

APOLLO

Chemical Bonding

FBISE Chemistry Class 11 (HSSC-I)

Domain B: Physical Chemistry

44 questions | questions

Original FBISE question crops. National Curriculum 2022-23 topic.

8.	Which species is not tetrahedral?	CCl_4	CH_4	NH_4^{1+}	ICl_4^{1-}
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13.	Which of these molecules is polar?	CO_2	BF_3	CH_4	NH_3
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Scenario for MCQ 57 to 60		A chemist compares the molecules BF_3 , NF_3 , and NH_3 , noting that BF_3 has no dipole moment despite having polar B–F bonds, that NF_3 and NH_3 are both polar but differ in bond angles and boiling points, and that NH_3 has an unusually high boiling point compared to similar-sized molecules, leading her to apply VSEPR theory, Valence Bond Theory, orbital hybridization, and intermolecular force concepts to explain these observations.			
57.	Why does BF_3 have zero net dipole moment despite having polar B–F bonds?	The B–F bonds are non-polar because fluorine and boron have the same electronegativity	BF_3 is trigonal planar; the three bond dipoles are symmetrically arranged and cancel out exactly	BF_3 is trigonal pyramidal and dipoles cancel due to lone pair	The bond dipoles in BF_3 are too weak to create a net dipole

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58.	Using VSEPR theory, what is the correct geometry and bond angle of NH_3 ?	Trigonal planar, 120°	Tetrahedral, 109.5°	Trigonal pyramidal, 107°	Bent, 104.5°

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59.	Which of the following orbitals overlap in the ammonia (NH_3) molecule to form the N–H bonds?	p–p	sp^2 –p	sp^3 –s	s–s

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60.	Which type of intermolecular force is mainly responsible for the unusually high boiling point of NH_3 compared to PH_3 ?	London dispersion forces	Dipole–dipole interactions	Hydrogen bonding	van der Waals forces only

Predict the shapes and bond angles of methane, ammonia and water using VSEPR theory, and explain the type of hybridization of the central atom in each molecule.

2.	Which pair of elements will most likely form an ionic bond?	$\text{C \& H}$	$\text{B \& Cl}$	$\text{Na \& O}$	$\text{H \& Cl}$	☐	☐	☐	☐
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(ii)	Briefly explain the structure of PCl_3 & NH_4^+ ion on the basis of VSEPR theory.	1.5 + 1.5
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(iii)	Keeping in view the factors affecting bond energy, Justify the order of bond energies in the following: a) $\text{Cl}_2 > \text{F}_2$ b) $\text{H}_2 > \text{HBr}$ c) $\text{N}_2 > \text{O}_2$	03
(iv)	Write down three differences between limiting and non-limiting reactants	03

Q.3	What is mass spectrometry? Explain the construction and working of a mass spectrometer. How can average atomic mass of an element be calculated from data obtained?	1+4 +2	OR	Explain formation of covalent bonds in O_2 molecule on the basis of molecular orbital theory and valance bond theory. Justify that molecular orbital theory is superior to valence bond theory.	3+3 +1
Q.4	Describe by giving balanced chemical equations			Discuss the effect of following changes on the	

(ii)	Draw molecular orbital diagram for N_2 and calculate its bond order.	03
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Q.3	What is hybridization? Write down three differences between sp^3 and sp^2 hybridizations. Explain bonding in BF_3 on the basis of hybridization.	1+3 +3	OR	
Q.4	Explain one physical and one chemical method to			

Write any three differences between sigma (σ) and pi (π) bonds.	1x3
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(v)	Consider the following substances to identify the type of Bond (ionic, polar or non-polar covalent bond) on the basis of Electronegativity difference $O_2(O: 3.44), KCl(K: 0.82), HCl(Cl: 3.16)(H: 2.20)$	1.5			
		03	OR	Write K_{sp} expression for the following molecules: a. CaF_2 b. $MgSO_4$	1.5 + 1.5

Q.3	What is hybridization? Explain hybridization with molecular diagrams in Methane (CH_4) and Boron Tri Fluoride (BF_3).	1+3 +3
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Identify intermolecular forces among the following molecules. Also write in descending order of their strength. C_2H_2, NH_3, HCl, H_2O	2+1
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What is meant by electronegativity? Explain its trend along the period of periodic table.	03
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Q.6	How ethyl chloride can be prepared from the following: a. ethene b. ethane c. ethanol Write complete balanced equations with conditions involved in each reaction.	2x3	OR	Explain in detail the type of hybridization, bond angles and geometrical shapes of following molecules: a. BF_3 b. C_2H_2	3+3
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According to VSEPR theory bond angle in methane is:	90°	109.5°	120°	180°
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OR	Explain in detail the type of hybridization, bond angles and geometrical shapes of following molecules: a. C_2H_4 b. NH_3	3+3
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x.	Predict the geometry of XeF_4	Tetrahedral	Trigonal planner	Square planner	V-shaped
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xi.	Which electronic configuration represents the most electronegative element?	ns^2np^2	ns^2np^1	ns^2np^4	ns^2np^5
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(xii)	Define electronegativity. Explain the trend of electronegativity down the group of the periodic table.	1+2
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configuration as possessed by neon:					
3.	Select the molecule, which has a dipole moment equal to zero. ($\mu = 0$)	C_6H_6	HBr	SO_2	NH_3

A molecule has two lone pairs and two bond pairs around the central metal atom, it is expected to be:	Triangular geometry	Linear geometry	V-shaped geometry	Tetrahedral geometry
The volume occupied by Nitrogen gas (N_2)				

		water			chloride
9.	In crystal lattice of ice, each O-atom of water molecule is attached to:	Four hydrogen atoms	Three hydrogen atoms	Two hydrogen atoms	Five hydrogen atoms
Formation of NH_4^+ is a reversible, exothermic		More reactant	More H^+ will	More NH_3 will	More NH_4^+ will

Why bond formation is NOT possible between two He-atoms? Prove with the molecular orbital theory.	03
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hydrogen atom.	
The dipole moment of HF is 2.03 D, and the bond length is 120 pm. Calculate the percentage of ionic character of HF bond.	03

theory.	
By using VSEPR theory, predict the geometry, bond angle of the following:	03
a) CH_2O b) SO_3 c) CHCl_3	

First Annual 2025 | Section B Q2(xiii) | 3 marks

(xiii)	How the anomalous behaviour of water will be explained when its density becomes maximum at 4°C ?	03
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First Annual 2025 | Section C Q4 | 6 marks

Carbon atom shows sp^3, sp^2, sp hybridization. Give one example of each along the structures.	2x3
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Second Annual 2025 | Section A Q3 | 1 mark

3.	What is the bond angle in methane according to VSEPR theory?	90°	109.5°	120°	180°
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Second Annual 2025 | Section A Q4 | 1 mark

4.	s-s overlap leads to the formation of:	Sigma bond	Pi bond	Metallic bond	Ionic bond	☐	☐	☐	☐
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Second Annual 2025 | Section A Q8 | 1 mark

8.	The anomalous behaviour of water at 4 °C is explained by:	Van der Waals forces	Ionic bonding	Hydrogen bonding	Metallic bonding
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Second Annual 2025 | Section B Q2(iii) OR | 3 marks

OR	Use VSEPR theory to draw the shapes of PH_3 and H_2S molecules.	03
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Second Annual 2025 | Section B Q2(iv) | 3 marks

(iv)	Write three differences between Sigma (σ) and Pi (π) bond.	1x3
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Second Annual 2025 | Section B Q2(v) | 3 marks

(v)	Predict whether CO_2 and H_2O are polar or non-polar. Justify your answer with reference to molecular geometry regarding dipole moment.	1+2
(vi)	Differentiate liquid crystals from pure liquids or	

Second Annual 2025 | Section B Q2(vi) OR | 3 marks

	Why ice has low density? Explain briefly give its one application in real life.	2+1
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Second Annual 2025 | Section C Q6 | 6 marks

Q.6	Briefly explain and draw orbital diagram for the formation of N_2 and O_2 according to Valence Bond theory.	3+3	OR	Justify the following statements: a. Boiling point of Halogens increases down the group. b. Methane is gas while Hexane is liquid.	3+3
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First Annual 2026 | Section B Q2(ii) | 3 marks

(ii)	Draw the shapes of the following molecules according to VSEPR. Mention name of geometry and bond angles (approx.): a. H_2S b. SF_6	1.5 + 1.5
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First Annual 2026 | Section B Q2(viii) OR | 3 marks

Explain the formation of ethyne molecule on the basis of hybridization with the help of diagram.	03
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First Annual 2026 | Section B Q2(ix) | 3 marks

(ix)	Ice has low density than water and it occupies 9% more space than liquid water, why?	03
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First Annual 2026 | Section C Q4 | 6 marks

Q.4	Draw the molecular orbital diagram of the following molecules: a. N_2 b. O_2^{-2}	3+3
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