ULTIMATE KCET CRASH COURSE 2026

CHEMISTRY

DPP: 1

Chemical bonding and molecular

Q1 Which of the following pairs contains 2 lone pairs of electrons on the central atom?

(A) XeF_4, NH_3

(B) $SO_4^{2-}, H_2\ S$

(C) I_3^+, H_2O

(D) H_2O, NF_3

Q2 Of the following sets which does not contain isoelectronic species ?

(A) CN^-, N_2, C_2^{2-}

(B) $PO_4^{3-}, SO_4^{2-}, ClO_4^-$

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

(D) $SO_3^{2-}, CO_3^{2-}, NO_3^-$

Q3 The electronic configuration of metal M is $1s^2 2s^2 2p^6 3s^1$. The formula of its oxide will be

(A) MO (B) MO_2

(C) M_2O (D) M_2O_3

Q4 p – p overlapping is diagrammatically represented as

(A) 

(B) 

(C) 

(D) 

Q5 The shape of water molecule should be tetrahedral but it has a bent or distorted tetrahedral shape with a bond angle 104.5°. What could be the reason for this?

(A) lp – lp repulsion is more than lp – bp repulsion.

(B) lp – lp repulsion is more than lp – lp repulsion.

(C) lp – lp repulsion is equal to lp – lp repulsion.

(D) Presence of lone pair does not affect the bond angle.

Q6 Which of the following structures is expected to have 4 bond pairs ?

(A) Tetrahedral

(B) Pyramidal

(C) Octahedral

(D) Trigonal planar

Q7 The electronegativity of an element is low. The bond formed between two identical atoms of the above element is most likely to be

(A) ionic

(B) co-ordinate covalent

(C) covalent

(D) metallic

Q8 The minimum bond length is shown between

(A) $\overset{sp^3}{C} - \overset{sp^3}{C}$

(B) $\overset{sp}{C} - \overset{sp}{C}$

(C) all have same

(D) $\overset{sp^2}{C} - \overset{sp^2}{C}$

Q9 The maximum number of 90° angles between bond pair-bond pair of electrons is observed between

(A) dsp^2 hybridisation

(B) $sp^3 d$ hybridisation

(C) $sp^3 d^2$ hybridisation

(D) dsp^3 hybridisation

Q10 Oxygen molecule is paramagnetic in nature. What is the paramagnetic content in terms of magnetic moment (B.M.) in O_2^- ?

(A) 1.5 (B) 1.732

(C) 3 (D) 2.5

Q11 What is the type of hybridisation found in methane?

(A) sp (B) sp^3

(C) sp^2 (D) None of these

Q12 Incorrect matching amongst the following is

i. Linear – H_2O, SO_2

ii. V – shaped– : $CH_2, SnCl_2$

iii. See Saw – $SF_4, TeCl_4$

iv. T – shaped – ICl_3, ClF_3

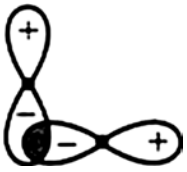
(A) only (iii)

(B) both (i) and (ii)

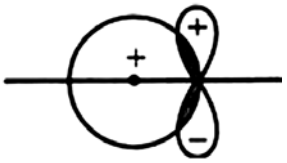
(C) both (iii) and (iv)

(D) only (i)

Q13 Which of the following orbital overlapping is not possible according to VBT ?

(A) 

(B) All of these

(C) 

(D) 

Q14 What is the percentage of -subshell in H_2O molecule?

(A) 33.33% (B) 50%

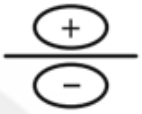
(C) 25% (D) 75%

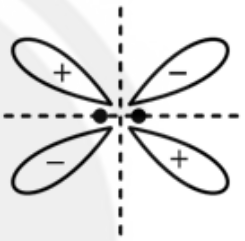
Q15 The lowest energy structure is the one with the ..... formal charges on the atoms

(A) smallest (B) highest

(C) zero (D) negative

Q16 Which of the following is **correct** molecular orbital representation of π^*2p_x-molecular orbital?

(A) 

(B) 

(C) 

(D) 

Q17 Which of the following is diamagnetic?

(A) H_2^+ (B) O_2

(C) Li_2 (D) He_2^+

Q18 The lattice energies of KF, KCl, KBr and KI follow the order :

(A) KF > KCl > KBr > KI

(B) KI > KBr > KCl > KF

(C) KF > KCl > KI> KBr

(D) KI > KBr > KF > KCl

Q19 **A neutral molecular XF_3 has zero dipole moment. The element X is most likely**

(A) chlorine (B) boron

(C) nitrogen (D) bromine

Q20 In the formation of π-bond, the atomic orbitals overlap in such a way that

(A) Their axes remain parallel to each other and perpendicular to the internuclear axis

(B) Their axes remain parallel to each other and parallel to the internuclear axis

(C) Their axes remain perpendicular to each other and parallel to the internuclear axis

(D) Their axes remain perpendicular to each other and perpendicular to the internuclear axis.

Q21 A pair of compound which have odd electrons in the group PH_3NO, CO, ClO_2, $N2O_5$, SO_2 and O_3 are

(A) NO and ClO_2

(B) CO and SO_2

(C) ClO_2 and CO

(D) SO_2 and O_3

Q22 **It is believed that atoms combine with each other such that outermost shell acquires stable configuration of 8 electrons. If stability were attained with 6 electrons rather than 8, what would be the formula of the stable fluoride ion?**

(A) F^- (B) F^+

(C) F^{2+} (D) F^{3+}

Q23 According to molecular orbital theory, which of the following statement about the magnetic character and bond order is correct regarding O_2^+

(A) Paramagnetic and Bond order < O_2

(B) Paramagnetic and Bond order > O_2

(C) Diamagnetic and Bond order < O_2

(D) Diamagnetic and Bond order > O_2

Q24 The order of increasing lattice energy of the following salt is :

(A) NaCl < CaO < NaBr < BaO

(B) NaBr < NaCl < BaO < CaO

(C) NaCl < NaBr < BaO < CaO

(D) NaBr < NaCl < CaO < BaO

Q25 Which of the following compounds show intramolecular hydrogen bonding:

(1) o-nitrophenol

(2) p-nitrophenol

(3) phenol

(4) salicylaldehyde

(A) 1 & 2 (B) 1 & 3

(C) 1 & 4 (D) 2 & 3

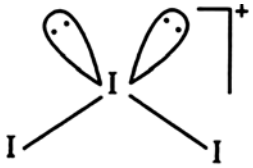
Answer Key

Q1	C
Q2	D
Q3	C
Q4	D
Q5	A
Q6	A
Q7	D
Q8	B
Q9	C
Q10	B
Q11	B
Q12	D
Q13	B
Q14	C
Q15	A
Q16	B
Q17	C
Q18	A
Q19	B
Q20	A
Q21	A
Q22	B
Q23	B
Q24	B
Q25	C

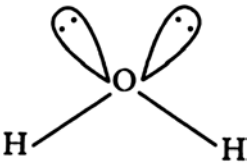
Hints & Solutions

Note: scan the QR code to watch video solution

Q1 Text Solution:



Bent or V-shape



Bent or V-shape

Video Solution:

Q2 Text Solution:

$$\text{Number of electronsin } SO_3^{2-} = 16 + 3 \times 8 + 2 = 42$$

$$\text{Number of electronsin } CO_3^{2-} = 6 + 3 \times 8 + 2 = 32$$

$$\text{Number of electron sin } NO_3^- = 7 + 3 \times 8 + 1 = 32$$

Video Solution:

Q3 Text Solution:

$$\underset{(1s^2 2s^2 2p^6 3s^1)}{2M} \rightarrow \underset{(1s^2 2s^2 2p^6)}{2M^+} + 2e^-$$

$$\underset{(1s^2 2s^2 2p^4)}{O} + 2e^- \rightarrow \underset{(1s^2 2s^2 2p^6)}{O^{2-}}$$

Thus, M_2O.

Video Solution:

Q4 Text Solution:

Video Solution:

Q5 Text Solution:

Due to presence of lone pairs, the repulsion is more which changes the bond angle to 104.5°

Video Solution:

Q6 Text Solution:

Tetrahedral

Video Solution:

Q7 Text Solution:

Less electronegative elements mean metals which form metallic bond between themselves.

Video Solution:

Q8 Text Solution:

$\overset{sp}{C} - \overset{sp}{C}$

Video Solution:

Q9 Text Solution:

$sp^3\ d^2$ hybridisation

Video Solution:

Q10 Text Solution:

$O_2^- : (\sigma 1s^2)(\sigma^* 1s^2)(\sigma 2s^2)(\sigma^* 2s^2)(\sigma 2p_z^2)$
$(\pi 2p_x^2 = \pi 2p_y^2)(\pi^* 2p_x^2 = \pi^* 2p_y^1)$

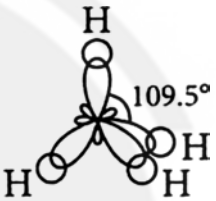
O_2^- has 1 unpaired electron.

$$\mu = \sqrt{n(n+2)}\ \text{B.M.} = \sqrt{1(1+2)} = \sqrt{3}$$
$$= 1.732\ \text{B.M.}$$

Video Solution:

Q11 Text Solution:

Methane (CH_4) exhibits sp^3 hybridisation.



Video Solution:

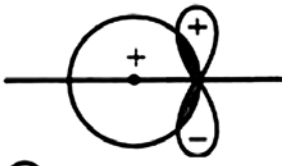
Q12 Text Solution:

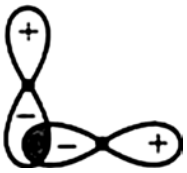
H_2OH_2O and SO_2SO_2 both are bent.

Video Solution:

Q13 Text Solution:

Net overlapping will be zero in





is ruled out as it is neither σ nor π-bond.

is not allowed due to opposite signs of orbitals.

Video Solution:

Q14 Text Solution:

Hybridisation of O in H_2O is sp^3

Percentage of -subshell = 25%.

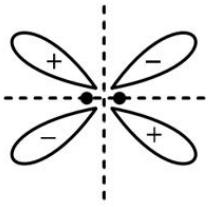
Video Solution:

Q15 Text Solution:

The lowest energy structure is the one with the smallest formal charges on the atoms.

Video Solution:

Q16 Text Solution:



: $\pi^* 2p_x$

Video Solution:

Q17 Text Solution:

H_2^+ and He_2^+ contains odd number of electrons

$\therefore$ They are paramagnetic.

Among Li_2 and O_2

$Li_2(6) = \sigma 1s^2, \sigma^* 1s^2, \sigma 2s^2$

Li have no unpaired electron.

$\therefore$ It is diamagnetic

$$O_2(18) = \sigma 1s^2, \sigma 1s^2, \sigma 2s^2, \sigma 2s^2 \pi 2p_x^2$$

$$= \pi 2p_y^2$$

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

It has two unpaired electrons. So, it is paramagnetic.

Video Solution:

Q18 Text Solution:

Lattice Energy $\propto \frac{q_{C^+} \cdot q_{A^-}}{r_{C^+} + r_{A^-}}$

Order of lattice energy KF > KCl > KBr > KI

Video Solution:

Q19 Text Solution:

BF_3 is planar triangular.

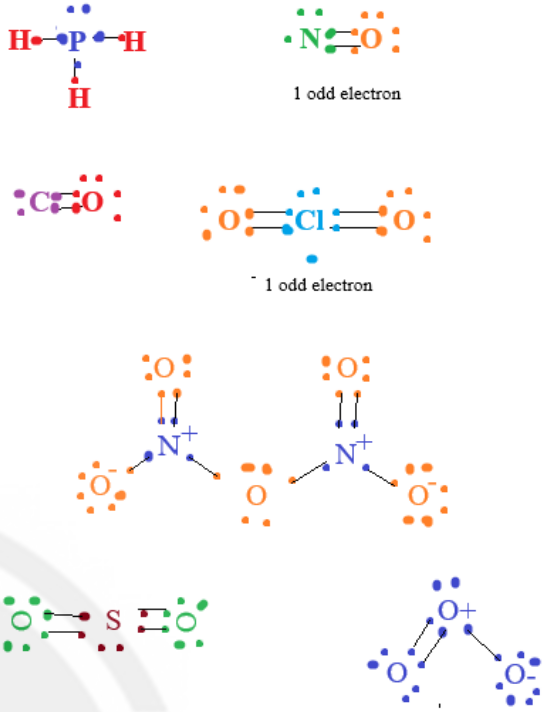
Video Solution:

Q20 Text Solution:

Their axes remain parallel to each other and perpendicular to the internuclear axis

Video Solution:

Q21 Text Solution:



Video Solution:

Q22 Text Solution:

No. of valence electrons in F = 7. In order to have 6-electrons in the outermost shell, it should lose one electron and hence form F^+.

Video Solution:

Q23 Text Solution:

O_2

$$: \sigma 1s^2 \sigma^* 1s^2 \sigma 2s^2 \sigma^* 2s^2 \sigma 2p_z^2 \begin{cases} \pi 2p_x^2 \\ \pi 2p_y^2 \end{cases} \begin{cases} \pi^* 2p_x^1 \\ \pi^* 2p_y^1 \end{cases}$$

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

(two unpaired electrons in antibonding molecular orbital)

O_2^+

$: \sigma 1s^2 \sigma^* 1s^2 \sigma 2s^2 \sigma^* 2s^2 \sigma 2p_z^2 \left\{ \begin{matrix} \pi 2p_x^2 \\ \pi 2p_y^2 \end{matrix} \right. \left\{ \begin{matrix} \pi^* 2p_x^1 \\ \pi^* 2p_y^0 \end{matrix} \right.$

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

(One unpaired electron in antibonding molecular orbital)

Hence, O_2 as well as O_2^+ both are paramagnetic, and bond order of O_2^+ is greater than that of O_2.

Video Solution:

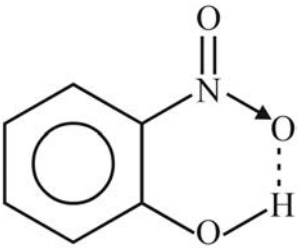
Q24 Text Solution:

Order of lattice energy NaBr < NaCl < BaO < CaO

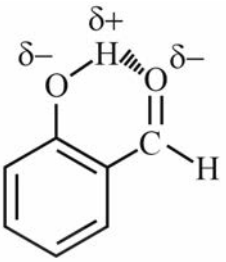
$\because$ Lattice energy $\propto \frac{|Q^+||Q^{-1}|}{r_+ + r_-}$

Video Solution:

Q25 Text Solution:



Intramolecular hydrogen bonding



Video Solution: