CHEMISTRY

BOOKS - CENGAGE CHEMISTRY

CHEMICAL BONDING

Mandatory Exercise Exercise Set I

1. Which of the following sets of atoms can combine to form ionic bonds?

A. C and H

B. C and Cl

C. K and Br

D. H and O

Answer: C

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2. Among the following compounds which one completely ionises in water?

A. Alcohol

B. Sodium chloride

C. Cane sugar

D. Acetic acid

Answer: B

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3. Magnesium ion $\left(Mg^{2+}\right)$ has the electronic configuration:

A. 2,8,2

B. 2,8,8

C. 2,8,1

D. 2,8

Answer: D

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4. Condition for the formation of chemical bond is

A. Increase in stability

B. Octet configuration

C. Both

D. unstable nucleus.

Answer: C

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5. Formation of a chemical bond is____in nature.

A. exothermic

B. endothermic

C. Both

D. can't be predicted

Answer: A

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6. Formation of chemical bond between two atoms take place, when net force_____ in nature.

A. attractive

B. repulsive

C. both

D. None

Answer: A

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7. When two atoms have large difference in electronegativity they form.

A. Ionic bond

B. covalent bond

C. co-ordinate bond

D. All of the above

Answer: A

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8. When electron rich compound combines with electron deficient compound formation of _____ take place.

A. Ionic bond

B. covalent bond

C. co-ordinate bond

D. H-bond

Answer: C

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9. When Group-1 element combine with Group-17 element. Formation of _____ bond take place.

A. Ionic bonds

B. covalent bond

C. co-ordinate bond

D. H-bond

Answer: A

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10. When element A having electric configuration 2,8, 2 combine with element B

having electronic configuration 2, 7. Formula of compound will be _____

A. AB

B. AB_2

C. A_2B

D. A_2B_2

Answer: B

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11. Which of the following combination can form a polar covalent bond?

A. H and H

B. H and Br

C. N and N

D. Na and Br

Answer: B

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12. When a metal atom combines with a non-metal atom, the non-metal atom will

A. lose electrons and decrease in size

B. lose electrons and increase in size

C. gain electrons and decrease in size

D. gain electrons and increase in size

Answer: D

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13. Why boiling point of H_2O is greater than hydrides of other elements of group 16?

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14. KHF_2 exist but $KHCl_2$ does not? Explain.

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Mandatory Exercise Exercise Set Ii

1. Which of the following substances is covalent?

A. $CaCl_2$

B. MgO

C. Br_2

D. NaBr

Answer: C

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2. Ionic as well as covalent bonds are present in

A. MgO

B. $AlCl_3$

C. H_2O

D. NaOH

Answer: D

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3. Which of the following molecules contains a double bond?

A. N_2

B. H_2

C. O_2

D. Cl_2

Answer: C

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4. The nature of bonds present in PH_3 is

A. covalent

B. electrovalent

C. hydrogen

D. both ionic and covalent

Answer: A

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5. The number of electrons that take part in forming the bond in N_2 is

A. 2

B. 6

C. 10

D. 3

Answer: B

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6. Which of the following does not conduct electricity in aqueous solution?

A. NaCl

B. $MgCl_2$

C. Sucrose

D. NH_4Cl

Answer: C

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7. An element forms compounds of the type MCl_3, M_2O_5 and Ca_3M_2 but does not form MF_5 The element could be

A. Al

B. B

C. N

D. P

Answer: C

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8. For Ionic compounds which of the following statements are false

A. They consist of ions

B. They generally have high M.P. and B.P.

C. Soluble in polar solvent

D. conduct electricity in the solid state

Answer: D

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9. For covalent bond, which of the following statements are incorrect?

A. The electrons are shared between atoms.

B. The bond is non-directional.

C. The strength of both depends upon the extent of overlapping.

D. The bond formed may be polar or non-polar.

Answer: B

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10. HCl molecule contains

A. Ionic bond

B. covalent bond

C. H-bond

D. co-ordinate bond

Answer: B

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11. When H_2O combine with $H^{\oplus}$ formation of $H_3O^{\oplus}$ take place due to formation of

A. Ionic bond

B. polar covalent bond

C. non-polar covalent bond

D. co-ordinate bond

Answer: D

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12. NH_4Cl contains

A. covalent bond

B. Ionic bond

C. co-ordinate bond

D. All

Answer: D

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13. Number of electron pair shared in a co-ordinate bond is

A. 0

B. 1

C. 2

D. $1/2$

Answer: B

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14. Which of the following statements is correct?

A. All carbon to carbon bonds contains a δ bond and one or more π bond

B. All carbon to hydrogen bonds are π bond

C. All oxygen to hydrogen bonds are hydrogen bond

D. All carbon to hydrogen bonds are π bond

Answer: D

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15. In which of the following molecules the central atom does not follow the octel rule?

A. H_2O

B. NH_3

C. H_2

D. BH_3

Answer: D

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16. The number of electrons in the valence shell of sulphur in SF_6 is

A. 12

B. 10

C. 8

D. 11

Answer: A

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17. During the formation of a chemical bond

A. electron-electron repulsion because more than the nucleus-electron attraction

B. energy of the system does not change

C. energy of the system increases

D. energy of the system decreases

Answer: D

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18. Explain all energy terms involved in formation of

$CaF_2(s)$ from $Ca(s) \& F_2(g)$

$Ca(s) + F_2(s) \rightarrow CaF_2(s)$

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19. Which of the following is strongest bond?

A. Ionic bond

B. covalent bond

C. co-ordinate bond

D. H-bond

Answer: A

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20. Which of the following is intermolecular force of attraction?

A. Ionic bond

B. covalent bond

C. metallic bonding

D. dipole-dipole

Answer: D

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Mandatory Exercise Exercise Set Iii

1. Which of the following descriptions of metallic bonding is true?

A. Metallic bonding consists of a sea of electrons floating around fixed cations.

B. Metallic bonding consists of a sea of electrons floating around fixed anions.

C. Metallic bonding consists of thousands of atoms held together by shared pairs

of electrons.

D. Metallic bonding consists of sets of ions held together in a lattice.

Answer: A

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2. Most polar bond is

A. C-H

B. N-H

C. O-H

D. F-H

Answer: D

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3. Most polar bond is

A. H-F

B. H-Cl

C. H-Br

D. H-I

Answer: D

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4. Which of the following involve breaking of covalent bond

A. boiling of H_2O

B. Melting of H_2O

C. boiling of benzene

D. melting of SiO_2

Answer: D

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5. Which statement is not correct?

A. A sigma bond is weaker than a π bond

B. A sigma bond is stronger than π bond

C. A double bond is stronger than a δ bond

D. A double bond is shorter than a single bond

Answer: A

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6. Ozone molecule consist of

A. 1σ and 2π bond

B. 2σ and 2π bond

C. 1σ and 1π bond

D. 2σ and 1π bond

Answer: D

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7. The number of it bond in the following compound

$O_2N - C \equiv C - NO_2$ is

A. 2

B. 3

C. 4

D. 1

Answer: C

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8. The nature of bond in diamond is

A. Ionic

B. metallic

C. σ bond

D. π bond

Answer: C

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9. Metallic bond is

A. similar to ionic bond

B. similar to covalent bond

C. neither similar to ionic nor covalent bond

D. formed by movement of positive charged spheres in a sea of electrons.

Answer: D

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10. Which of the following is least volatile?

A. H_2O

B. H_2S

C. H_2Se

D. H_2Te

Answer: A

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11. Malleability and ductility of metals can be accounted due to

A. the presence of electrostatic in force

B. the crystalline structure in metal

C. the capacity of layers of metal ions to slide over the other

D. the interaction of electrons with metal ions in the lattice.

Answer: C

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12. Which of the following compound shows H-bonding?

A. RCH_2NHCH_3

B. RCH_2CHO

C. C_2H_6

D. HCl

Answer: A

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13. H-bond is present in

A. water

B. glycerol

C. Ammonia

D. All

Answer: D

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14. Which of the following overlapping can from σ bond?

A. s - s overlap

B. s - p overlap

C. p - p over lap

D. All

Answer: D

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15. Which of the following overlap can form π bond?

A. s - s overlap

B. s - p overlap

C. p - p over lap

D. None

Answer: C

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16. If intermolecular axis is z-axis, then σ bond formed by which overlapping.

A. $P_x - P_x$

B. $P_y - P_y$

C. $P_z - P_z$

D. All

Answer: C

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17. According to valence bond theory, in covalent bond formation, which type of atomic orbital participate

A. full filled

B. half filled

C. vacant

D. all

Answer: B

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18. π bond electron cloud is bisected by

A. σ bond

B. x-axis

C. x-y axis

D. y-axis

Answer: A

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19. Which of the following molecule do not follow octet rule

A. HNO_3

B. H_2S

C. PCl_5

D. PH_3

Answer: C

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20. Carbon contain only 2 unpaired electrons but form four σ bond explain?

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21. Why valency of nitrogen is 3?

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22. What is Hypervalency?

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23. Which of the following compound are hypervalent?

A. SO_3

B. $HClO_4$

C. PCl_5

D. all

Answer: D

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24. What is meant by equal and unequal sharing of electron? Give example

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25. Water is more viscous than ethyl alcohol. Why?

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26. Metallic bonding is present in

A. Na(s)

B. $H_2(g)$

C. $N_2(g)$

D. $O_2(g)$

Answer: A

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Consolidated Exercise

1. Match the following:

A	B
(1) Covalent bond	(a) Bond formed by the lateral overlapping of p orbitals
(2) Sigma bond	(b) Bond formed by the complete transfer of one or more electrons from the valence shell of one atom to the valence shell of the other
(3) Ionic bond	(c) Bond formed by the sharing of an electron pair between two atoms
(4) Pi bond	(d) Bond formed by the end-to-end overlapping (axial) of atomic orbitals
	(e) Bond formed by sharing of pair of electrons, both the electrons belongs to one atom in a molecule.

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Consolidated Exercise Multiple Choice Questions With One Or More Than One Correct Answer

1. Which of the following characteristics do not represent ionic compounds?

A. They have generally low melting points and boiling points.

B. They are generally soluble in polar solvents.

C. Aqueous solution is a bad conductor of electricity.

D. They are generally crystalline.

Answer: A::C::D

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2. Which of the following forms an ion containing the same number of electrons as the noble gas neon?

A. $_{14}Si$

B. $_{8}C$

C. $_{11}Na$

D. $_{9}F$

Answer: A::C::D

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3. In which of the following molecules, octet rule is not obeyed?

A. BF_3

B. SF_6

C. NF_3

D. H_2O_2

Answer: A::B::D

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4. Which of the following is/are correct about pi bond?

A. Sideways overlap of atomic orbitals occurs.

B. It is generally weaker than sigma bond.

C. It is stronger than sigma bond.

D. It is more reactive.

Answer: A::B::D

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5. Hydrogen bonding (intermolecular) is expected to occur in

A. HF

B. C_2H_5OH

C. CH_4

D. H_2S

Answer: A::B::D

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Challenging Exercise

1. Which of the following do not accurately represent stable binary ionic compounds?

Why?

$BaCl_2, SrS_2, Cr_2O_3, NaBr_2, Li_2S, Be_2O, SrS_2$

.

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2. Write the Lewis dot structure for the following covalent molecules:

H_2S

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3. Write the Lewis dot structure for the following covalent molecules:

PCl_3

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4. Write the Lewis dot structure for the following covalent molecules:

SiH_4

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5. Write the Lewis dot structure for the following covalent molecules:

$COCl_2$

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6. Write the Lewis dot structure for the following covalent molecules:

NCl_3

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Olympiad And Ntse Level Exercises Paragraph

1. Hydrogen bond is a weak bond formed between hydrogen atoms and highly electronegative elements. It is of two types - intermolecular and intramolecular. It is a weaker bond than ionic, covalent and metallic bonds.

Which is a correct statement?

A. Keto form of acetoacetic ester involves hydrogen bonding.

B. In water vapour, hydrogen bonding exists.

C. For first ionisation, maleic acid is a stronger acid than fumaric acid. This can be explained on the basis of concept of hydrogen bonding.

D. Boiling point of HCl is higher than that of HF.

Answer: C

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2. Hydrogen bond is a weak bond formed between hydrogen atoms and highly electronegative elements. It is of two types - intermolecular and intramolecular. It is a weaker bond than ionic, covalent and metallic bonds.

In a suitable solvent such as benzene, benzoic acid associates and exists as a

A. dimer

B. trimer

C. tetramer

D. hexamer

Answer: A

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3. Hydrogen bond is a weak bond formed between hydrogen atoms and highly electronegative elements. It is of two types - intermolecular and intramolecular. It is a weaker bond than ionic, covalent and metallic

bonds.

The number of hydrogen bonds in $H_9O_4^{\oplus}$ species is

A. 2

B. 3

C. 4

D. 1

Answer: B

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4. Hydrogen bond is a weak bond formed between hydrogen atoms and highly electronegative elements. It is of two types - intermolecular and intramolecular. It is a weaker bond than ionic, covalent and metallic bonds.

Which is a correct statement?

A. Paranitrophenol is steam volatile but not orthonitrophenol.

B. Ethyl alcohol is more viscous than glycerol.

C. If a dry paper is torn, sound is heard due to breaking of hydrogen bonds one after another in a rhythmatic manner.

D. In fermic salt, bonds present are covalent, metallic and hydrogen bond.

Answer: C

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Olympiad And Ntse Level Exercises

1. Match Column I with Column II and mark the correct option from the codes given below

Column I	Column II
(a) Methane molecules	(i) Covalency
(b) Sharing of electrons	(ii) Tetrahedral molecules
(c) H_2O	(iii) Pyramidal molecules
(d) NH_3	(iv) Polar molecule

A. a-i, b-ii, c-vi, d-iii

B. a-ii, b-i, c-vi, d-iii

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

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

Answer: B

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2. Match Column I with Column II and mark the correct option from the codes given below

Column I (Compound)	Column II (Examples)
(a) Covalent	(i) SiO_2
(b) Molecular	(ii) CaO
(c) Ionic	(iii) CCl_4
(d) Metallic	(iv) Bronze

A. a-i, b-iii, c-vi, d-ii

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

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

D. a-iii, b-i, c-vi, d-ii

Answer: C

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3. In PO_4^{3-}, $P-O$ bond order is

A. 1.25

B. 2

C. -0.75

D. -3

Answer: A

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4. The types of bonds present in $CuSO_4 \cdot 5H_2O$ are only

A. Electrovalent and covalent

B. Electrovalent and coordinate covalent

C. Electrovalent, covalent and coordinate covalent

D. Covalent and coordinate covalent

Answer: C

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5. The correct order of dipole moment is

A. $CH_4 < NF_3 < NH_3 < H_2O$

B. $NF_3 < CH_4 < NH_3 < H_2O$

C. $NH_3 < NF_3 < CH_4 < H_2O$

D. $H_2O < NH_3 < NF_3 < CH_4$

Answer: A

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6. Which of the following compounds has the least tendency to form H-bonds?

A. HF

B. HCl

C. H_2O

D. NH_3

Answer: B

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7. Most favourable conditions for ionic bonding are

A. Low charge on ions, large cations, small anions

B. Low charge on ions, large cations, large anions

C. High charge on ions, small cations, large anions

D. High charge on ions, large cations, small anions

Answer: A

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8. Which of the following statement regarding valence bond theory (VBT) is not true?

A. A molecule is considered to be a collection of atoms, and then interactions between different atoms is considered.

B. For a molecule to be stable, the electrostatic attractions must predominate over the repulsion.

C. The potential energy of a diatomic molecule is less than the sum of potential energies of free atoms.

D. The net force of altration acting on the atoms in a molecule is not zero.

Answer: D

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9. The strength of bonds formed by overlapping of atomic orbitals is in the order:

A. $s-s>s-p>p-p$

B. $s-s<p-p<s-p$

C. $s - p < s - s < p - p$

D. $p - p < s - s < s - p$

Answer: A

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