CBSE TEST PAPER-01

CLASS - XI CHEMISTRY (Chemical Bonding and Molecular Structure)

General Instruction:

- All questions are compulsory.
- Marks are given alongwith their questions.

1. Define a chemical bond.

2. Give the main feature of Lewis approach of chemical bonding.

3. Write electron dot structure (Lewis structure) of Na, Ca, B, Br, Xe, As, Ge, N^{3-}.

6. Define electrovalent bond.

7. Give the octet rule in short.

4. Give the main feature of Kossel's explanation of chemical bonding.

5. How can you explain the formation of NaCl according to kossel concept?

8. Write the significance of octet rule.

9. Write the Lewis structure for CO molecule

10. Give the Lewis dot structure of HNO_3.

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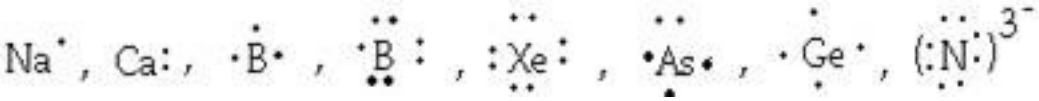
[Answers]

Ans 1. The attractive force which holds various constituents (atoms, ions etc.) together in different chemical species is called a chemical bond.

Ans 2. Lewis postulated that atoms achieve the stable octet when they are linked by chemical bonds. He assured that atoms are positively charged centre and the outer shell that could accommodate a maximum of eight electrons. These electrons occupy the corners of a cube which surrounds the centre. Lewis introduced simple notations to represent valence electrons in an atom called Lewis symbol.

Ans 3.



Ans 4. The bond formed, as a result of the electrostatic attraction between the positive and negative ions are termed as the electrovalent bond.

Ans 5. The atoms tend to adjust the arrangement of their electrons in such a way that they (except H and He) achieve eight electrons in their outermost shell. This is known as the octet rule.

Ans 6. Kossel in relation to chemical bonding drew attention to the following facts –

i) In the periodic table, the highly electronegative halogens and the highly electropositive alkali metals are separated by the noble gases.

ii) In the formation of a negative ion from a halogen atom and a positive ion from an alkali metal, atom is associated with a gain and loss of an electron by the respective atoms.

iii) The negative and positive ions so formed attain stable noble gas electronic configurations. The noble gases have particularly eight electrons, $ns^2\ np^6$.

iv) The –ve and +ve ions are stabilized by electrostatic attraction.

Ans 7. The formation of NaCl from sodium and chlorine can be explained as

$Na \rightarrow Na^+ + e^-$

$[Ne]\ 3s^1 \rightarrow [Ne]$

$Cl + e^- \rightarrow Cl^-$

$[Ne]\ 3s^2\ 3p^5 \quad [Ne]\ 3s^2\ 3p^6$ or [Ar]

$Na^+ + Cl^- \rightarrow Na^+\ Cl^-$ or NaCl.

Ans 8. Octet rule signifies –

i) It is useful for understanding the structures of most of the organic compounds.

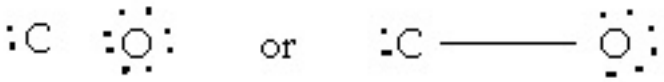
ii) It mainly applies to the second period elements of the periodic table.

Ans 9. (i) The outer (valence) shell configurations of carbon and oxygen atoms are

Carbon : (6) – $1s^2\ 2s^2\ 2p^2$

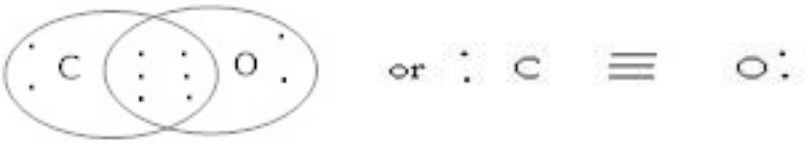
Oxygen : (8) – $1s^2\ 2s^2\ 2p^4$.

The valence electrons (4 + 6 = 10)



But it does not complete octet, thus multiple bond is exhibited.

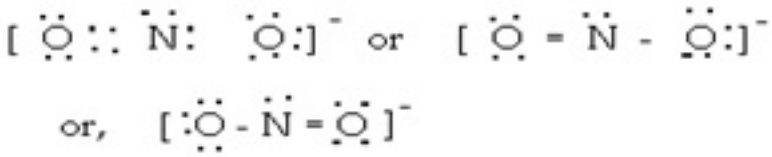
Thus,



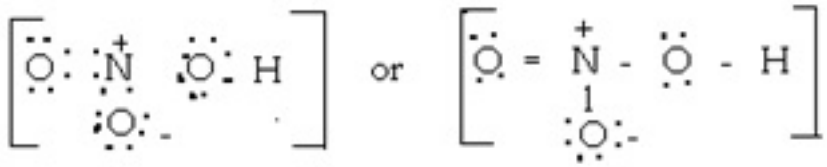
(ii) N ($2s^2\ 2p^3$), O ($2s^2\ 2p^4$)

5 + (2 x 6) + 1 = 18 electrons.

Thus,



Ans 10. HNO_3 ®



CBSE TEST PAPER-02

CLASS - XI CHEMISTRY (Chemical Bonding and Molecular Structure)

General Instruction:

- All questions are compulsory.
- Marks are given alongwith their questions.

1. Define an ionic bonding. [1]

2. What changes are observed in atoms undergoing ionic bonding? [2]

3. Mention the factors that influence the formation of an Ionic bond.[2]

4. Which one of the following has the highest bond order? N_2, N_2^+ or N_2^-. [1]

5. Define bond order. [1]

6. Give reason why H_2^+ ions are more stable than H_2^- though they have the same bond order. [2]

7. How would the bond lengths vary in the following species? C_2, C_2^- C_2^{2-}. [2]

8. What type of bond is formed when atoms have high difference of electronegativity?[1]

9. Out of covalent and hydrogen bonds, which is stronger. [2]

10. Define covalent radius. [2]

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CLASS - XI CHEMISTRY (Chemical Bonding and Molecular Structure)

[Answer]

Ans1. An ionic bond (or electrovalent bond) is formed by a complete transfer of one or more of outer most electrons from the atom of a metal to that of a non – metal.

Ans2. Due to the electron transfer the following changes occurs –

i) Both the atoms acquire stable noble gas configuration.

ii) The atom that loses electrons becomes +vely charged called cation whereas that gains electrons becomes –vely charged called anion.

iii) Cation and anion are held together by the coulombic forces of attraction to form an ionic bond.

Ans3. Ionic bond formation mainly depends upon three factors –

i) Low ionization energy – elements with low ionization enthalpy have greater tendency to form an ionic bonds.

ii) High electron gain enthalpy – high negative value of electron gain enthalpy favours ionic bond.

iii) Lattice energy – high lattice energy value favours ionic bond formation.

Ans4. N_2 has the highest bond order.

Ans5. Bond order is defined as number of bonds between two atoms in a molecule.

Ans6. In H_2^- ion, one electron is present in anti bonding orbital due to which destabilizing effect is more and thus the stability is less than that of H_2^+ ion.

Ans7. The order of bond lengths in C_2 , C_2^- and C_2^{2-} is $C_2 > C_2^- > C_2^{2-}$.

Ans8. Electrovalent or ionic bond.

Ans9. Covalent bond.

Ans10. The covalent radius is measured approximately as the radius of an atom's core which is in contact with the core of an adjacent atom in a bonded situation.

CBSE TEST PAPER-05

CLASS - XI CHEMISTRY (Chemical Bonding and Molecular Structure)

General Instruction:

- All questions are compulsory.
- Marks are given alongwith their questions.

1. What is sigma bond? [1]

2. What is pi – bond? [1]

3. Why is s– bond stronger than π - bond? [2]

4. How many s and π bond are there in a molecule of C_2H_4 (ethene)? [1]

5. How many s and π bonds are there in a molecule of $CH_2 = CH – CH = CH_2$? [1]

6. What type of bond exists in multiple bond (double / triple)? [1]

7. What are the different types of s - bond formation? [2]

8. What type of bond are formed due to orbital overlap? [1]

9. How do covalent bonds form due to orbital overlapping? [1]

10. What is zero overlap? [2]

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CLASS - XI CHEMISTRY (Chemical Bonding and Molecular Structure)

ANSWERS]

Ans1. A covalent bond formed due to the overlap of orbitals of the two atoms along the line going the two nuclei (orbital axis) is called sigma (s) bond.

Ans2. A covalent bond formed between the two atoms due to the sideways overlap of their p – orbitals is called a pi (π) bond.

Ans3. Orbitals can overlap to a greater extent in a s - bond due to axial orientation, so s - bond is strong. Whereas, in a pi – bond sideways overlapping is not to an appreciable extent due to the presence of s - bond which restricts the distance between the involved atoms.

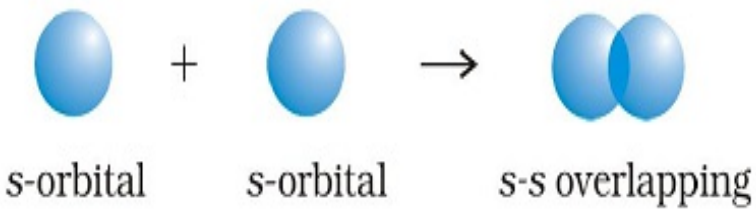
Ans4. In a molecule of ethene, there are 5 s - bonds (one between C-C , and four between C-H and one π - bond.

Ans5. There are 9 s - bonds (three between C – C and 6 between C – H) and 2 π - bonds.

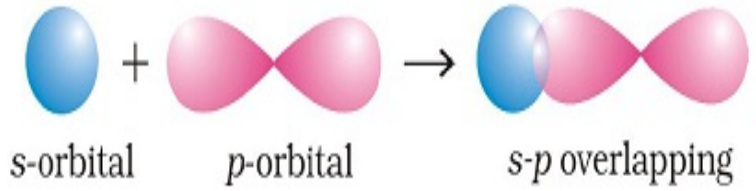
Ans6. pi (p) – bond is always present in molecules containing multiple bond.

Ans7. s - bond can be formed by any of the following types of combinations of atoms orbitals.

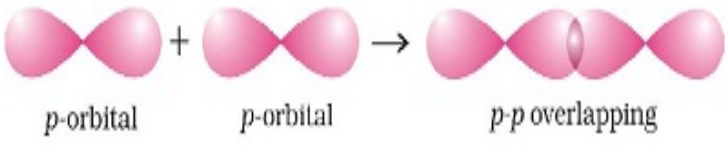
(a) S – S – overlapping : In this case, there is a overlap of two half – filled S – orbitals along the inter nuclear axis.



(b) S- P overlapping : This type of over lapping occurs between half – filled s-orbitals of one atom and half-filled p-orbitals of another atom.



(c) P – P overlapping : This type of overlap takes place between half-filled p-orbitals of the two approaching atoms.



Ans8. Covalent bonds are formed due to the overlap of certain orbitals that are oriented favourably in the space.

Ans9. According to orbital overlap concept, the formation of a covalent bond between two atoms results by pairing of electrons present in the valence shell having opposite spins.

Ans10. The unsymmetrical overlap of orbitals results in zero overlap i-e; between p_x-s and p_x-p_y orbital

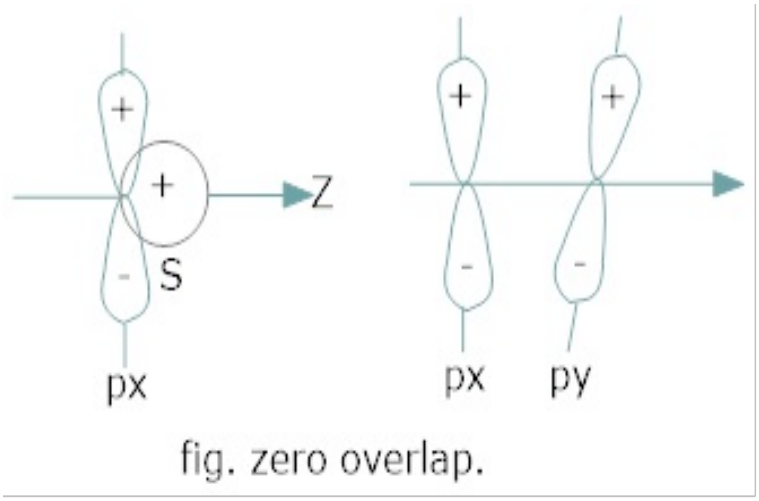


fig. zero overlap.