

PREVIOUS YEAR QUESTIONS

(Chapterwise)

CHAPTER NAME: CHEMICAL BONDING

SUMMARY POINTS

Concept/Topic	Key Points	Formula/Diagram/Example	Notes
Electron Dot Structure	Represents valence electrons as dots around the element symbol.	- Methane (CH_4): Four single bonds between C and H. - Nitrogen (N_2): Triple bond between N atoms.	Steps: (1) Determine valence electrons. (2) Arrange electrons to satisfy octet rule. Lone pairs are non-bonding electrons.
Lone Pair of Electrons	Electrons not involved in bonding, present as paired electrons in an atom's outermost shell.	Oxygen in water (H_2O) has two lone pairs .	Lone pairs influence molecular shape and polarity. Example: Lone pairs in NH_3 cause a pyramidal structure.
Covalent Bonding	Sharing of electrons between non-metal atoms to achieve a stable configuration.	Covalent compounds: CH_4 , H_2 , O_2 .	Covalent bonds are of three types: single, double, and triple bonds. They result in low melting/boiling points.
Ionic Bonding	Transfer of electrons from metals to non-metals, forming cations and anions.	Example: $\text{Na}^+ + \text{Cl}^- \rightarrow \text{NaCl}$.	Ionic compounds conduct electricity in molten/aqueous states and have high melting/boiling points.
Polarity in Covalent Bonds	- Polar Covalent: Unequal sharing of electrons due to electronegativity difference. - Non-Polar: Equal sharing.	- Example: Polar: HCl . Non-polar: CH_4 .	Polar covalent compounds dissolve in water; non-polar compounds do not.

Melting and Boiling Points	- Ionic compounds: High due to strong electrostatic forces. - Covalent compounds: Low due to weak intermolecular forces.	Example: Ionic NaCl : High melting point. Covalent CH_4 : Low melting point.	Covalent compounds are soft and volatile, while ionic compounds are hard and brittle.
Conductivity of Compounds	- Ionic compounds conduct electricity in molten/aqueous form (ions move freely). - Covalent compounds do not.	Example: Molten NaCl conducts electricity. CH_4 : Bad conductor.	Non-polar covalent compounds are bad conductors of heat and electricity due to lack of free ions.
Catenation	The property of an element to form chains or rings by bonding with itself.	Example: Carbon forms long chains in hydrocarbons such as alkanes ($\text{C}_n\text{H}_{2n+2}$).	Carbon exhibits maximum catenation due to its strong covalent bonds and tetravalency.
Electron Configuration and Bonding	- Determine bonding type based on valence electrons. - Metals lose electrons; non-metals gain or share electrons.	Example: - Atomic Number: $\text{Na} = 11$: 2, 8, 1 $\rightarrow$ Ionic bonding. - $\text{C} = 6$: 2, 4 $\rightarrow$ Covalent bonding.	Predict formulas using valency. Example: Compound of X (2 valency) and Y (3 valency) $\rightarrow \text{X}_3\text{Y}_2$.
Coordinate Bonding	A covalent bond where both shared electrons come from the same atom.	Example: NH_4^+ : Nitrogen donates a lone pair to form a bond with H^+ .	Found in molecules like hydronium ion (H_3O^+) and ammonium ion (NH_4^+).
Periodic Trends	- Electronegativity: Increases across a period, decreases down a group. - Atomic Size: Decreases across a period.	- Metals are electropositive; non-metals are electronegative. Example: Na^+ smaller than Na .	Trends help predict bond type and reactivity. Example: Element with atomic number 19 (metal) reacts with atomic number 17 (non-metal).



Concept Integration

- **Bonding Type and Structure:** Use electron dot diagrams to visualize bonding types in compounds like H_2O , CH_4 , NH_4^+ .
- **Polarity and Conductivity:** Analyze polarity to predict solubility and conductivity of compounds.
- **Periodic Trends and Reactivity:** Apply periodic properties to predict formulas and bond types of compounds.

Q.NO.: 1	In the molecule of water, oxygen atom has: (a) One shared pair of electrons (b) Three shared pairs of electrons (c) Two lone pairs of electrons (d) One lone pair of electrons	YEAR [2024]
ANS.:	(C) Two lone pairs of electrons	
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Q.NO.: 2	Draw the electron dot structure of: (a) Methane molecule (b) Nitrogen molecule [Atomic number: N = 7, C = 6, H = 1]	YEAR [2024]
ANS.:		
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Q.NO.: 3	Give reason: Covalent compounds have a low melting and boiling point.	YEAR [2024]
ANS.:	The molecules of covalent compounds are held by very weak forces of attraction. That is why they have low melting and boiling points.	
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Q.NO.: 4	Fill in the blank by choosing the correct answer from the bracket: Carbon tetrachloride is a _____ . [polar / non-polar] covalent compound.	YEAR [2024]
ANS.:	Non-polar	
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Q.NO.: 5	The following table shows the electronic configuration of the atoms A, B, C and D.	YEAR
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	<table><tr><td>Element</td><td>A</td><td>B</td><td>C</td><td>D</td></tr><tr><td>Electronic Configuration</td><td>2, 8, 8, 2</td><td>2, 6</td><td>2, 8, 7</td><td>2, 4</td></tr></table> (a) Write the formula of the compound formed between: (a) Write the formula of the compound formed between: (b) Which of the above elements will exhibit catenation?	Element	A	B	C	D	Electronic Configuration	2, 8, 8, 2	2, 6	2, 8, 7	2, 4	[2024]
Element	A	B	C	D								
Electronic Configuration	2, 8, 8, 2	2, 6	2, 8, 7	2, 4								
ANS.:	(a) 1. AB (b) D											
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Q.NO.: 6	Match the column A with column B: Column A a. Water b. Alkali metal c. Halogen compound d. Calcium oxide e. Weak acid	Column B 1.Lithium 2. Iodine 3. Covalent 4.Acetic acid 5.Ionic compound 6.Sulphuric acid	YEAR [2024]
ANS.:	a. Water - Covalent compound b. Alkali Metal - Lithium c. Halogen - Iodine d. Calcium Oxide - Ionic compound e. Weak Acid - Acetic acid		
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Q.NO.: 7	Fill in the blank by choosing the correct answer from the bracket: Non-polar covalent compounds are _____ [good / bad] conductors of heat and electricity.	YEAR [2023]
ANS.:	Bad	
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Q.NO.: 8	Draw the electron dot structure of: (a) Ammonium ion (b) A molecule of Nitrogen [Atomic number: N = 7, H = 1]	YEAR [2023]
ANS.:		
TOPIC:	Page No.:	Ref. Link

Q.NO.: 9	Give reason: Ionic compounds do not conduct electricity in solid state.	YEAR [2023]
ANS.:	In the solid state, ions are held together by strong electrostatic forces and are not free to move about within the solid. Hence, ionic solids do not conduct electricity in the solid state.	
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Q.NO.: 10	Give the appropriate term defined by the statement below: The covalent bond in which the electrons are shared equally between the combining atoms.	YEAR [2019]
ANS.:	Non-polar covalent bond	
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Q.NO.: 11	Draw the electron dot structure of: (1) Nitrogen molecule [N=7] (2) Sodium chloride [Na = 11, Cl = 17] (3) Ammonium ion [N=7,H=1]	YEAR [2019]
ANS.:		
TOPIC:	Page No.:	Ref. Link

Q.NO.: 12	Give a reason the following: Ionic compounds have a high melting point.	YEAR [2018]
ANS.:	Ionic compounds are made up of positive and negative ions. They have a strong force of attraction between oppositely charged ions. So a lot of heat energy is required to break the force of attraction or break the bonds (ionic bonds). Due to this, ionic compounds have high melting points.	
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Q.NO.: 13	(i) What do you understand by a lone pair of electro lab (ii) Draw the electron dot diagram of Hydronium ion. (H=1; O=8)	YEAR [2018]
ANS.:		
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Q.NO.: 14	Fill in the blanks from the choices given in brackets: The compound that does not have a lone pair of electrons is _____ (water, ammonia, carbon tetra chloride).	YEAR [2017]
ANS.:	carbon tetrachloride	
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Q.NO.: 15	Choose the correct answer from the options given below: Which of the following is a common characteristic of a covalent compound? (i) high melting point (ii) consists of molecules (iii) always soluble in water (iv) conducts electricity when it is in the molten state	YEAR [2017]
ANS.:	(B) Consists of molecules.	
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Q.NO.: 16	State the type of Bonding in the following molecules: (i) Water (ii) Calcium oxide	YEAR [2017]
ANS.:	(A) Covalent bonding (B) Ionic bonding / electrovalent bond	
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Q.NO.: 17	Draw an electron dot diagram to show the formation of each of the following compounds: (i) Methane (ii) Magnesium Chloride [H = 1, C = 6, Mg = 12, Cl = 17]	YEAR [2017]
ANS.:		
TOPIC:	Page No.:	Ref. Link

Q.NO.: 18	Fill in the blank with the choices given in bracket. Electrovalent compounds have _____ (high / low) melting points.	YEAR [2016]
ANS.:	High	
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Q.NO.: 19	Choose the correct answer from the options given below: An element with the atomic number 19 will most likely combine chemically with the element whose atomic number is: a. 17 b. 11 c. 18 d. 20	YEAR [2016]
ANS.:	(A) 17	

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Q.NO.: 20	The following table shows the electronic configuration of the elements W. X. Y, Z: <table><tr><td>Element</td><td>W</td><td>X</td><td>Y</td><td>Z</td></tr><tr><td>Electronic configurations</td><td>2, 8, 1</td><td>2, 8, 7</td><td>2, 5</td><td>1</td></tr></table> Answer the following question based on the table above: (i) What type of Bond is formed between: 1. W and X 2. Y and Z (ii) What is the formula of the compound formed between: 1. X and Z 2. W and X	Element	W	X	Y	Z	Electronic configurations	2, 8, 1	2, 8, 7	2, 5	1	YEAR [2016]
Element	W	X	Y	Z								
Electronic configurations	2, 8, 1	2, 8, 7	2, 5	1								
ANS.:	(i) 1. Ionic bond / Electrovalent bond 2. Covalent bond (ii) 1. XZ 2. WX											
TOPIC:	Page No.:	Ref. Link										

Q.NO.: 21	Bonding in this molecule can be understood to involve coordinate bonding. (A) Carbon tetrachloride (B) Hydrogen (C) Hydrogen chloride (D) Ammonium chloride	YEAR [2015]
ANS.:	(D) Ammonium Chloride (NH ₄ Cl)	
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Q.NO.: 22	Answer the following question:	YEAR
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	Explain the bonding in methane molecules using electron dot structure.	[2015]
ANS.:		
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Q.NO.: 23	Element X is a metal with a valency 2, Y is a non-metal with a valency 3. (i) Write an equation to show how Y forms an ion. (ii) If Y is a diatomic gas, write an equation for the direct combination of X and Y to form a compound.	YEAR [2015]
ANS.:	(i) Y being a non-metal, gains three electrons and forms Y^{3-} anion. The chemical equation is: $Y^{+3e^-} \rightarrow Y^{3-}$ (ii) (B) $3X + Y_2 \rightarrow X_3Y_2$	
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Q.NO.: 24	An element L consists of molecules. (i) What type of bonding is present in the particles that make up L? (ii) When L is heated with iron metal, it forms a compound FeL. What chemical term would you use to describe the change undergone by L?	YEAR [2015]
ANS.:	(A) Covalent bond (B) Reduction	
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