\text{L} = 6.72\text{L}$$

Question19

Amongst the following which one will have maximum 'lone pair - lone pair' electron repulsions?

[NEET-2022]

Options:

A. ClF_3

B. IF_5

C. SF_4

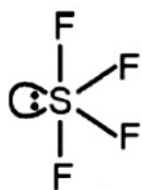
D. XeF_2

Answer: D

Solution:



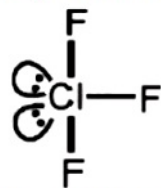
$SF_4 \rightarrow sp^3d + 1$ lone pair



$XeF_2 \rightarrow sp^3d + 3$ lone pair



$ClF_3 \rightarrow sp^3d + 2$ lone pair



$IF_5 \rightarrow sp^3d^2 + 1$ lone pair



XeF_2 having maximum lone pairs, so, it has maximum 'lone pair-lone pair' electron repulsions.

Question20

Which amongst the following is incorrect statement?
[NEET-2022]

Options:

- A. The bond orders of O_2^+ , O_2 , O_2^- and O_2^{2-} are 2.5, 2, 1.5 and 1, respectively
- B. C_2 molecule has four electrons in its two degenerate π molecular orbitals
- C. H_2^+ ion has one electron
- D. O_2^+ ion is diamagnetic

Answer: D

Solution:

Solution:

Due to one unpaired electron in $\pi^* 2p$ molecular orbital, O_2^- is a paramagnetic ion.

Question21

BF_3 is planar and electron deficient compound. Hybridization and number of electrons around the central atom, respectively are :
[NEET 2021]

Options:

- A. sp^3 and 4



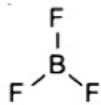
B. sp^3 and 6

C. sp^2 and 6

D. sp^2 and 8

Answer: C

Solution:



- Number of electrons around boron atom is 6.
- Hybridization of B is sp^2 .
- Shape is trigonal planar.

Question22

Match List-I with List-II.

List-I	List-II
(a) PCl_5	(i) Square pyramidal
(b) SF_6	(ii) Trigonal planar
(c) BrF_5	(iii) Octahedral
(d) BF_3	(iv) Trigonal bipyramidal

Choose the correct answer from the options given below.
[NEET 2021]

Options:

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

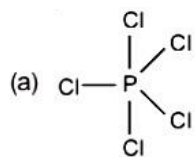
B. (a)-(ii), (b)-(iii), (c)-(iv), (d)-(i)

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

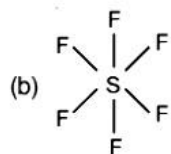
D. (a)-(iv), (b)-(iii), (c)-(ii), (d)-(i)

Answer: A

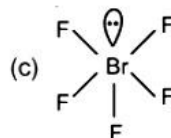
Solution:



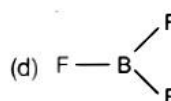
sp^3d hybridised and trigonal bipyramidal in shape



sp^3d^2 hybridised and octahedral in shape



sp^3d^2 hybridised and square pyramidal in shape



sp^2 hybridised and trigonal planar in shape

Question23

The correct sequence of bond enthalpy of 'C—X' bond is :
[NEET 2021]

Options:

- A. $\text{CH}_3\text{-F} < \text{CH}_3\text{-Cl} < \text{CH}_3\text{-Br} < \text{CH}_3\text{-I}$
- B. $\text{CH}_3\text{-F} > \text{CH}_3\text{-Cl} > \text{CH}_3\text{-Br} > \text{CH}_3\text{-I}$
- C. $\text{CH}_3\text{-F} < \text{CH}_3\text{-Cl} > \text{CH}_3\text{-Br} > \text{CH}_3\text{-I}$
- D. $\text{CH}_3\text{-Cl} > \text{CH}_3\text{-F} > \text{CH}_3\text{-Br} > \text{CH}_3\text{-I}$

Answer: B

Solution:

Solution:

The size of halogen atom increases from F to I hence bond length from C – F to C – I increases
∴ Bond enthalpy from $\text{CH}_3\text{-F}$ to $\text{CH}_3\text{-I}$ decreases

C – X Bond	Bond dissociation enthalpies/ kJ mol^{-1}
$\text{CH}_3\text{-F}$	452
$\text{CH}_3\text{-Cl}$	351
$\text{CH}_3\text{-Br}$	293
$\text{CH}_3\text{-I}$	234

Question24

Which of the following molecules is non-polar in nature?
[NEET 2021]

Options:

- A. POCl_3
- B. CH_2O
- C. SbCl_5
- D. NO_2

Answer: C

Solution:

Solution:

Net vector summation of bond moments will be zero so SbCl_5 is a non-polar molecule.

Question25

Which of the following set of molecules will have zero dipole moment?
[2020]

Options:

- A. Boron trifluoride, hydrogen fluoride, carbon dioxide, 1,3-dichlorobenzene
- B. Nitrogen trifluoride, beryllium difluoride, water, 1,3-dichlorobenzene
- C. Boron trifluoride, beryllium difluoride, carbon dioxide, 1,4-dichlorobenzene
- D. Ammonia, beryllium difluoride, water, 1,4-dichlorobenzene

Answer: C

Solution:

Solution:
(c) BF_3 , BeF_2 , CO_2 and 1, 4-dichlorobenzene all are symmetrical molecules.

Question26

**Identify a molecule which does not exist.
[2020]**

Options:

- A. Li_2
- B. C_2
- C. O_2
- D. He_2

Answer: D

Solution:

(d) For He molecule, Electronic configuration is $\sigma 1s^2, \sigma^* 1s^2$
Bond order = $\frac{1}{2}(N_b - N_a) = \frac{1}{2}(2 - 2) = 0$
since, bond order of He_2 is zero, so it does not exist.

Question27

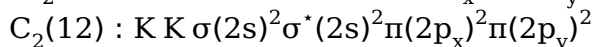
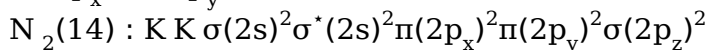
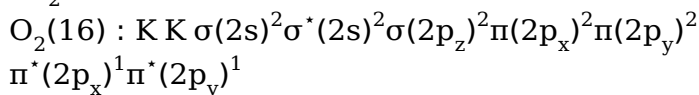
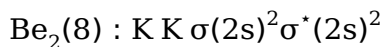
**Which of the following diatomic molecular species has only π bonds according to Molecular Orbital Theory?
(NEET 2019)**

Options:

- A. Be_2
- B. O_2
- C. N_2
- D. C_2

Answer: D

Solution:



Therefore, C_2 contains 2π bonds as it has electrons in two pi-molecular orbitals.

Question28

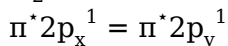
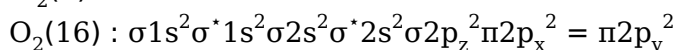
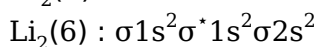
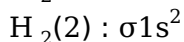
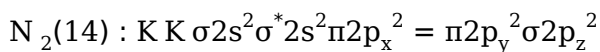
Which of the following is paramagnetic?
(Odisha NEET 2019)

Options:



Answer: D

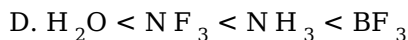
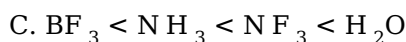
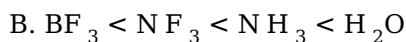
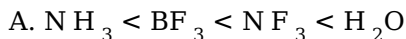
Solution:



Question29

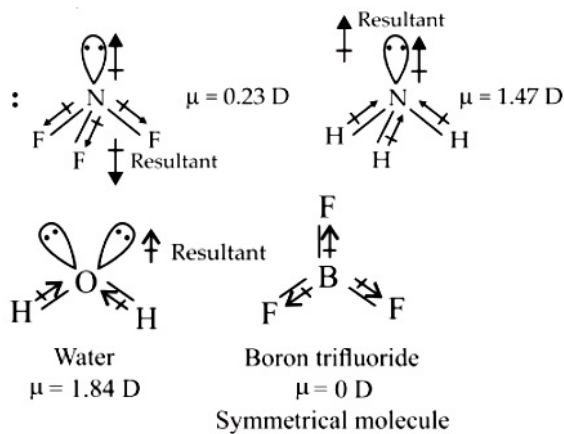
Which of the following is the correct order of dipole moment?
(Odisha NEET 2019)

Options:



Answer: B

Solution:



Question30

Consider the following species : CN^+ , CN^- , NO and CN . Which one of these will have the highest bond order?
(NEET 2018)

Options:

- A. NO
- B. CN^-
- C. CN^+
- D. CN

Answer: B

Solution:

Solution:
 $\text{NO} : (\sigma 1s)^2, (\sigma^* 1s)^2, (\sigma 2s)^2, (\sigma^* 2s)^2, (\sigma 2p_z)^2, (\pi 2p_x)^2 = (\pi 2p_y)^2, (\pi^* 2p_x)^1 = (\pi^* 2p_y)^0$

$$\text{B.O.} = \frac{10 - 5}{2} = 2.5$$

$\text{CN}^- : (\sigma 1s)^2, (\sigma^* 1s)^2, (\sigma 2s)^2, (\sigma^* 2s)^2, (\pi 2p_x)^2 = (\pi 2p_y)^2, (\sigma 2p_z)^2$

$$\text{B.O.} = \frac{10 - 4}{2} = 3$$

$\text{CN} : (\sigma 1s)^2, (\sigma^* 1s)^2, (\sigma 2s)^2, (\sigma^* 2s)^2, (\pi 2p_x)^2 = (\pi 2p_y)^2, (\sigma 2p_z)^1$

$$\text{B.O.} = \frac{9 - 4}{2} = 2.5$$

$\text{CN}^+ : (\sigma 1s)^2, (\sigma^* 1s)^2, (\sigma 2s)^2, (\sigma^* 2s)^2, (\pi 2p_x)^2 = (\pi 2p_y)^2$

$$\text{B.O.} = \frac{8 - 4}{2} = 2$$

Hence, CN^- has highest bond order.

Question31

In the structure of ClF_3 , the number of lone pairs of electrons on central atom 'Cl' is
(NEET 2018)

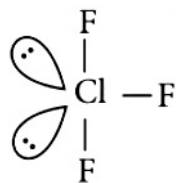
Options:

- A. one
- B. two
- C. four
- D. three.

Answer: B

Solution:

The structure of ClF_3 is



Hence, Cl has 2 lone pairs of electrons.

Question32

Which of the following pairs of compounds is isoelectronic and isostructural?
(NEET 2017)

Options:

- A. $\text{TeI}_2, \text{XeF}_2$
- B. $\text{IBr}_2^-, \text{XeF}_2$
- C. $\text{IF}_3, \text{XeF}_2$
- D. $\text{BeCl}_2, \text{XeF}_2$
- E. None of the above

Answer: E

Solution:

Species	No. of electrons	Structure
TeI_2	158	Bent
XeF_2	72	Linear
IBr_2^-	124	Linear
XeF_2	72	Linear
IF_3	80	T-Shaped
XeF_2	72	Linear
BeCl_2	38	Linear
XeF_2	72	Linear

Note : In this question, in place of isoelectronic there should be same number of valence electrons.

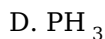
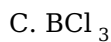
Question33

The species, having bond angles of 120° is
(NEET 2017)

Options:

- A. ClF_3

©



Answer: C

Solution:

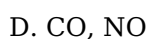
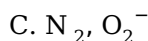
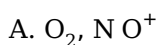
Solution:

BCl_3 -Trigonal planar, sp^2 -hybridised, 120° angle.

Question34

Which one of the following pairs of species have the same bond order?
(NEET 2017)

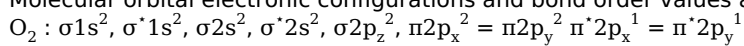
Options:



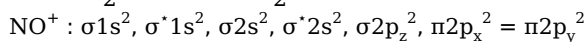
Answer: B

Solution:

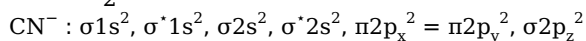
Molecular orbital electronic configurations and bond order values are :



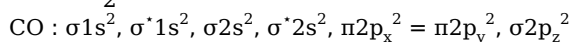
$$\text{B.O.} = \frac{1}{2}(\text{N}_b - \text{N}_a) = \frac{1}{2}(10 - 6) = 2$$



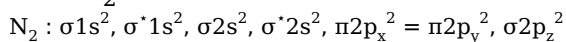
$$\text{B.O.} = \frac{1}{2}(10 - 4) = 3$$



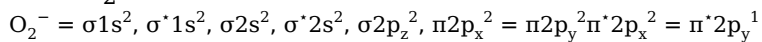
$$\text{B.O.} = \frac{1}{2}(10 - 4) = 3$$



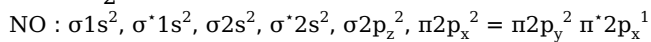
$$\text{B.O.} = \frac{1}{2}(10 - 4) = 3$$



$$\text{B.O.} = \frac{1}{2}(10 - 4) = 3$$



$$\text{B.O.} = \frac{1}{2}(10 - 7) = 1.5$$



$$\text{B.O.} = \frac{1}{2}(10 - 5) = 2.5$$

Question35

Which one of the following compounds shows the presence of intramolecular hydrogen bond?
(NEET-II 2016)

Options:

- A. H_2O_2
- B. HCN
- C. Cellulose
- D. Concentrated acetic acid

Answer: C

Solution:

H_2O_2 , HCN and conc. CH_3COOH form intermolecular hydrogen bonding while cellulose has intramolecular hydrogen bonding.

Question36

The hybridizations of atomic orbitals of nitrogen in NO_2^+ , NO_3^- and NH_4^+ respectively are (NEET-II 2016)

Options:

- A. sp, sp^3 and sp^2
- B. sp^2 , sp^3 and sp
- C. sp, sp^2 and sp^3
- D. sp^2 , sp and sp^3

Answer: C

Solution:

Solution:

$$X = \frac{1}{2}(\text{VE} + \text{MA} - c + a)$$

$$\text{For } \text{NO}_2^+, X = \frac{1}{2}(5 + 0 - 1) = 2 \text{ i.e., sp hybridisation}$$

$$\text{For } \text{NO}_3^-, X = \frac{1}{2}(5 + 0 + 1) = 3 \text{ i.e., } \text{sp}^2 \text{ hybridisation}$$

$$\text{For } \text{NH}_4^+, X = \frac{1}{2}(5 + 4 - 1) = 4 \text{ i.e., } \text{sp}^3 \text{ hybridisation}$$

Question37

Which of the following pairs of ions is isoelectronic and isostructural? (NEET-II 2016)

Options:

- A. CO_3^{2-} , NO_3^-
- B. ClO_3^- , CO_3^{2-}
- C. SO_3^{2-} , NO_3^-
- D. ClO_3^- , SO_3^{2-}

Answer: D

Solution:

(a) CO_3^{2-} : $6 + 24 + 2 = 32$; sp^2 ; trigonal planar



NO_3^- : $7 + 24 + 1 = 32$; sp^2 ; trigonal planar

Hence, these are isoelectronic as well as isostructural.

(b) ClO_3^- : $17 + 24 + 1 = 42$; sp^3 , trigonal pyramidal

CO_3^{2-} : $6 + 24 + 2 = 32$; sp^2 , trigonal planar

Hence, these are neither isoelectronic nor isostructural.

(c) SO_3^{2-} : $16 + 24 + 2 = 42$; sp^3 , trigonal pyramidal

NO_3^- : $7 + 24 + 1 = 32$; sp^2 , trigonal planar

These are neither isoelectronic nor isostructural

(d) ClO_3^- : $17 + 24 + 1 = 42$; sp^3 , trigonal pyramidal

SO_3^{2-} : $16 + 24 + 2 = 42$; sp^3 , trigonal pyramidal

Hence, these are isoelectronic as well as isostructural.

Question 38

The correct geometry and hybridization for XeF_4 are
(NEET - II 2016)

Options:

A. octahedral, sp^3d^2

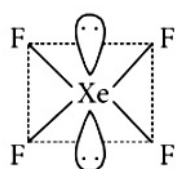
B. trigonal bipyramidal, sp^3d

C. planar triangle, sp^3d^3

D. square planar, sp^3d^2

Answer: A

Solution:



sp^3d^2 hybridisation
(octahedral geometry, square planar shape)

Question 39

Among the following, which one is a wrong statement?
(NEET-II 2016)

Options:

A. PH_5 and BiCl_5 do not exist.

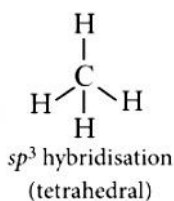
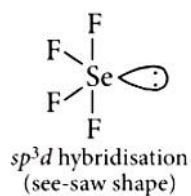
B. $\text{p}\pi - \text{d}\pi$ bonds are present in SO_2 .

C. SeF_4 and CH_4 have same shape.

D. I_3^+ has bent geometry.

Answer: C

Solution:



Question40

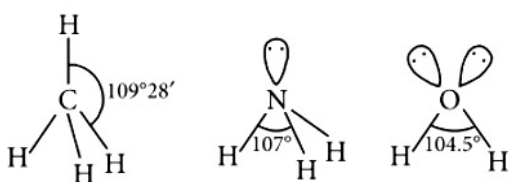
Consider the molecules CH_4 , NH_3 and H_2O Which of the given statements is false?
(NEET- I 2016)

Options:

- A. The $H - O - H$ bond angle in H_2O is smaller than the $H - N - H$ bond angle in NH_3 .
- B. The $H - C - H$ bond angle in CH_4 , is larger than the $H - N - H$ bond angle in NH_3
- C. The $H - C - H$ bond angle in CH_4 , the $H - N - H$ bond angle in NH_3 , and the $H - O - H$ bond angle in H_2O are all greater than 90° .
- D. The $H - O - H$ bond angle in H_2O is larger than the $H - C - H$ bond angle in CH_4

Answer: D

Solution:



Question41

Predict the correct order among the following :
(NEET - I 2016)

Options:

- A. bond pair-bond pair > lone pair - bond pair lone pair - lone pair
- B. lone pair - bond pair > bond pair - bond pair > lone pair - lone pair
- C. lone pair - lone pair > lone pair - bond pair bond pair - bond pair
- D. lone pair - lone pair > bond pair - bond pair > lone pair - bond pair

Answer: C

Solution:

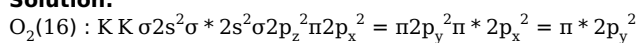
Solution:
According to VSEPR theory, the repulsive forces between lone pair and lone pair are greater than between lone pair and bond pair which are further greater than bond pair and bond pair.

Question42

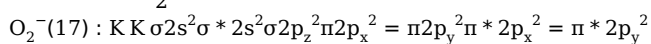
Decreasing order of stability of O_2 , O_2^- , O_2^+ and O_2^{2-} is
(2015)

Options:

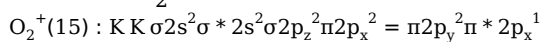
- A. $O_2^{2-} > O_2^- > O_2 > O_2^+$
 B. $O_2 > O_2^+ > O_2^{2-} > O_2^-$
 C. $O_2^- > O_2^{2-} > O_2^+ > O_2$
 D. $O_2^+ > O_2 > O_2^- > O_2^{2-}$

Answer: D**Solution:****Solution:**

$$\text{Bond order} = \frac{1}{2}(8 - 6) = 1$$



$$\text{Bond order} = \frac{1}{2}(8 - 5) = 1.5$$



$$\text{Bond order} = \frac{1}{3}(8 - 3) = 2.5$$

As, bond order \ll stability

The decreasing order of stability is $O_2^+ > O_2 > O_2^- > O_2^{2-}$

Question43

In which of the following pairs, both the species are not isostructural? (2015)

Options:

- A. Diamond, Silicon carbide
 B. NH_3 , PH_3
 C. XeF_4 , XeO_4
 D. $SiCl_4$, PCl_4

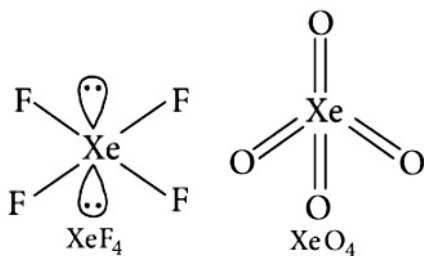
Answer: C**Solution:**

In diamond and silicon carbide, central atom is sp^3 hybridised and hence, both are isostructural.

NH_3 and PH_3 , both are pyramidal and central atom in both cases is sp^3 hybridised

$SiCl_4$ and PCl_4^+ , both are tetrahedral and central atom in both cases is sp^3 hybridised

In XeF_4 , Xe is sp^3d^2 hybridised and structure is square planar while in XeO_4 , Xe is sp^3 hybridised and structure is tetrahedral

**Question44**

Maximum bond angle at nitrogen is present in which of the following?

(2015 Cancelled)

Options:

- A. NO_2^+
- B. NO_3^-
- C. NO_2
- D. NO_2^-

Answer: A

Solution:

Species	NO_3^-	NO_2	NO_2^-	NO_2^+
Hybridisation	sp^2	sp^2	sp^2	sp(linear)
Bond angle	120°	134°	115°	180°

So, NO_2^+ has maximum bond angle

Question45

**Which of the following options represents the correct bond order?
(2015)**

Options:

- A. $\text{O}_2^- > \text{O}_2 < \text{O}_2^+$
- B. $\text{O}_2^- < \text{O}_2 > \text{O}_2^+$
- C. $\text{O}_2^- > \text{O}_2 > \text{O}_2^+$
- D. $\text{O}_2^- < \text{O}_2 < \text{O}_2^+$

Answer: D

Solution:

$$\text{O}_2^- < \text{O}_2 < \text{O}_2^+$$

B.O : 1.5 2.0 2.5

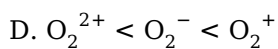
Question46

**The correct bond order in the following species is
(2015 Cancelled)**

Options:

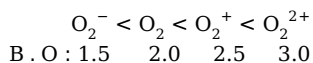
- A. $\text{O}_2^+ < \text{O}_2^- < \text{O}_2^{2+}$
- B. $\text{O}_2^- < \text{O}_2^+ < \text{O}_2^{2+}$
- C. $\text{O}_2^{2+} < \text{O}_2^+ < \text{O}_2^-$





Answer: B

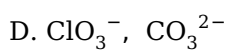
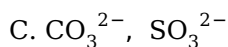
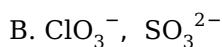
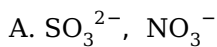
Solution:



Question47

Which of the following pairs of ions are isoelectronic and isostructural? (2015)

Options:



Answer: B

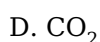
Solution:

Species	Hybridisation	Shape	No. of e^-s
SO_3^{2-}	sp^3	Pyramidal	42
ClO_3^-	sp^3	Pyramidal	42
CO_3^{2-}	sp^2	Triangularplanar	32
NO_3^-	sp^2	Triangular planar	32

Question48

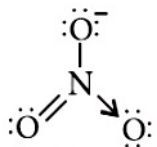
Which one of the following species has plane triangular shape? (2014)

Options:



Answer: B

Solution:



(sp^2 -hybridised, trigonal planar)

Question49

Which of the following molecules has the maximum dipole moment?
(2014)

Options:

- A. CO_2
- B. CH_4
- C. NH_3
- D. NF_3

Answer: C

Solution:

In NH_3 , H is less electronegative than N and hence dipole moment of each N—H bond is towards N and create high net dipole moment whereas in NF_3 , F is more electronegative than N, the dipole moment of each N—F bond is opposite to that of lone pair, hence reducing the net dipole moment.

Question50

Dipole-induced dipole interactions are present in which of the following pairs?
(NEET 2013)

Options:

- A. HCl and He atoms
- B. SiF_4 and He atoms
- C. H_2O and alcohol
- D. Cl_2 and CCl_4

Answer: A

Solution:

HCl is polar ($\mu \neq 0$) and He is non-polar ($\mu = 0$) gives dipole-induced dipole interaction.

Dipole-induced dipole forces /interactions are those which take place between a polar and a non polar molecule or with an atom. H_2O and Alcohol both are polar, thus this is not an example of Dipole-Induce dipole. While HCl is a polar while helium is non-polar, thus it is an example of Dipole induce dipole. SiF_4 and He atom are both non polar. Cl_2 and CCl_4 are both non-polar molecule. (In CCl_4 chlorine atoms are bonded symmetrically with the carbon central atom thus it is non-polar similarly SiF_4 is also non-polar)

Question51



Which of the following is paramagnetic?
(NEET 2013)

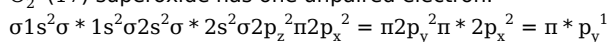
Options:

- A. CN^-
- B. NO^+
- C. CO
- D. O_2^-

Answer: D

Solution:

O_2^- (17) superoxide has one unpaired electron.



Question 52

Which of the following is a polar molecule?
(NEET 2013)

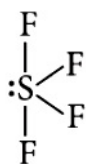
Options:

- A. SiF_4
- B. XeF_4
- C. BF_3
- D. SF_4

Answer: D

Solution:

SF_4 has sp^2d hybridisation and see-saw shape with (4bp+1lp)



and resultant $\mu \neq 0$

Question 53

XeF_2 is isostructural with
(NEET 2013)

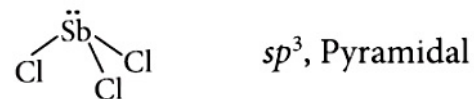
Options:

- A. SbCl_3
- B. BaCl_2
- C. TeF_2
- D. ICl_2^-



Answer: D

Solution:



Question 54

**Which of the following is electron-deficient?
(NEET 2013)**

Options:

- A. $(\text{BH}_3)_2$
- B. PH_3
- C. $(\text{CH}_3)_2$
- D. $(\text{SiH}_3)_2$

Answer: A

Solution:

Solution:
Boron hydrides are electron deficient compounds.

Question 55

**The pair of species that has the same bond order in the following is
(Karnataka NEET 2013)**

Options:

- A. CO , NO^+
- B. NO^- , CN^-
- C. O_2 , N_2
- D. O_2 , B_2

Answer: A

Solution:

$\text{CO} = 6 + 8 = 14$ electrons
 $\text{NO}^+ = 7 + 8 - 1 = 14$ electrons
Electronic configuration of NO^+ :
 $\sigma 1s^2 \sigma^* 1s^2 \sigma 2s^2 \sigma^* 2s^2 \sigma 2p_z^2 \pi 2p_x^2 \pi 2p_y^2$



Electronic configuration of CO :
 $\sigma 1s^2 \sigma^* 1s^2 \sigma 2s^2 \sigma^* 2s^2 \pi 2p_x^2 \pi 2p_y^2 \sigma 2p_z^2$
So, both have bond order = $\frac{10-4}{2} = 3$

Question56

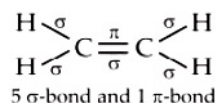
The outer orbitals of C in ethene molecule can be considered to be hybridized to give three equivalent sp^2 orbitals. The total number of sigma (σ) and pi (π) bonds in ethene molecule is
(Karnataka NEET 2013)

Options:

- A. 3 sigma (σ) and 2 pi (π) bonds
- B. 4sigma(σ) and 1pi(π) bonds
- C. 5 sigma (σ) and 1 pi (π) bonds
- D. 1 sigma (σ) and 2 pi (π) bonds.

Answer: C

Solution:



Question57

In which of the following pairs both the species have sp^3 hybridization?
(Karnataka NEET 2013)

Options:

- A. SiF_4 , BeH_2
- B. NF_3 , H_2O
- C. NF_3 , BF_3
- D. H_2S , BF_3

Answer: B

Solution:

NF_3 and H_2O are sp^3 -hybridised.

Question58

In which of the following ionization processes the bond energy increases and the magnetic behaviour changes from paramagnetic to diamagnetic?
(Karnataka NEET 2013)

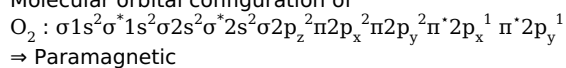
Options:

- A. $O_2 \rightarrow O_2^+$
 B. $C_2 \rightarrow C_2^+$
 C. $NO \rightarrow NO^+$
 D. $N_2 \rightarrow N_2^+$

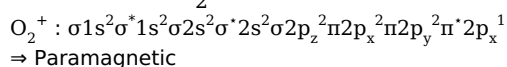
Answer: C

Solution:

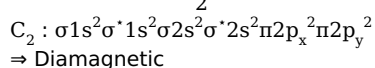
Molecular orbital configuration of



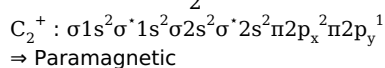
Bond order = $\frac{10 - 6}{2} = 2$



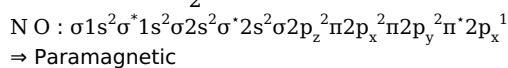
Bond order = $\frac{10 - 5}{2} = 2.5$



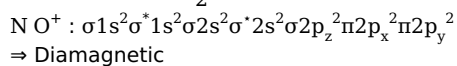
Bond order = $\frac{8 - 4}{2} = 2$



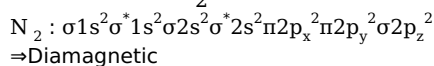
Bond order = $\frac{7 - 4}{2} = 1.5$



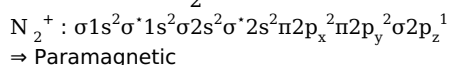
Bond order = $\frac{10 - 5}{2} = 2.5$



Bond order = $\frac{10 - 4}{2} = 3$



Bond order = $\frac{10 - 4}{2} = 3$



Bond order = $\frac{9 - 4}{2} = 2.5$

Question 59

Four diatomic species are listed below. Identify the correct order in which the bond order is increasing in them (2008, 2012 M)

Options:

- A. $NO < O_2^- < C_2^{2-} < He_2^+$
 B. $O_2^- < NO < C_2^{2-} < He_2^+$
 C. $C_2^{2-} < He_2^+ < O_2^- < NO$
 D. $He_2^+ < O_2^- < NO < C_2^{2-}$

Answer: D

Solution:

Diatomic species	Bond order
NO	2.5
O_2^-	1.5
C_2^{2-}	3.0
He_2^+	0.5

Thus increasing order : $He_2^+ < O_2^- < NO < C_2^{2-}$

Question60

**During change of O_2 to O_2^- ion, the electron adds on which one of the following orbitals?
(Mains 2012)**

Options:

- A. π^* orbital
- B. π orbital
- C. σ^* orbital
- D. σ orbital

Answer: A

Solution:

Electronic configuration of O_2
 $\sigma(1s)^2, \sigma^*(1s)^2, \sigma(2s)^2, \sigma^*(2s)^2, \sigma(2p_z)^2, \pi(2p_x)^2, \pi(2p_y)^2, \pi^*(2p_x)^1, \pi^*(2p_y)^1$

Thus the incoming electron will enter in $\pi^* 2p_x$ to form O_2^-

Question61

**The pair of species with the same bond order is
(2012)**

Options:

- A. O_2^{2-}, B_2
- B. O_2^+, NO^+
- C. NO, CO
- D. N_2, O_2

Answer: A

Solution:

$O_2^{2-} \rightarrow 1$ $B_2 \rightarrow 1$
 $O_2^+ \rightarrow 2.5$ $NO^+ \rightarrow 3$
 $NO \rightarrow 2.5$ $CO \rightarrow 3$

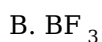
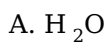


Question62

Which of the following species contains three bond pairs and one lone pair around the central atom?

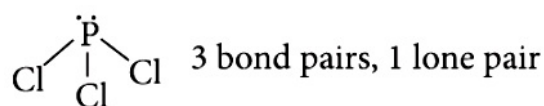
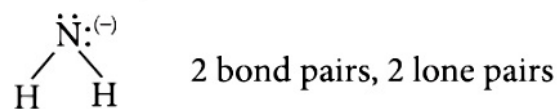
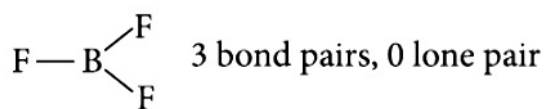
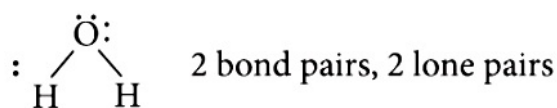
(2012)

Options:



Answer: D

Solution:

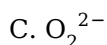


Question63

Bond order of 1.5 is shown by

(2012)

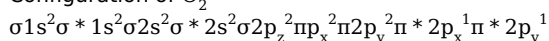
Options:



Answer: B

Solution:

Configuration of O_2



Bond order = $\frac{\text{No. of } e^- \text{ in bonding M.O} - \text{No. of } e^- \text{ in antibonding M.O}}{2}$

$$\text{Bond order of } O_2^+ = \frac{10-5}{2} = 2.5$$

$$\text{Bond order of } O_2^- = \frac{10-7}{2} = 1.5$$

$$\text{Bond order of } O_2^{2-} = \frac{10-8}{2} = 1.0$$

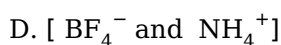
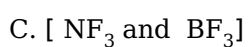
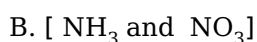
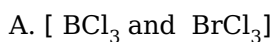
$$\text{Bond order of } O_2 = \frac{10-6}{2} = 2$$

Question64

Which one of the following pairs is isostructural (i.e., having the same shape and hybridization)?

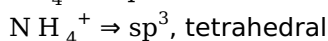
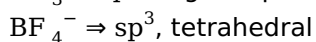
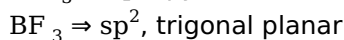
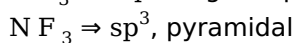
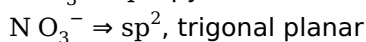
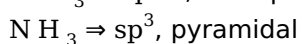
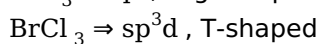
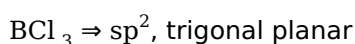
(2012)

Options:



Answer: D

Solution:

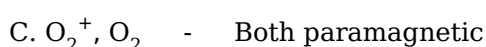


Question65

The pairs of species of oxygen and their magnetic behaviour are noted below. Which of the following presents the correct description?

(2011 Mains)

Options:



Answer: C

Solution:

O_2^+ and O_2 are paramagnetic in nature as they contain one and two unpaired electrons respectively.



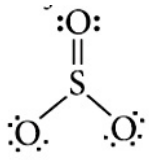
Question66

Which of the following structures is the most preferred and hence of lowest energy for SO_3 ?

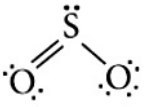
(Mains 2011)

Options:

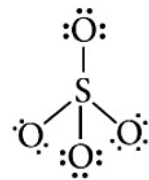
A.



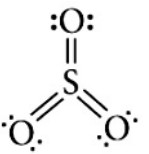
B.



C.

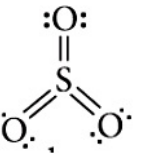


D.



Answer: D

Solution:



has maximum number of covalent bonds.

Question67

The correct order of increasing bond length of C - H, C - O, C - C and C=C is (2011)

Options:

A. C-H < C=C < C-O < C-C

B. C-C < C=C < C-O < C-H

C. C-O < C-H < C-C < C=C

D. C-H < C-O < C-C < C=C

Answer: A

Solution:

Increasing order of bond length is
 $C-H < C=C < C-O < C-C$
107 pm 134pm 141 pm 154 pm

Question68

Which of the two ions from the list given below that have the geometry that is explained by the same hybridization of orbitals, NO_2^- , NO_3^- , NH_2^- , NH_4^+ , SCN^- ?

(2011)

Options:

- A. NO_2^- and NO_3^-
- B. NH_4^+ and NO_3^-
- C. SCN^- and NH_2^-
- D. NO_2^- and NH_2^-

Answer: A

Solution:

Ions	Hybridisation
NO_2^-	sp^2
NO_3^-	sp^2
NH_2^-	sp^3
NH_4^+	sp^3
SCN^-	sp

Question69

Which of the following has the minimum bond length ?
(2011)

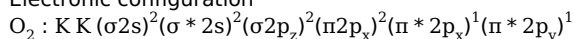
Options:

- A. O_2^+
- B. O_2^-
- C. O_2^{2-}
- D. O_2

Answer: A

Solution:

Electronic configuration



$$\text{Bond order} = \frac{1}{2}(8 - 4) = 2$$

$$\text{O}_2^+ \text{ Bond order} = \frac{1}{2}(8 - 3) = 2\frac{1}{2}$$

$$\text{O}_2^- \text{ Bond order} = \frac{1}{2}(8 - 5) = 1\frac{1}{2}$$

$$\text{O}_2^{2-} \text{ Bond order} = \frac{1}{2}(8 - 6) = 1$$

As bond order increases, bond length decreases.

Question 70

Some of the properties of the two species, NO_3^- and H_3O^+ are described below. Which one of them is correct?
(2010 Mains)

Options:

- A. Dissimilar in hybridization for the central atom with different structures
- B. Isostructural with same hybridization for the central atom
- C. Isostructural with different hybridization for the central atom
- D. Similar in hybridization for the central atom with different structures

Answer: A

Solution:

No. of electron pairs at the central atom

= No. of atoms bonded to it + $\frac{1}{2}$ [Group number of central atom - Valency of the central atom \pm no. of electrons]

No. of electron pairs at the central atom in NO_3^-

$$= 3 + \frac{1}{2}[5 - 6 + 1] = 3 \quad (\text{sp}^2 \text{ hybridisation})$$

No. of electron pairs at the central atom in H_3O^+

$$3 + \frac{1}{2}[6 - 3 - 1] = 4 \quad (\text{sp}^3 \text{ hybridisation})$$

Question 71

In which of the following molecules the central atom does not have sp^3 hybridization ?
(2010 Mains)

Options:

- A. CH_4
- B. SF_4
- C. BF_4^-
- D. NH_4^+

Answer: B

Solution:

For neutral molecules, No. of electron pairs = No. of atoms bonded to it + $\frac{1}{2}$ [Gp.no of central atom - Valency of central atom]

$$\therefore \text{For } \text{CH}_4 \text{ no of } e^- \text{ pairs} = 4 + \frac{1}{2}[4 - 4] = 4 (\text{sp}^3)$$

For SF_4 no of e^- pairs = $4 + \frac{1}{2}[6 - 4] = 5(\text{sp}^3\text{d})$

For ions,
No of electron pairs = NO of atoms bonded to it + $\frac{1}{2}[\text{G.P. no. of central atom} - \text{Valency of central atom} \pm \text{No of electrons}]$

\therefore For BF_4^- , no of e^- pairs = $4 + \frac{1}{2}[3 - 4 + 1] = 4(\text{sp}^3)$ hybridisation

For NH_4^+ , no of e^- pairs = $4 + \frac{1}{2}[5 - 4 - 1] = 4(\text{sp}^3)$ hybridisation

Question 72

In which one of the following species the central atom has the type of hybridization which is not the same as that present in the other three ?
(2010)

Options:

- A. SF_4
- B. I_3^-
- C. SbCl_5^{2-}
- D. PCl_5

Answer: C

Solution:

Hybridisation of the central atom can be calculated as:

$$H = \frac{1}{2}[(\text{No. of valence electrons in the central atom}) + (\text{No. of monovalent atoms around central atom}) - (\text{Charge on cation}) + (\text{Charge on anion})]$$

After calculation of hybridisation of the central atom we find that all the given species except $[\text{SbCl}_5]^{2-}$ have central atom with sp^3d (corresponding $H=5$) hybridization, In $[\text{SbCl}_5]^{2-}$, Sb is sp^3d^2 hybridized.

Question 73

Which one of the following species does not exist under normal conditions?
(2010)

Options:

- A. Be_2^+
- B. Be_2
- C. B_2
- D. Li_2

Answer: B

Solution:

Be_2 does not exist

Be_2 has an electronic configuration : $\sigma 1s^2\sigma^* 1s^2\sigma^* 2s^2$

$$\therefore \text{Bond order} = \frac{4 - 4}{2} = 0$$

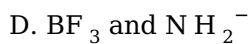
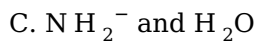
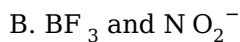
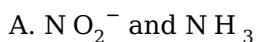
Thus, Be_2 does not exist



Question 74

In which of the following pairs of molecules/ions, the central atoms have sp^2 hybridisation?
(2010)

Options:



Answer: B

Solution:

Solution:

The hybridisation of the central atom can be calculated as

$$H = \frac{1}{2}[(\text{No. of electrons in valence shell of atom}) + (\text{No. of monovalent atoms around central atom}) - (\text{Charge on cation}) + (\text{Charge on anion})]$$

For

$$\text{For } \text{BF}_3, H = \frac{1}{2}[(3) + (3) - (0) + (0)] = 3$$

$\Rightarrow sp^2$ hybridisation

For

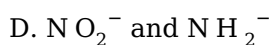
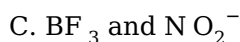
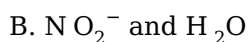
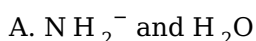
$$\text{For } \text{NO}_2^-, H = \frac{1}{2}[(5) + (0) - (0) + (1)] = 3$$

$\Rightarrow sp^2$ hybridisation

Question 75

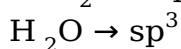
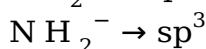
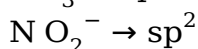
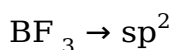
In which of the following molecules/ions BF_3 , NO_2^- , NH_2^- and H_2O , the central atom is sp^2 hybridised?
(2009)

Options:



Answer: C

Solution:

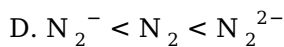
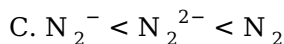
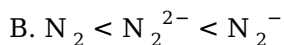
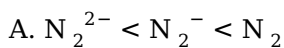


Question 76

According to MO theory which of the lists ranks the nitrogen species in terms of increasing bond order?

(2009)

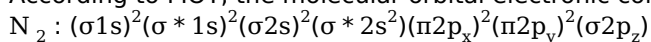
Options:



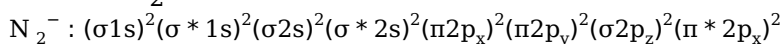
Answer: A

Solution:

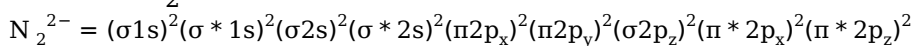
According to MOT, the molecular orbital electronic configuration of



$$\therefore B.O = \frac{10 - 4}{2} = 3$$



$$\therefore B.O = \frac{10 - 5}{2} = 2.5$$



$$\therefore B.O = \frac{10 - 6}{2} = 2. \text{ Hence the order : } N_2^{2-} < N_2^- < N_2$$

Question 77

What is the dominant intermolecular force or bond that must be overcome in converting liquid CH_3OH to a gas ?

(2009)

Options:

A. Dipole-dipole interaction

B. Covalent bonds

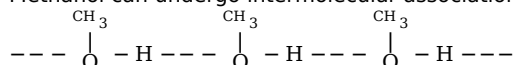
C. London dispersion force

D. Hydrogen bonding

Answer: D

Solution:

Methanol can undergo intermolecular association through H-bonding as the -OH group in alcohols is highly polarised.



As a result, in order to convert liquid CH_3OH to gaseous state the strong hydrogen bonds must be broken.

Question 78

The correct order of increasing bond angles in the following triatomic species is (2008)



Options:

- A. $\text{NO}_2^+ < \text{NO}_2 < \text{NO}_2^-$
- B. $\text{NO}_2^+ < \text{NO}_2^- < \text{NO}_2$
- C. $\text{NO}_2^- < \text{NO}_2^+ < \text{NO}_2$
- D. $\text{NO}_2^- < \text{NO}_2 < \text{NO}_2^+$

Answer: D

Solution:

Solution:

Structures of NO_2^- , NO_2 and NO_2^+

The correct order of increasing bond angles in the following triatomic species is $\text{NO}_2^- < \text{NO}_2 < \text{NO}_2^+$

Question 79

Four diatomic species are listed below in different sequences. Which of these presents the correct order of their increasing bond order? (2008)

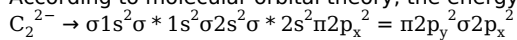
Options:

- A. $\text{C}_2^{2-} < \text{He}_2^+ < \text{NO} < \text{O}_2^-$
- B. $\text{He}_2^+ < \text{O}_2^- < \text{NO} < \text{C}_2^{2-}$
- C. $\text{O}_2^- < \text{NO} < \text{C}_2^{2-} < \text{He}_2^+$
- D. $\text{NO} < \text{C}_2^{2-} < \text{O}_2^- < \text{He}_2^+$

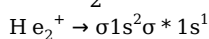
Answer: B

Solution:

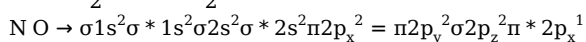
According to molecular orbital theory, the energy level of the given molecules are



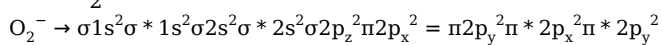
$B.O = \frac{1}{2}[10 - 4] = 3$



$B.O = \frac{1}{2}[2 - 1] = \frac{1}{2} = 0.5$

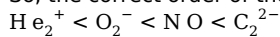


$B.O \rightarrow \frac{1}{2}[10 - 5] = 2.5$



$B.O = \frac{1}{2}[10 - 7] = 1.5$

So, the correct order of their increasing bond order is

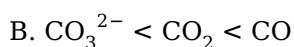


Question 80

The correct order of C - O bond length among CO , CO_3^{2-} , CO_2 is (2007)

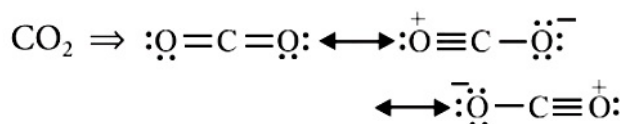
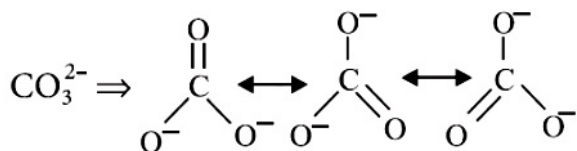
Options:

- A. $\text{CO} < \text{CO}_3^{2-} < \text{CO}_2$



Answer: C

Solution:

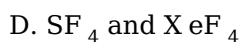
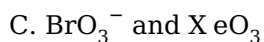
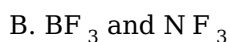
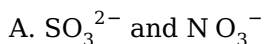


More single bond character in resonance hybrid, more is the bond length. Hence the increasing bond length is $\text{CO} < \text{CO}_2 < \text{CO}_3^{2-}$

Question81

In which of the following pairs, the two species are isostructural? (2007)

Options:



Answer: C

Solution:

Hybridisation of Br in BrO_3^- :

$$H = \frac{1}{2}(7 + 0 - 0 + 1) = 4 \text{ i.e. } sp^3 \text{ hybridisation}$$

Hybridisation of Xe in XeO_3 :

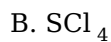
$$H = \frac{1}{2}(8 + 0 - 0 + 0) = 4 \text{ i.e. } sp^3 \text{ hybridisation}$$

In both BrO_3^- and XeO_3 , the central is sp^3 hybridised and contains one lone pair of electrons, hence in both the cases, the structure is trigonal pyramidal.

Question82

Which of the following is not isostructural with SiCl_4 (2006)

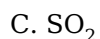
Options:

**Answer: B****Solution:****Solution:**

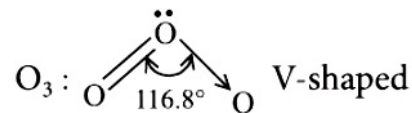
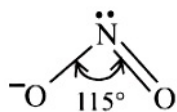
SCl_4 , NH_4^+ , SO_4^{2-} and PO_4^{3-} ions are the examples of molecules/ions which are of AB_4 and have tetrahedral structure SCl_4 is AB_4 (lone pair) type species. Although the arrangements of five sp^3d hybrid orbitals in space is trigonal bipyramidal, due to the presence of one lone pair of electron in the basal hybrid orbital, the shape of AB_4 (lone pair) species gets distorted and becomes distorted tetrahedral or see-saw.

Question 83

Which of the following species has a linear shape? (2006)

Options:**Answer: D****Solution:**

NO_2^- : Due to sp^2 hybridisation of N-atom and the presence of one lone pair on it, NO_2^- has angular shape.



SO_2 : Due to the presence of one lone pair of electrons in one of the three sp^2 - hybrid orbitals and sp^2 hybridisation of S or S^+ atom, SO_2 molecule has angular (V-shaped) structure



NO_2^+ : Due to sp hybridisation of N^+ , NO_2^+ ion has linear shape



Question 84

Which of the following is not a correct statement? (2006)

Options:

A. Multiple bonds are always shorter than corresponding single bonds

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- B. The electron-deficient molecules can act as Lewis acids
- C. The canonical structures have no real existence
- D. Every AB_5 molecule does in fact have square pyramid structure.

Answer: D

Solution:

For AB_5 molecules, there are three possible geometries i.e. planar pentagonal, square pyramidal and trigonal bipyramidal. Out of these three geometries, it is only trigonal pyramidal shape in which bond pair-bond pair repulsions are minimum and hence this geometry is the most probable geometry of AB_5 .

Question85

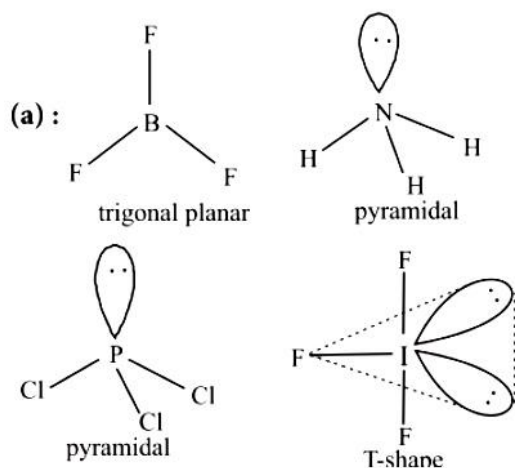
Which of the following molecules has trigonal planar geometry? (2005)

Options:

- A. BF_3
- B. NH_3
- C. PCl_3
- D. IF_3

Answer: A

Solution:



Question86

The correct order in which the O – O bond length increases in the following is (2005)

Options:

- A. $O_2 < H_2O_2 < O_3$
- B. $O_3 < H_2O_2 < O_2$
- C. $H_2O_2 < O_2 < O_3$

©



D. $O_2 < O_3 < H_2O_2$

Answer: D

Solution:

Solution:

Bond lengths of O – O in O_2 is 1.21Å, in H_2O_2 is 1.48Å and in O_3 is 1.28Å. Therefore, correct order of the O – O bond length is $H_2O_2 > O_3 > O_2$

Question87

The surface tension of which of the following liquid is maximum? (2005)

Options:

A. C_2H_5OH

B. CH_3OH

C. H_2O

D. C_6H_6

Answer: C

Solution:

Solution:

Hydrogen bonding in $H_2O > C_2H_5OH > CH_3OH$

Hence, H_2O has maximum surface tension.

Question88

Among the following, the pair in which the two species are not isostructural is (2004)

Options:

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

Solution:

Solution:

SiF_4 has symmetrical tetrahedral shape which is due to sp^3 hybridisation of the central silicon atom in its excited state configuration.

SF_4 has distorted tetrahedral or see-saw geometry which arises due to sp^3d hybridisation of central sulphur atom and due to the presence of one lone pair of electrons in one of the equatorial hybrid orbital.

Question89

In a regular octahedral molecule, MX_6 the number of X – M – X bonds at 180° is



(2004)

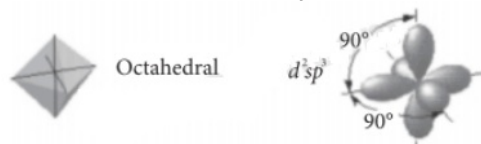
Options:

- A. three
- B. two
- C. six
- D. four.

Answer: A

Solution:

In octahedral molecule, six hybrid orbitals directed towards the corners of a regular octahedron with a bond angle of 90° .



According to this geometry, the number of X – M – X bonds at 180° must be three.

Question90

H_2O is dipolar, whereas BeF_2 is not. It is because
(2004)

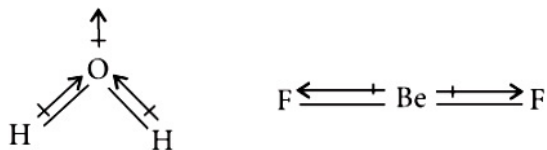
Options:

- A. the electronegativity of F is greater than that of O
- B. H_2O involves hydrogen bonding whereas BeF_2 is discrete bonding
- C. H_2O is linear and BeF_2 is angular
- D. H_2O is angular and BeF_2 is linear.

Answer: D

Solution:

Solution:
The overall value of the dipole moment of a polar molecule depends on its geometry and shape, i.e. vectorial addition of dipole moment of the constituent bonds. Water has angular structure with bond angle 105° as it has dipole moment. However BeF_2 is a linear molecule since dipole moment summation of all the bonds present in the molecule cancel each other.



Question91

In BrF_3 molecule, the lone pairs occupy equatorial positions to minimize
(2004)

Options:

- A. lone pair - bond pair repulsion only
- B. bond pair - bond pair repulsion only
- C. lone pair - lone pair repulsion and lone pair - bond pair repulsion

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D. lone pair - lone pair repulsion only.

Answer: D

Solution:

Solution:
Bent T-shaped geometry in which both lone pairs occupy the equatorial positions of the trigonal bipyramid. Here (lp - lp) repulsion = 0, (lp - bp) repulsion = 4 and (bp - bp) repulsion = 2

Question92

Which one of the following statements is not correct for sigma- and pi- bonds formed between two carbon atoms? (2003)

- Options:**
- A. Sigma-bond is stronger than a pi-bond.
 - B. Bond energies of sigma- and pi-bonds are of the order of 264kJ/mol and 347kJ/mol, respectively.
 - C. Free rotation of atoms about a sigma bond is allowed but not in case of a pi bond.
 - D. Sigma-bond determines the direction between carbon atoms but a pi-bond has no primary effect in this regard.

Answer: B

Solution:

We know C - C = 347kJ/mol
C = C = 619kJ/mol

Question93

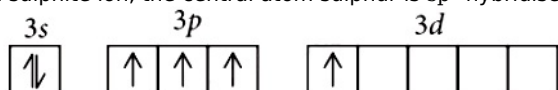
Which of the following has $\pi - d \pi$ bonding? (2002)

- Options:**
- A. NO_3^-
 - B. SO_3^{2-}
 - C. BO_3^{3-}
 - D. CO_3^{2-}

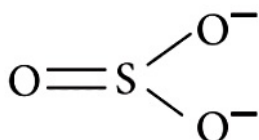
Answer: B

Solution:

In sulphite ion, the central atom sulphur is sp^3 hybridised. Electronic structure of S atom in excited state



The three p electrons form σ bonds with three oxygen atoms - with one position (of the tetrahedron) being occupied by a lone pair. The d electron (excluded from hybridisation) forms π bond with one oxygen atom. i.e. $\pi - d \pi$ bonding occurs.



Question94

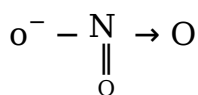
In NO_3^- ion number of bond pair and lone pair of electrons on nitrogen atom are (2002)

Options:

- A. 2,2
- B. 3,1
- C. 1,3
- D. 4,0

Answer: D

Solution:



In NO_3^- ion, Due to the presence of one negative charge, number of valence electrons = $5 + 1 = 6$.

One O-atom forms two bonds (= bond) and two O-atom are shared with two electrons of N atom Thus, 30 -atoms are shared with 8 electrons of N -atom.

Number of bond pairs (or shared pairs) = 4 Number of lone pairs = 0

Question95

Which of the following is isoelectronic? (2002)

Options:

- A. CO_2 , NO_2
- B. NO_2^- , CO_2
- C. CN^- , CO
- D. SO_2 , CO_2

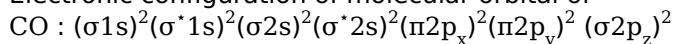
Answer: C

Solution:

In CO, the number of electrons

$$= 6 + 8 = 14 [Z \text{ of C} = 6 \text{ and O} = 8]$$

Electronic configuration of molecular orbital of



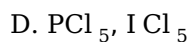
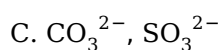
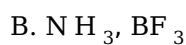
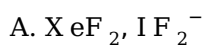
CN^- have also get $(6 + 7 + 1)14$ electrons and the configuration is similar to that of CO.

CN^- and CO are isoelectronic.

Question96

Which of the following two are isostructural? (2001)

Options:



Answer: A

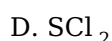
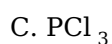
Solution:

Solution:
Compounds having same shape with same hybridisation are known as isostructural. $\text{XeF}_2, \text{IF}_2^- \rightarrow$ both are sp^3d hybridised linear molecules.

Question97

**In which of the following bond angle is maximum?
(2001)**

Options:



Answer: B

Solution:

Solution:
Bond angle is maximum in NH_4^+ tetrahedral molecule with bond angle 109°

Question98

**Nitrogen forms N_2 , but phosphorus does not form P_2 , however, it converts P_4 , reason is
(2001)**

Options:

A. triple bond present between phosphorus atom

B. $\text{p}\pi - \text{p}\pi$ bonding is weak

C. $\text{p}\pi - \text{p}\pi$ bonding is strong

D. multiple bonds form easily.

Answer: B

Solution:

Solution:
For strong π -bonding, $\text{p}\pi - \text{p}\pi$ bonding should be strong. In case of P, due to larger size as compared to N-atom, $\text{p}\pi - \text{p}\pi$ bonding is not so strong.



Question99

In $X - H \dots Y$, X and Y both are electronegative elements. Then (2001)

Options:

- A. electron density on X will increase and on H will decrease
- B. in both electron density will increase
- C. in both electron density will decrease
- D. on X electron density will decrease and on H increases.

Answer: A

Question100

$d\pi - p\pi$ bond present in (2000)

Options:

- A. CO_3^{2-}
- B. PO_4^{3-}
- C. NO_3^-
- D. NO_2^-

Answer: B

Solution:

In PO_4^{3-} , P atom has vacant d-orbitals, thus it can form $p\pi - d\pi$ bond. 'N' and 'C' have no vacant 'd' orbitals in their valence shell, so they cannot form such bond.

Question101

Right order of dissociation energy N_2 and N_2^+ is (2000)

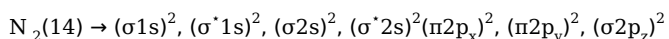
Options:

- A. $N_2 > N_2^+$
- B. $N_2 = N_2^+$
- C. $N_2^+ > N_2$
- D. none.

Answer: A



Solution:



$$\text{In } N_2, \text{ bond order} = \frac{N_b - N_a}{2} = \frac{10 - 4}{2} = 3$$

$$\text{In } N_2^+, \text{ bond order} = \frac{9 - 4}{2} = 2.5$$

As the bond order in N_2 is more than N_2^+ so the dissociation energy of N_2 is higher than N_2^+

Question102

**Which species does not exhibit paramagnetism?
(2000)**

Options:



Answer: C

Solution:

Solution:

In 'CO' (14 electrons), there is no unpaired electron in its molecular orbital. Therefore, this does not exhibit paramagnetism.

Question103

**The number of anti-bonding electron pairs in O_2^{2-} molecular ion on the basis of molecular orbital theory is (Atomic number of O is 8)
(1998)**

Options:

A. 3

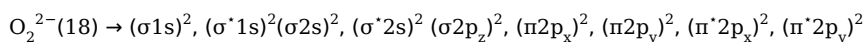
B. 2

C. 5

D. 4

Answer: D

Solution:



Thus, the no. of antibonding electrons in O_2^{2-} ion is 8(4 pairs)

Question104

In PO_4^{3-} ion, the formal charge on each oxygen atom and P – O bond order respectively are



(1998)

Options:

- A. $-0.75, 1.25$
- B. $-0.75, 1.0$
- C. $-0.75, 0.6$
- D. $-3, 1.25$

Answer: A

Solution:

The total charge = -3

So the average formal charge on each 'O' atom is $-3/4 = -0.75$

Again total no. of electrons in the valence shell of PO_4^{3-} ion = $5 + 8 = 13$

No. of electrons involved in bond formation in PO_4^{3-} ion = $13 - 3 = 10$

PO_4^{3-} ion = $13 - 3 = 10$

No. of bonds in $\text{PO}_4^{3-} = \frac{10}{2} = 5$

\Rightarrow Average P - O bond order = $\frac{5}{4} = 1.25$

Question 105

N_2 and O_2 are converted into monocations, N_2^+ and O_2^+ respectively. Which is wrong? (1997)

Options:

- A. In O_2^+ paramagnetism decreases.
- B. N_2^+ becomes diamagnetic.
- C. In N_2^+ , the N - N bond weakens.
- D. In O_2^+ , the O - O bond order increases.

Answer: B

Solution:

Diamagnetism is caused due to the absence of unpaired electrons. But in N_2^+ , there is unpaired electron. So, it is paramagnetic.

Question 106

N_2 and O_2 are converted into monocations, N_2^+ and O_2^+ respectively. Which is wrong? (1997)

Options:

- A. In O_2^+ paramagnetism decreases.
- B. N_2^+ becomes diamagnetic.



C. In N_2^+ , the N – N bond weakens.

D. In O_2^+ , the O – O bond order increases.

Answer: B

Question107

The bond length between hybridised carbon atom and other carbon atom is minimum in (1996)

Options:

A. propene

B. propyne

C. propane

D. butane.

Answer: B

Solution:

Solution:

The C-C bond length = 1.54\AA A C = C bond length = 1.34\AA and C \equiv C bond length = 1.20\AA since propyne has a triple bond, therefore it has minimum bond length.

Question108

Which of the following has sp^2 -hybridisation? (1996)

Options:

A. $BeCl_2$

B. C_2H_2

C. C_2H_6

D. C_2H_4

Answer: D

Solution:

Solution:

$BeCl_2$ and C_2H_2 have sp -hybridisation and C_2H_6 has sp^3 -hybridisation.

Question109

Which of the following species is paramagnetic? (1995)



Options:

- A. CO
 B. CN^-
 C. O_2^{2-}
 D. NO

Answer: D**Solution:****Solution:**

Paramagnetism is caused by the presence of atoms, ions or molecules with unpaired electrons, i.e. $\cdot\dot{\text{N}} = \ddot{\text{O}}:$

Question110

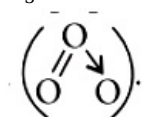
The correct order of the O-O bond length in O_2 , H_2O_2 and O_3 is (1995)

Options:

- A. $\text{O}_2 > \text{H}_2\text{O}_2 > \text{O}_3$
 B. $\text{H}_2\text{O}_2 > \text{O}_3 > \text{O}_2$
 C. $\text{O}_2 > \text{O}_3 > \text{H}_2\text{O}_2$
 D. $\text{O}_3 > \text{H}_2\text{O}_2 > \text{O}_2$

Answer: B**Solution:**

Bond length of O – O in O_2 is 1.21\AA (O = O); in H_2O_2 is 1.48\AA (H O – OH) and in O_3 is 1.28\AA

**Question111**

The ground state electronic configuration of valence shell electrons in nitrogen molecule (N_2) is written as $\text{KK}, \sigma 2s^2, \sigma^* 2s^2, \pi 2p_x^2 = \pi 2p_y^2, \sigma 2p_z^2$. Hence the bond order in nitrogen molecule is (1995)

Options:

- A. 2
 B. 3
 C. 0
 D. 1

Answer: B

Solution:

Number of electrons in bonding orbitals $N_b = 10$ and number of electrons in antibonding orbitals $N_a = 4$

Therefore bond order

$$= \frac{1}{2}(N_b - N_a) = \frac{1}{2}(10 - 4) = 3$$

Question 112

Which of the following molecules has the highest bond order?
(1994)

Options:

- A. O_2^-
- B. O_2
- C. O_2^+
- D. O_2^{2-}

Answer: C

Solution:

Solution:

The bond order of $O_2^+ = 2.5$, $O_2^{2-} = 1$, $O_2^- = 1.5$ and that of $O_2 = 2$

Question 113

Which of the following molecules does not possess a permanent dipole moment?
(1994)

Options:

- A. CS_2
- B. SO_3
- C. H_2S
- D. SO_2

Answer: A

Solution:

Solution:

The structure of CS_2 is linear and therefore it does not have permanent dipole moment. It is represented as $S = C = S$.

Question 114

The table shown below gives the bond dissociation energies (E_{diss}) for single covalent bonds of carbon (C) atoms with element A, B, C and D. Which element has the smallest atoms?



Bond	$E_{\text{diss}}(\text{kJ mol}^{-1})$
C - A	240
C - B	328
C - C	276
C - D	485

(1994)

Options:

- A. C
- B. D
- C. A
- D. B

Answer: B

Solution:

Solution:
Smaller the atom, stronger is the bond and greater the bond dissociation energy. Therefore the bond C – D has the greatest energy or smallest atoms.

Question115

**Among the following which compound will show the highest lattice energy?
(1993)**

Options:

- A. KF
- B. NaF
- C. CsF
- D. RbF

Answer: B

Solution:

Solution:
For compounds containing ions of same charge, lattice energy increases as the size of ions decreases. Thus, NaF has highest lattice energy.

Question116

**Which one of the following is the correct order of interactions?
(1993)**

Options:

- A. Covalent < hydrogen bonding < van der Waals' < dipole-dipole
- B. van der Waals' < hydrogen bonding < dipole-dipole < covalent
- C. van der Waals' < dipole-dipole < hydrogen bonding < covalent



D. Dipole-dipole < van der Waals' < hydrogen bonding < covalent.

Answer: B

Solution:

Solution:

(b) The van der Waals' forces are weakest forces and covalent bond is strongest, so the order of interactions is van der Waals' < H-bonding < dipole-dipole < covalent.

Question117

Which one of the following has the shortest carbon carbon bond length? (1992)

Options:

- A. Benzene
- B. Ethene
- C. Ethyne
- D. Ethane

Answer: C

Solution:

Solution:

There is a triple bond in ethyne molecule ($\text{H} - \text{C} \equiv \text{C} - \text{H}$) and due to this triple bond, carbon-carbon bond distance is shortest in ethyne.

Question118

Which structure is linear? (1992)

Options:

- A. SO_2
- B. CO_2
- C. CO_3^{2-}
- D. SO_4^{2-}

Answer: B

Solution:

Solution:

CO_2 molecule is sp -hybridised and thus it is linear, while CO_3^{2-} is planar (sp^2 -hybridised), SO_2 is an angular molecule with sp^2 hybridisation and SO_4^{2-} is tetrahedral (sp^3 - hybridised)

Question119

Strongest hydrogen bond is shown by (1992)



Options:

- A. water
- B. ammonia
- C. hydrogen fluoride
- D. hydrogen sulphide.

Answer: C

Solution:

Solution:
H-F shows strongest H-bonds because fluorine is most electronegative.

Question120

In compound X , all the bond angles are exactly $109^{\circ}28'$, X is (1991)

Options:

- A. chloromethane
- B. carbon tetrachloride
- C. iodoform
- D. chloroform.

Answer: B

Solution:

As all C - Cl bonds are directed towards the corner of a regular tetrahedron.

Question121

Among LiCl , BeCl_2 , BCl_3 and CCl_4 , the covalent bond character follows the order (1990)

Options:

- A.
 $\text{BeCl}_2 > \text{BCl}_3 > \text{CCl}_4 < \text{LiCl}$
- B.
 $\text{BeCl}_2 < \text{BCl}_3 < \text{CCl}_4 < \text{LiCl}$
- C.
 $\text{LiCl} < \text{BeCl}_2 < \text{BCl}_3 < \text{CCl}_4$
- D.
 $\text{LiCl} > \text{BeCl}_2 > \text{BCl}_3 > \text{CCl}_4$

Answer: C

Solution:



Along the period, as we move from $\text{Li} \rightarrow \text{Be} \rightarrow \text{B} \rightarrow \text{C}$, the electronegativity increases and hence the E N difference between the element and Cl decreases and accordingly the covalent character increases.
Thus $\text{LiCl} < \text{BeCl}_2 < \text{BCl}_3 < \text{CCl}_4$ is correct.

Question122

The complex ion $[\text{Co}(\text{NH}_3)_6]^{3+}$ is formed by sp^3d^2 hybridisation. Hence the ion should possess
(1990)

Options:

- A. octahedral geometry
- B. tetrahedral geometry
- C. square planar geometry
- D. tetragonal geometry.

Answer: A

Solution:

Solution:
According to VSEPR theory, a molecule with 6 bond pairs must be octahedral.

Question123

Which statement is not correct?
(1990)

Options:

- A. A sigma bond is weaker than a pi bond.
- B. A sigma bond is stronger than a pi bond.
- C. A double bond is stronger than a single bond.
- D. A double bond is shorter than a single bond.

Answer: A

Solution:

Solution:
A sigma bond is formed by end-to-end overlap of the bonding orbitals. Whereas, a pi - bond is formed by side-to-side overlap of (usually) two p-orbitals. This places the electron density above and below the plane of the nuclei with a node in the middle. The nodal region reduces the degree to which the orbitals overlap, and therefore, a pi bond is weaker than a sigma bond between the same two elements.
Hydrogen bonds are a strong type of dipole-dipole interaction. As a Rule of Thumb, they are weaker than covalent and ionic ("intramolecular") bonds", but stronger than most dipole-dipole interactions.

Question124

Which one shows maximum hydrogen bonding?
(1990)

Options:

- A. H₂O
- B. H₂Se
- C. H₂S
- D. HF

Answer: A

Solution:

Solution:

H₂O shows maximum H-bonding because each H₂O molecule is linked to four H₂O molecules through H-bonds.

Question125

Linear combination of two hybridized orbitals belonging to two atoms and each having one electron leads to the formation of (1990)

Options:

- A. sigma bond
- B. double bond
- C. co-ordinate covalent bond
- D. pi bond.

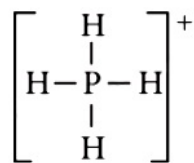
Answer: A

Question126

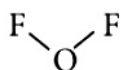
Which one of the following formulae does not correctly represent the bonding capacities of the two atoms involved? (1990)

Options:

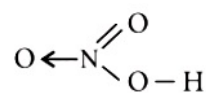
A.



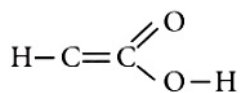
B.



C.

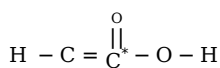


D.



Answer: D

Solution:



The asterisk (*) marked carbon has a valency of 5 and hence this formula is not correct because carbon has a maximum valency of 4 .

Question127

Which of the following molecules does not have a linear arrangement of atoms? (1989)

Options:

- A. H_2S
- B. C_2H_2
- C. BeH_2
- D. CO_2

Answer: A

Solution:

Solution:
For linear arrangement of atoms the hybridisation is sp (bond angle = 180°).
Only H_2S has sp^3 -hybridisation and hence it has angular shape while C_2H_2 , BeH_2 and CO_2 all involve sp -hybridisation and hence has linear arrangement of atoms.

Question128

Which of the following does not apply to metallic bond? (1989)

Options:

- A. Overlapping valence orbitals
- B. Mobile valence electrons
- C. Delocalized electrons
- D. Highly directed bonds

Answer: D

Solution:

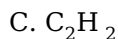
Solution:
Metallic bonds have electrostatic attraction on all sides and hence do not have directional characteristics.

Question129

In which one of the following molecules the central atom can be said to adopt sp^2 hybridization?

(1989)

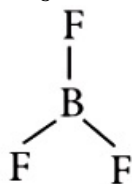
Options:



Answer: B

Solution:

BF_3 involves sp^2 -hybridisation.



Question130

H_2O has a net dipole moment while BeF_2 has zero dipole moment because (1989)

Options:

A. H_2O molecule is linear while BeF_2 is bent

B. BeF_2 molecule is linear while H_2O is bent

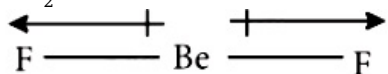
C. fluorine has more electronegativity than oxygen

D. beryllium has more electronegativity than oxygen.

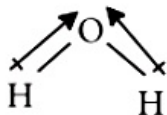
Answer: B

Solution:

BeF_2 is linear and hence it has zero dipole moment.



while H_2O is a bent molecule and hence it has a non-zero dipole moment



Question131

The angle between the overlapping of one s -orbital and one p -orbital is (1988)

Options:

A. 180°

©

- B. 120°
- C. $109^\circ 28'$
- D. $120^\circ, 60^\circ$

Answer: A

Solution:

The type of overlapping between s- and p-orbitals occurs along internuclear axis and hence the angle is 180° .

Question 132

Equilateral shape has (1988)

Options:

- A. sp hybridisation
- B. sp^2 hybridisation
- C. sp^3 hybridisation
- D. d sp^3 hybridisation.

Answer: B

Solution:

Equilateral or triangular planar shape involves sp^2 hybridisation. e . g., BCl_3 .

