Class 11 Chemistry

Chemical Bonding And Molecular Structure

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Exercise 4.1

Explain the formation of a chemical bond.

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Exercise 4.2

Write Lewis symbols for atoms of the following elements: Mg,Na, B,O,N,Br.

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Exercise 4.3

Write Lewis symbols for the following atoms and ions:

S and S^{2-} ,Al, and Al^{3+} ,$H$and $H^{?}$

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Exercise 4.4

Draw the Lewis structures for the following molecules and ions:

H_2S,$SiCl_4$,BeF_2,CO_3^{2-} ,$HCOOH$

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Exercise 4.5

Define octet rule. Write its significance and limitations.

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Exercise 4.6

Write the favourable factors for the formation of ionic bond.

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Exercise 4.7

Discuss the shape of the following molecules using the $VSEPR$ model:

$BeCl_2, BCl_3, SiCl_4, AsF_5, H_2S, PH_3$

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Exercise 4.8

Although geometries of NH_3 and H_2O molecules are distorted tetrahedral, bond angle in water is less than that of ammonia. Discuss.

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Exercise 4.9

How do you express the bond strength in terms of bond order?

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Exercise 4.10

Define the bond length.

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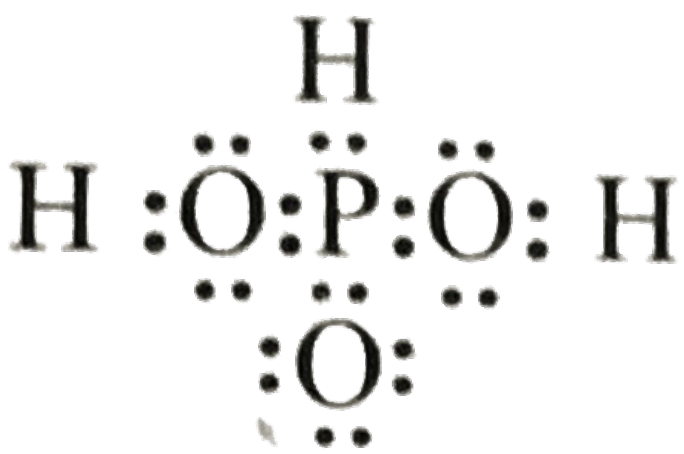
Exercise 4.11

Explain the important aspects of resonance with reference to the CO_3^{2-} ion.

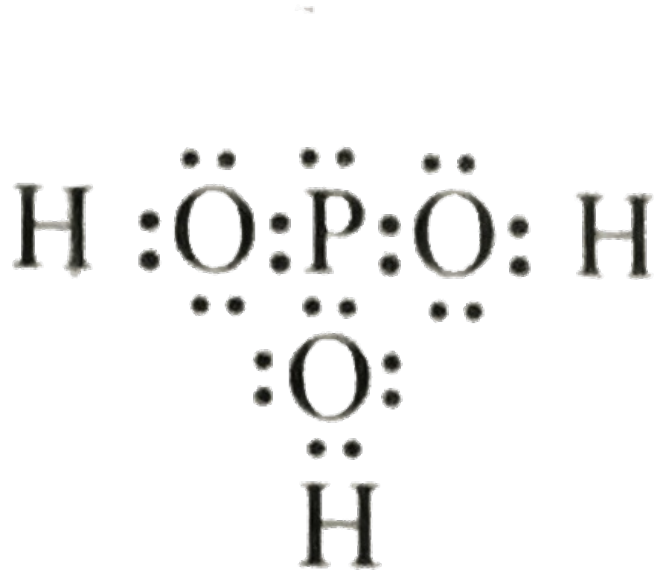
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Exercise 4.12

H_3PO_3 can be represented by structure (a) and (b) shown below. Can these two structures be taken as the canonical forms of the resonance hybrid representing H_3PO_3 ?If not, give reasons for the same.



(a)



(b)

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Exercise 4.13

Write the resonance structures for SO_3 ,NO_2, and $NO_3^?$.

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Exercise 4.14

Use Lewis symbols to show electron transfer between the following atoms to form cations and anions : (a) K and S (b) Ca and O (c) Al and N.

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Exercise 4.15

Although both CO_2 and H_2O are triatomic molecules, the shape of H_2O molecules in bent while that of CO_2 is linear. Explain this on the basis of dipole moment.

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Exercise 4.16

DIPOLE MOMENT AND ITS APPLICATIONS

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Exercise 4.17

Define electronegativity. How does it differ from electron gain enthalpy ?

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Exercise 4.18

Explain with the help of suitable example polar covalent bond.

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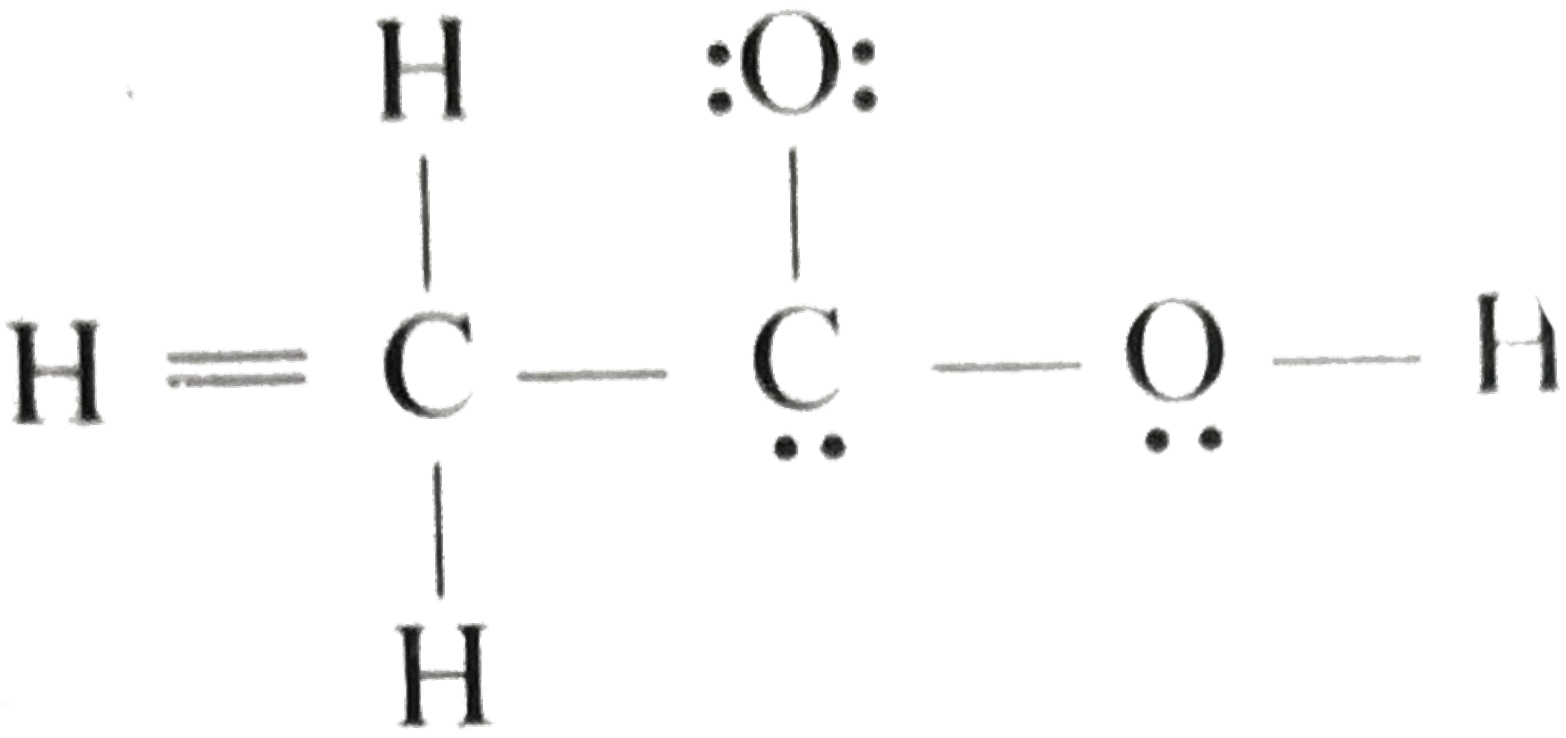
Exercise 4.19

Arrange the bonds in order of increasing ionic character in the molecules: LiF, K_2O, N_2, SO_2 and ClF_3.

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Exercise 4.20

The skeletal structure of CH_3COOH as shown below is correct, but some of the bonds are shown incorrectly. Write the correct Lewis structure for acetic acid.



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Exercise 4.21

Apart from tetrahedral geometry, another possible geometry for CH_4 is square planar with the four H atoms at the corners of the

square and the C atom at its centre. Explain why CH_4 is not square planar?

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Exercise 4.22

Explain why BeH_2 molecule has a zero dipole moment although the $Be - H$ bonds are polar?

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Exercise 4.23

Dipole moment of NH_3 is_____than NF_3 .

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Exercise 4.24

What is meant by hybridisation of atomic orbitals? Describe the shape of sp, sp^2, sp^3 hybrid orbitals.

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Exercise 4.25

Describe the change in hybridisation (if any) of the AI atom in the following:

$AlCl_3 + Cl^? \rightarrow AlCl_4^?$

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Exercise 4.26

Is there any change in hybridisation of the B and N atom as a result of the following reaction?

$BF_3 + NH_3 \rightarrow F_3B.NH_3$

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Exercise 4.27

Draw diagrams showing the formation of a double bond and a triple bond between carbon atoms in C_2H_4 and C_2H_2 molecules.

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Exercise 4.28

what is the total number of sigma and pi bonds in the following molecules?

a. C_2H_2 , b. C_2H_4

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Exercise 4.29

Considering X axis as the internuvlear axis, which out of the following will form a sigma bond

(a) $1s$ and ls (b) ls and $2p_x$

(c) $2p_y$ and $2p_y$ (d) $2p_x$ and $2p_y$

(e) $1s$ and $2s$.`

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Exercise 4.30

Which hybrid orbitals are used by carbon atoms in the following molecules?

(a)$CH_3 - CH_3$,(b)$CH_3 - CH = CH_2$,(c)$CH_3 - CH_2OH$,

(d)$CH_3 - CHO$,(e)$CH_3 - CHO$ (f)CH_3COOH

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Exercise 4.31

What do you understand by bond pairs and lone pairs of electrons?

Illustrate by giving one example of each type.

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Exercise 4.32

Distinguish between a sigma and a pi bond.

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Exercise 4.33

Explain the formation of H_2 molecule on the basis of valance bond theory.

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Exercise 4.34

Write the important conditions required for the linear combination of atomic orbitals to form molecular orbitals.

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Exercise 4.35

Use molecular orbital theory to explain why the Be_2 molecules do not exist?

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Exercise 4.36

Compare the relative stability of the following species and indicate their magnetic properties:

$O_2, O_2^{\oplus}, O_2^{?}$ (superoxide), O_2^{-2} (peroxoide).

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Exercise 4.37

Write the significance of a plus ans a minus sign shown in

representing the orbitals.

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Exercise 4.38

Describe the hydribisation in case of PCl_5. Why are the axial bonds longer as compared to equatorial bonds?

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Exercise 4.39

Define hydrogen bond. Is it weaker or stronger than the van der Waals forces?

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Exercise 4.40

What is meant by the term bond order? Calculate the bond order of $N_2, O_2, O_2^{\oplus}$ and $O_2^?$.

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Solved Example 1

Write the Lewis structure of CO molecule .

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Solved Example 2

Write the Lewis structure of the nitrite ion $\left(NO_2^?\right)$.

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Solved Example 3

Explain the structure of CO_3^{2-} ion in terms of resonance

(b) Explain the resonance structures of CO_2 molecule .

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Solved Example 4

Explain the structure of CO_3^{2-} ion in terms of resonance

(b) Explain the resonance structures of CO_2 molecule .

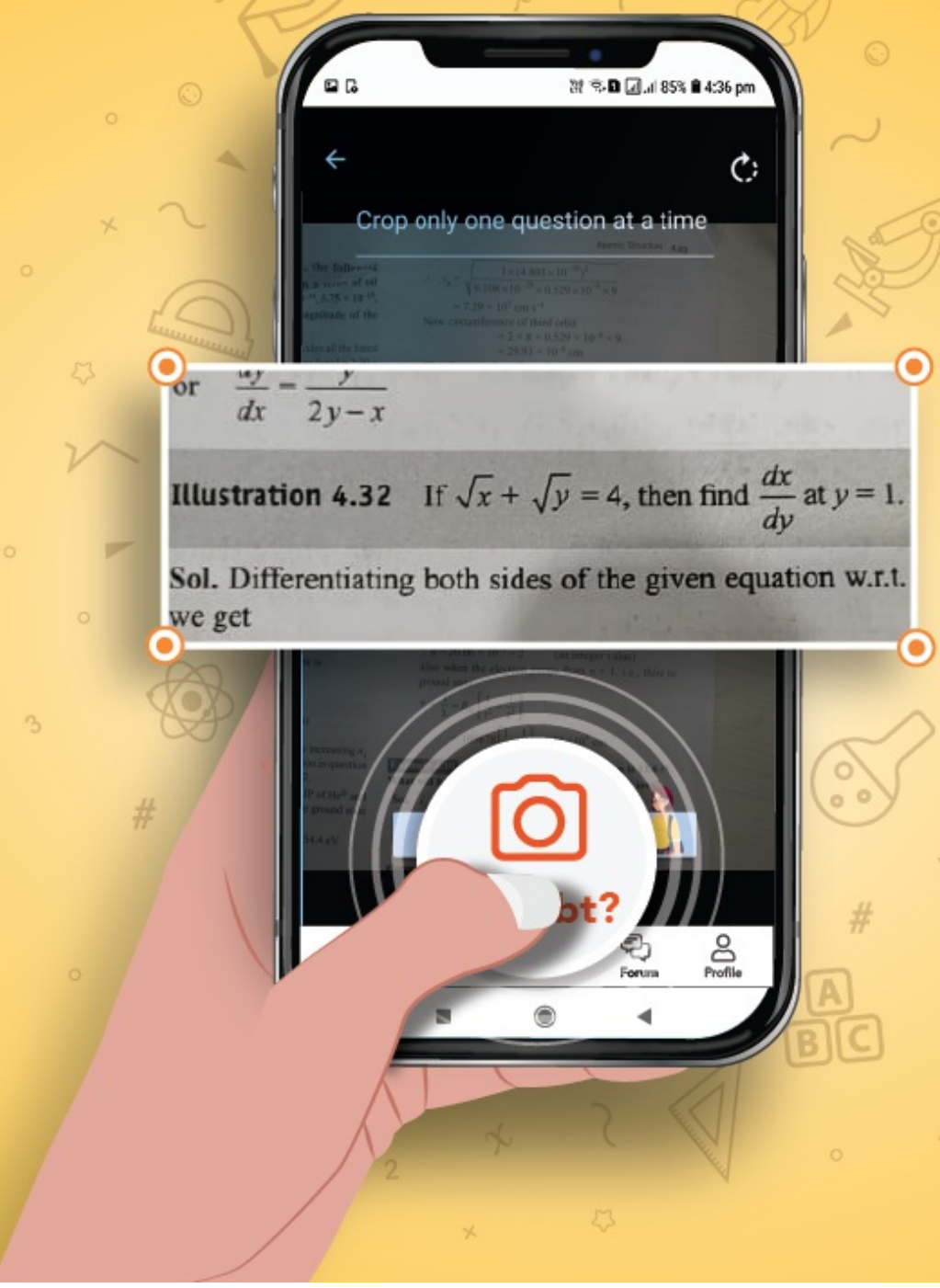
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