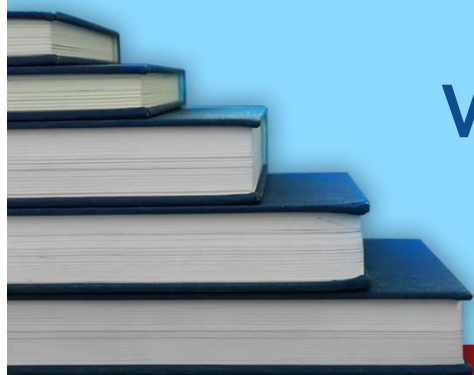


CHEMISTRY



WORKSHEET-14



STP

A PROJECT BY PUNJAB GROUP

Q.6 According to VSEPR theory, which of the following is not the basic condition for the regular geometry:

- A) Central atom is surrounded by similar atoms
- B) Central atom has no lone pair
- C) Molecule has similar bonds
- D) The electronegativity of central or surrounding atoms affect the bond angle

Q.7 Majority of the compounds in nature have:

- A) Electrovalent bond
- B) Dative covalent bond
- C) Ordinary covalent bond
- D) Hydrogen bond

Q.8 Which property is not shown by covalent compounds?

- A) They are present in the gas, liquid or solid state
- B) They are more reactive than ionic compounds
- C) They show resonance and isomerism
- D) They have low melting points and boiling points as compared to ionic compounds

Q.9 Which one of the following molecules shows a linear geometry?

- A) H_2O
- B) Cl_2O
- C) HCN
- D) C_2H_4

Q.10 Second and higher electron affinity values are positive because of:

- A) Repulsion between electrons and negatively charged ions
- B) Attraction between electrons and positively charged ions
- C) First repulsion between electrons and then attraction
- D) Both A and B

Q.11 In which of the following ionic bond is formed between atoms of elements?

- A) Al and Cl
- B) H and Cl
- C) B and F
- D) Na and H

Q.12 Which of the following molecules has six bonding electrons?

- A) C_2H_4
- B) H_2S
- C) CO_2
- D) NCl_3

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- Q.26** When heated solid iodine readily forms iodine vapors. What does this information suggest about the nature of particles in these two physical states of iodine?

Option	Solid	Vapor
A)	Ionic	Atomic
B)	Ionic	Molecular
C)	Molecular	Atomic
D)	Molecular	Molecular

- Q.27** Magnesium oxide is used to line industrial furnaces because it has a very high melting point. Which type of bond needs to be broken for magnesium oxide to melt?

- A) Co-ordinate bond C) Covalent bond
B) Ionic bond D) Metallic bond

- Q.28** All of the following are correct statements regarding difference between polar and non-polar bonds EXCEPT:

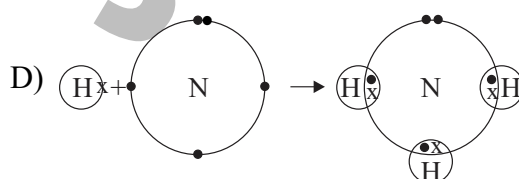
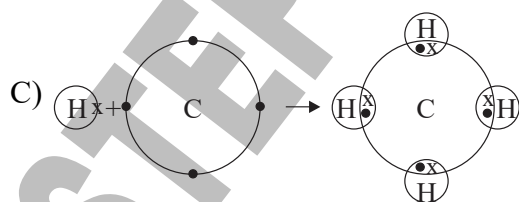
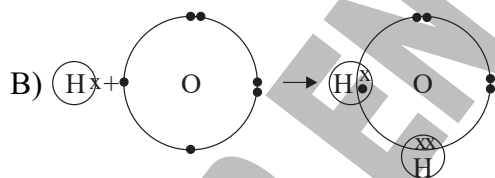
Option	Non-Polar	Polar
A)	It is a covalent bond which exists between two similar atoms or those having negligible electronegativity difference	It is a covalent bond which exists between two dissimilar atoms or those having appreciable electronegativity difference but less than 1.7
B)	It is a weaker bond	It is a stronger bond
C)	It has no polarity	It has always polarity in the molecule
D)	It is more reactive	It is less reactive

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Q.29 All of the following are correct statements regarding difference between sigma bond and pi-bond EXCEPT:

Option	Sigma bond	Pi bond
A)	It is formed by linear overlapping of two half-filled atomic orbitals	It is formed by sidewise overlapping of two half-filled parallel atomic orbitals
B)	It has restricted rotation about the inter-nuclear axis	It has free rotation about the inter nuclear axis
C)	It has only lobe of electron density between the nuclei	It has two lobes of electron density on opposite sides of inter nuclear axis
D)	It has symmetrical charge density about the inter-nuclear axis	It has no symmetrical charge density about the inter-nuclear axis

Q.30 Which of the following molecules does not obey dot-and-cross model diagram?



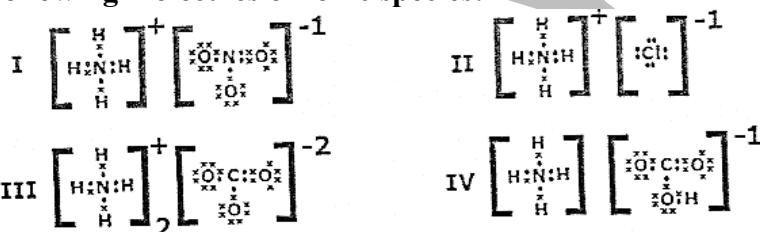
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Q.31 The distance between the nuclei of two atoms forming a covalent bond is called the bond length. All of the following statements are correctly matched EXCEPT:

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Options	Compound	Hybridization	Bond	Bond Length (pm)
A)	SiH ₄ (Monosilane)	sp ³	Si – H	148
B)	C ₂ H ₄ (Ethene)	sp ²	C = C	154
C)	BF ₃ (Boron trichloride)	sp ²	B – Cl	175
D)	C ₂ H ₂ (Ethyne)	sp	C ≡ C	120

Q.32 Observe the given dot and cross structures for the following molecules or ionic species:



The co-ordinate covalent bond exists between:

- A) N and C atoms in structure III and IV
- B) N and one H ion in all four structure
- C) N and Cl atom so structure II
- D) N and N atoms of structure I

Q.33 All of the following statements are correctly matched for ionic and covalent bonds EXCEPT:

Opt.	Ionic bond (Electrovalent bond)	Covalent bond (Electron pair bond)
A)	It is formed by complete transfer of electron/ electrons from one atom of element to the other.	It is formed by mutual sharing of electrons between two atoms.
B)	The migrated electron/ electrons belongs to only one of the two bonded atoms.	The shared electrons pair belongs to both the bonded atoms.
C)	It is directional bond.	It is non-directional bond.
D)	It is shown by positive and negative charge on the bonded atoms (+, -).	It is shown by small line (-) drawn between the two bonded atoms.

Q.34 No electrovalent bond is 100% ionic in nature. This is because of:

- A) When cations and anions approach each other, polarizability increases only
- B) Sharing of electrons takes place to some extent only
- C) Highest ionic character is present in CsF only
- D) Both A and B

Q.35 The compound which contains both ionic and covalent bond:

- A) CH₄
- B) KCN
- C) H₂
- D) KCl

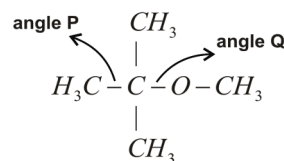
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SCRATCH WORK**

ANSWER KEY (Worksheet-14)

1	D	11	D	21	A	31	B
2	A	12	D	22	D	32	B
3	B	13	C	23	A	33	C
4	C	14	C	24	D	34	D
5	C	15	C	25	A	35	B
6	D	16	C	26	D		
7	C	17	B	27	B		
8	B	18	D	28	D		
9	C	19	A	29	B		
10	A	20	C	30	B		

ANSWERS EXPLAINED

- Q.1 (D)** PCl_3 is not planar structure due to the presence of lone pair on the central "P" atom of phosphorous. It is LAB_3 type molecule and shows **pyramidal geometry** (i.e. irregular geometry) while others are A, B and C have planar structure.
- Q.2 (A)** Al_2O_3 is giant ionic and Al_2Cl_6 is simple molecule
- (B) P_4O_{10} and PCl_3 are simple molecules
 - (C) SiO_2 and SiCl_4 . SiO_2 is a giant molecule while SiCl_4 is simple molecule
 - (D) HF and PbCl_4 both are simple molecules
- Q.3 (B)** In C_3H_8 ($\text{H}_3\text{C}-\text{CH}_2-\text{CH}_3$), all the carbon atoms are sp^3 hybridized and show **non-coplanar tetrahedral structure**.
- Q.4 (C)** All the ionic compounds show **polymorphism** and **isomorphism** but do not show **isomerism**. **Isomerism** is shown by **covalent compounds**.
- Q.5 (C)** **MTBE (Methyl tertiary butyl ether)** is a constituent of petrol and it has following structure.



From the structure it is clear that the value of **bond angle P** is 109° like alkane because the carbon atom is bonded with four other atoms while the value of **bond angle Q** is 105° just like water because oxygen is bonded with two atoms and has two lone pairs. The presence of two lone pair decreases the bond angle.

Options	Angle P	Angle Q
C)	109°	105°

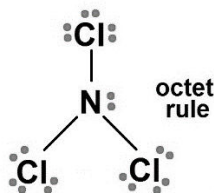
- Q.6 (D)** In fact, the electronegativity of **central or surrounding atoms** have **no** affect on the **bond angle**.
- Q.7 (C)** **Majority of the compound in nature are ordinary covalent compounds due to the following reason.**
- Carbon is tetravalent. It can form four covalent bonds at a time
 - It has unique property of catenation
 - It shows isomerism
 - It does not form ionic compound
- Q.8 (B)** Covalent compound are less reactive than ionic compounds, because first old bonds are broken then new bonds are formed by covalent compounds.
- Q.9 (C)** **HCN** molecule shows linear geometry like **BeCl_2 , HgCl_2 , and CO_2** .
- Q.10 (A)** Formation of uninegative ion is exothermic process while **2nd, 3rd**, and so on are **endothermic process**. **2nd and higher electron affinities** values are positive because when **2nd electron** is added to uninegative ion the

incoming electron is repelled by the already present negative charge and thus energy has to supply to counter the effect of repulsion between incoming electron and negatively charged ion. This clearly explains that second and high electron affinity are positive.

Q.11 (D) For the formation of ionic bond, there are two conditions.

- One element should have low ionization energy
- e.g first ionization energy of Na
= +496kJmol⁻¹
- Other element should have high electron affinity. It has high first ionization energy (1313kJmol⁻¹)
- e.g. electron affinity of H
= -73kJmol⁻¹
- e.g Na and H form ionic bond and fulfill the above two conditions

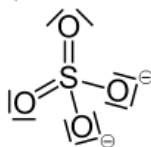
Q.12 (D) NCl₃ has six bonding electrons as shown in the structure.



Q.13 (C) It is coordinate covalent bond. A covalent bond in which shared electron pair is donated by only one atom is called coordinate covalent bond. It is shown by an arrow (→)



Q.14 (C) SO₄²⁻ shows tetrahedral geometry as shown in diagram.



Q.15 (C) CCl₄ is non-polar molecule and it shows tetrahedral geometry. It is in the liquid state because its molecules involve **instantaneous dipole induced dipole forces** (a type of intermolecular force).

Q.16 (C) H - C≡C - H. From the structure it is clear that it has three sigma bonds and two pi bonds having linear structure.

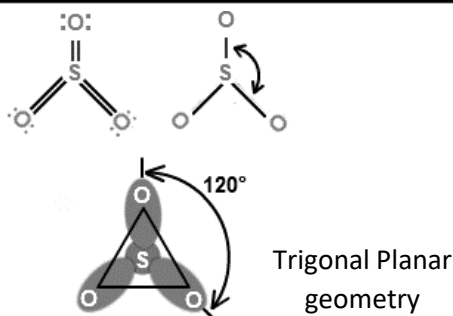
Q.17 (B) Covalent solids are giant molecules and have large number of covalent bonds. Due to their cumulative effect the **strength** of the bond is **very high** e.g. **diamond (3550°C) graphite (3700°C) and silicon carbide SiC (2730°C)** have high melting points.

Q.18 (D) Bond energy of the molecule is greater if the **bonded atoms have greater electronegative difference, high bond order and more s-character.** But the presence of lone pair decreases bond energy because they **produce repulsion.**

Q.19 (A) [H - H (436kJmol⁻¹)] H₂ molecule has greater bond energy because it have **no lone pair and smaller atomic size.**

Option	Bond	Bond energy (kJmol ⁻¹)
A)	H - H	436
B)	N - N	163
C)	O - O	146
D)	F - F	154.8

Q.20 (C) SO₃ shows trigonal planar geometry. It is AB₃ type molecule. It shows regular geometry. Double bond are treated as single bond like BF₃, AlCl₃ as shown in structure.



Q.21 (A) HCl is polar molecule and it has permanent dipoles. In HCl molecules there are dipole dipole forces. Debye forces are those forces which exist between polar and non-polar molecules e.g in HCl and Ar there are present debye forces which are also called dipole-induced dipole forces.

Q.22 (D) In propanone (CH_3COCH_3) there is no hydrogen bonding because hydrogen bonding is the electrostatic force between a highly electronegative atom (N, O, F, and rarely Cl) and partial positively charged hydrogen atom.

- In propanone there is no covalently bonded polarized hydrogen atom which is directly associated with more electronegative atoms such as N, O and F. That is why propanone does not show hydrogen bonding. It shows dipole dipole forces.

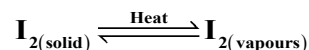
Q.23 (A) In ethanal (CH_3CHO), hydrogen atom is not covalently bonded with more electronegative atom such as N, O, F. That is why it does not show hydrogen bonding. It shows dipole dipole forces.

Q.24 (D) CO_2 is non-polar molecule and its dipole moment value is zero ($\mu = 0$). It has only London dispersion forces because in any non-polar molecule London dispersion forces are present which are the weakest and temporary forces.

Q.25 (A) The force which binds a metal cation to a **number of electrons** within its **sphere** of influence is **known as metallic bond** (in term of lattice of positive ions surrounded by mobile electron). Electron gas theory was **put forward by Drude** and **extended by Loren (1923)**. This theory is based on the following postulates:

- Each atom in a metal crystal loses all of its valence electron
- The valence electrons form a electron pool
- Valence electrons are not attached to any individual ion in the sphere of crystal
- Electrons are free to move within sphere of crystal

Q.26 (D) Since the solid iodine (I_2) readily sublimates when heated as shown below:



This shows that the forces of attraction between the iodine molecules are very weak (London dispersion forces). As the sublimation process does not require a high temperature, the covalent bonds in the iodine molecules are not broken in the vapour states. Iodine vapours are still in the discrete simple molecular form (I_2).

Q.27 (B) The type of bond **needs** to be broken for magnesium oxide to melt is ionic bond. Ionic bond is comparatively stronger than covalent bond. **That is why ionic compounds have higher melting points and boiling points.** Magnesium oxide is used to line industrial furnaces because it has a very high melting point. Melting point of **MgO** is **2,852°C**.

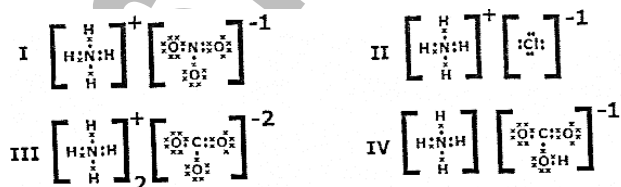
Q.28 (D) In fact, polar bond is more reactive than non-polar bond. Greater is the electronegative difference between two covalently bonded atoms in a molecule, greater is the polarity, greater is the reactivity. That is why polar molecules are more reactive than non-polar molecule.

Q.29 (B) **Sigma bond** has free rotation about the inter-nuclear axis but pi bond has restricted rotation about the **inter-nuclear axis**.

Q.30 (B) Dot-and-cross model is not followed by water molecule as shown in the diagram in option B.

Q.31 (B) In ethene C_2H_4 there is sp^2 orbital hybridization in the central carbon atom and **C = C bond length is 133 pm and it is not 154 pm.**

Q.32 (B) The co-ordinate covalent bond exists between N and one H ion in all four structure as shown below.



Q.33 (C) It is incorrect statement. In fact, the correct statement about ionic and covalent bond is as given in the tabular form:

Opt.	Ionic bond (Electrovalent bond)	Covalent bond (Electron pair bond)
C)	It is non-rigid and non-directional bond	It is rigid and directional bond

Q.34 (D) No electrovalent bond is 100% ionic in nature. This is because of:

- When cations and anions approach each other, polarizability increases only
- Sharing of electrons takes place to some extent only

Q.35 (B) In KCN there is ionic bond between potassium ion (K^+) and cyanide ion (CN^-). In cyanide ion there is covalent bond between carbon and nitrogen. So overall in KCN two bonds are involved i.e. ionic and covalent ($K^+C \equiv N$).

STOP

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