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FBISE Chemistry Class 11
Topical workbook - Volume 3 of 4

140 questions arranged by official framework topic.
National Curriculum 2022-23; supported examinations from 2027.

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Acids, Bases and Salts

Domain B: Physical Chemistry

Second Annual 2025 | Section B Q2(xi) | 3 marks

	b. More nitrogen is added in the mixture.	
(xi)	Derive the relation of Acid dissociation constant K_a for the following dissociation equation for an acid (*HX*) $HX + H_2O \rightleftharpoons H_3O^+ + X^-$	**03**
(xii)	Enlist the factors which affect the [illegible]	

First Annual 2026 | Section B Q2(x) OR | 3 marks

Calculate solubility of $Pb\ SO_4$ when $K_{sp} = 1.96 \times 10^{-8}$ at $25°C$.	**03**

First Annual 2026 | Section B Q2(xiii) OR | 3 marks

OR	Calculate the pH of formic acid sodium format buffer solution containing 1 mole of each component ($K_a = 1.8 \times 10^{-4}$).	**03**

First Annual 2026 | Section A Q12 | 1 mark

12. pH value of aqueous solution of NH_4Cl :	$pH > 7$	$pH < 7$	$pH = 7$	pH is undefined

First Annual 2026 | Section B Q2(x) OR | 3 marks

03	**OR**	The solubility of CaF_2 is $2.05 \times 10^{-4} M$ at $25°C$. Calculate its K_{sp}.

First Annual 2026 | Section B Q2(xiii) OR | 3 marks

03	OR	Calculate the pH of a buffer solution in which $0.11\,M\ CH_3COONa$ and $0.09\,M\ CH_3COOH$ solution are present. $\left(K_a = 1.8\times10^{-5}\right)$	03

FBISE model paper | Section A Q1(xii) | 1 mark

xii.	Predict which specie upon hydrolysis gives acidic solution?	Na_2CO_3	$NaNO_3$	$Cu(OH)_2$	$AlCl_3$

FBISE model paper | Section B Q2(x) OR | 3 marks

Lead(II) chloride is sparingly soluble in water. Solubility of lead (II) chloride at 25 ℃ is 0.5 gdm^{-3}. Calculate Ksp of lead(II) chloride at 25 ℃.	1.5+ 1.5

FBISE model paper | Section B Q2(xiii) OR | 3 marks

Calculate pH of a buffer solution containing 0.11M HCOOH and 0.11M HCOONa. pKa of methanoic acid at 25 ℃ is 3.76.	1+2

First Annual 2025 | Section A Q12 | 1 mark

12.	Which salt dissolved in water forms a solution with a pH greater than 7?	$NaCl$	$CuSO_4$	Na_2CO_3	NH_4Cl
	When a reaction proceeds in a sequence of			Order of	Molecula

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

What are Buffer solutions? Write their types.	2+1

Second Annual 2025 | Section A Q11 | 1 mark

11.	According to Bronsted-Lowery concept, acid is:	Proton donor	Proton acceptor	Electron donor	Electron acceptor

Second Annual 2025 | Section A Q12 | 1 mark

12.	The pH of pure water at 25 °C is:	0	7	14	1

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

OR	Calculate the pH of *0.01M* H_2SO_4 solution.	1.5 +1.5

Second Annual 2025 | Section C Q3 OR | 7 marks

OR	State common Ion effect. Explain its application for the purification of commercial NaCl using chemical equations.	2+5
	Balance the given redox equations:	

Q.4	What is Buffer solution? Write its types along with their composition. Explain working of CH_3COOH/CH_3COONa Buffer system when few drops of NH_3 are added to it.	**2+3 +2**

First Annual 2026 | Section B Q2(v) OR | 3 marks

R	What type of reactions occur on hydrolysis of the following salts? Answer along with the reactions involved: **a.** $NaCl$ **b.** NH_4Cl	1.5 + 1.5
	Write down the mechanism of ozonolysis of	

First Annual 2026 | Section B Q2(xi) | 3 marks

(xi)	What is the pH of the buffer solution of CH_3COOH and CH_3COONa? $[CH_3COOH] = 0.2M$ $[CH_3COONa] = 1.0M$ pK_a of CH_3COOH is 4.76	03
	Compare exothermic and endothermic reactions and	

First Annual 2026 | Section B Q2(i) OR | 3 marks

	Discuss conjugate acid-base pair with suitable examples.	03

First Annual 2026 | Section B Q2(ii) OR | 3 marks

	What is the composition of a buffer solution? How buffer play its role in human biological system?	2+1

First Annual 2026 | Section B Q2(vii) OR | 3 marks

OR	State Lowry and Bronsted concepts for acids and bases.	03

First Annual 2026 | Section C Q5 OR | 6 marks

OR	Why equeous solution of salt is not necessarily neutral? Explain with reference to NH_4Cl, K_2CO_3 and $NaCl$.	2+2 +2

	for a and b constants.	
Q.6	What is meant by solubility product? If solubility of $AgBr$ is $7.1\times10^{-7}M$ at $25°C$. Calculate its K_{sp}.	**2+5**

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Periodic Table

Domain C: Inorganic Chemistry

FBISE model paper | Section A Q33 | 0.5 marks

33.	The number of principal energy levels in an atom is equal to its:	Group number	Period number	Atomic number	Valence electrons

FBISE model paper | Section A Q42 | 0.5 marks

42.	An element in Period 3, Group 2 of the periodic table has:	3 principal energy levels and 2 valence electrons	2 principal energy levels and 3 valence electrons	3 valence electrons and 2 principal energy levels	2 valence electrons and 2 principal energy levels

FBISE model paper | Section A Q69 | 0.5 marks

Scenario for MCQ 69 to 72

Use the diagram to answer the questions.

Group →	**1 IA**	**2 IIA**		**13 III A**	**14 IV A**	**15 VA**	**16 VIA**	**17 VII A**	**18 VIII A**
1	**A**							**B**	
2	**C**	**D**						**E**	
3	**F**	**G**		**H**	**I**	**J**	**K**	**L**	**M**

Scenario for MCQ 69 to 72

Group →	**1 IA**	**2 IIA**		**13 III A**	**14 IV A**	**15 VA**	**16 VIA**	**17 VII A**	**18 VIII A**
1	**A**							**B**	
2	**C**	**D**						**E**	
3	**F**	**G**		**H**	**I**	**J**	**K**	**L**	**M**

69.	Which labeled element belongs to the p-block?	D	G	J	F

FBISE model paper | Section A Q70 | 0.5 marks

Scenario for MCQ 69 to 72

Use the diagram to answer the questions.

Group →	1 IA	2 IIA		13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA	18 VIIIA
1	A							B	
2	C	D						E	
3	F	G		H	I	J	K	L	M

Scenario for MCQ 69 to 72

Group →	1 IA	2 IIA		13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA	18 VIIIA
1	A							B	
2	C	D						E	
3	F	G		H	I	J	K	L	M

69.	Which labeled element belongs to the p-block?	D	G	J	F
70.	Which element has the greatest number of occupied energy levels?	C	D	F	L

FBISE model paper | Section A Q71 | 0.5 marks

Scenario for MCQ 69 to 72

Use the diagram to answer the questions.

Group →	1 IA	2 IIA		13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA	18 VIIIA
1	A							B	
2	C	D						E	
3	F	G		H	I	J	K	L	M

Scenario for MCQ 69 to 72

Group →	1 IA	2 IIA		13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA	18 VIIIA
1	A							B	
2	C	D						E	
3	F	G		H	I	J	K	L	M

69.	Which labeled element belongs to the p-block?	D	G	J	F
70.	Which element has the greatest number of occupied energy levels?	C	D	F	L
71.	Which labeled element is most likely a metalloid?	H	I	J	K

percentage yield of the reaction.

Scenario for MCQ 69 to 72

Use the diagram to answer the questions.

Group →	1 IA	2 IIA		13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA	18 VIIIA
1	A							B	
2	C	D						E	
3	F	G		H	I	J	K	L	M

Scenario for MCQ 69 to 72

Group →	1 IA	2 IIA		13 IIIA	14 IVA	15 VA	16 VIA	17 VIIA	18 VIIIA
1	A							B	
2	C	D						E	
3	F	G		H	I	J	K	L	M

69.	Which labeled element belongs to the p-block?	D	G	J	F
70.	Which element has the greatest number of occupied energy levels?	C	D	F	L
71.	Which labeled element is most likely a metalloid?	H	I	J	K
72.	Which element is expected to have the highest ionization energy?	F	H	L	M

FBISE model paper | Section B Q7 OR | 4 marks

2+2	**OR**	An element X has an electron configuration ending in $3s^1$. Answer the following: a) State the group, period, and block of element X. b) Explain how its position in the periodic table helps in determining its chemical properties.

First Annual 2025 | Section A Q8 | 1 mark

8.	Position of an element in periodic table with electronic configuration $1s^2, 2s^2p^6, 3s^2p^2$ is:	In Group–1 (I-A)	In Group–2 (II-A)	In Group–13 (III-A)	In Group–14 (IV-A)	○	○	○	○

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

(ix)	Determine the principal energy level and number of valence electrons in the different sub-shells and orbitals of an element present in 3rd period and group-VI A of the periodic table.	**03**
(x)	Describe the use of compounds of sulphur in any	**03**

First Annual 2025 | Section B Q2(iii) OR | 3 marks

	Describe by giving an example:	
OR	How are the elements arranged in different blocks of periodic table?	**03**
	Complete the following reactions:	

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

	carbocation:				
(xi)	Differentiate between metallic and non–metallic behavior of elements.	**03**	**OR**	For the reaction $2NO_2 + F_2 \longrightarrow 2NO_2F$ $Rate = [NO_2][F_2]$ propose the mechanism of	**03**

Second Annual 2025 | Section A Q10 | 1 mark

	Polygalic acid - base pair differs by:	One nucleon	One electron	One proton	One molecule
10.	The number of valence electrons in an atom can be deduced from its:	Atomic mass	Density	Group number	Isotopic composition
	Which of the following has no specific				

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

Justify the followings: **a.** Atomic size decreases along the period. **b.** Metallic character increases along the Group.	**1.5 + 1.5**

Justify the followings: **a.** Atomic size decreases along the period. **b.** Metallic character increases along the Group.	**1.5 + 1.5**

Write the General formulas of Primary, Secondary

First Annual 2026 | Section B Q2(i) | 3 marks

Write three equations showing reaction of chlorides with water.	**1x3**

First Annual 2026 | Section A Q4 | 1 mark

Which element shows highest electron affinity?	*Na*	*Mg*	*Al*	*Cl*

First Annual 2026 | Section B Q2(i) | 3 marks

Briefly explain effects of hydrolysis of any three chlorides on pH with equations.	1x3

FBISE model paper | Section B Q2(i) | 3 marks

(i)	Explain with equations the reactions of the following chlorides with water, Also mention pH of resulting mixture. a. $AlCl_3$ b. PCl_3	1.5+ 1.5

Complete the following reactions: $AlCl_3 + 3H_2O \longrightarrow$ $SiCl_4 + 4H_2O \longrightarrow$ $PCl_5 + 4H_2O \longrightarrow$	1x3

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Group17

Domain C: Inorganic Chemistry

FBISE model paper | Section A Q1 | 0.5 marks

1.	Which halide ion is the strongest reducing agent?	Cl^-	Br^-	I^-	F^-

FBISE model paper | Section A Q32 | 0.5 marks

32.	Which reaction occurs most vigorously at room temperature even in the darkness?	$Cl_2 + H_2 \rightarrow 2HCl$	$Br_2 + H_2 \rightarrow 2HBr$	$I_2 + H_2 \rightarrow 2HI$	$F_2 + H_2 \rightarrow 2HF$

FBISE model paper | Section B Q4 | 4 marks

Q4	Describe the trend in the relative reactivity of halide ions as reducing agents down Group 17 Describe how the behavior of a silver halide precipitate in aqueous ammonia (NH_3) can be used to distinguish between bromide (Br^-) and iodide (I^-) ions.	**2+2**	**OR**	Explain how nitroethane $C_2H_5NH_2$, is converted into aminoethane by reduction. Also give four other methods to obtain the same product?

First Annual 2025 | Section A Q3 | 1 mark

Which statement is **FALSE** about **comparative bond energy values** of Hydrogen halide molecules?	*H–Cl > H–F*	*H–F > H–Cl*	*H–Cl > H–Br*	*H–Br > H–I*	◯	◯	◯	◯

First Annual 2025 | Section A Q10 | 1 mark

10. Which of the following halides can reduce H_2SO_4 to H_2S?	*NaF*	*NaCl*	*NaBr*	*NaI*	◯	◯	◯	◯

First Annual 2025 | Section C Q5 | 6 marks

Q.5	Explain the relative reactivity of halogens: **(i)** as oxidizing agents **(ii)** in their reaction with H_2, by giving suitable examples.	**3+3**	**OR**

Second Annual 2025 | Section A Q17 | 1 mark

17.	Which of the following halogens exists in solid state at room temperature?	I_2	Cl_2	Br_2	F_2

Second Annual 2025 | Section B Q2(iii) | 3 marks

	briefly.	
(iii)	Why Bond energy in $F–F$ is lower than in $Cl – Cl$? Although the size of F_2 is smaller than Cl_2.	03

First Annual 2026 | Section B Q2(iii) OR | 3 marks

State three factors affecting reducing power of halide ions.	03

First Annual 2026 | Section B Q2(iii) OR | 3 marks

Explain the reactivity of F^-, Cl^- and Br^- with concentrated H_2SO_4.	03

FBISE model paper | Section A Q1(xvi) | 1 mark

xvi.	Suggest why I_2 is solid while Br_2 is liquid at room temperature?	Due to strong hydrogen bonding in I_2	Due to stronger London dispersion forces in I_2	Due to dipole dipole force in Br_2	Due to ion dipole force in Br_2

FBISE model paper | Section B Q2(iii) OR | 3 marks

Reducing power of halide ions increases down the group. Explain this fact with the help of reaction of **Cl^-** and **Br^{-1}** ions with conc. H_2SO_4.	1.5+ 1.5

First Annual 2026 | Section B Q2(iv) | 3 marks

(iv)	Why the F_2 and Cl_2 are gases, Br_2 is a liquid and I_2 is a solid, explain with reference to intermolecular forces?	03	OR	State the principle of Mass spectrometry and tell the methods of ionization of the sample species.	03
(v)	Describe the following properties of crystalline solids:			What type of reactions occur on hydrolysis of the	

First Annual 2026 | Section B Q2(xiv) OR | 3 marks

Describe the relative thermal stabilities of hydrogen halides in terms of bond strengths.	03

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Nitrogen and Sulphur

Domain C: Inorganic Chemistry

FBISE model paper | Section A Q34 | 0.5 marks

34.	Which of the following correctly represents an important industrial use of sulfur compounds?	Used only in making plastics and glass	Used to neutralize acids in water treatment	Used as a fuel in automobiles	Used in fertilizers & gunpowder

FBISE model paper | Section A Q52 | 0.5 marks

52.	In the formation of photochemical smog, Peroxyacetyl Nitrate (PAN) is produced when:	NO reacts directly with ozone	Hydrocarbon s react with NO to form PAN	Peroxyacetyl radicals formed from hydrocarbons combine with NO_2	Sunlight directly converts NO_2 into PAN

First Annual 2025 | Section A Q9 | 1 mark

9.	Peroxyacetyl nitrate (PAN) is formed by the reaction of oxides of nitrogen with:	Oxides of sulphur	Hydrogen sulphide	Oxides of phosphorus	Unburned hydrocarbons	○ ○ ○ ○

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

(x)	Describe the use of compounds of sulphur in any three chemical industries.	**03**	**OR**	State Markonikoff's rule by giving an example and its mechanism.	**1x3**
(xi)	Calculate the volume occupied by $3.011x10^{24}$	**03**	**OR**	How is Ethanol prepared from an/a:	**03**

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

	ii. has water high surface tension than Ether?	
OR	What is the Photo chemical smog? Briefly describe its formation.	**1+2**
	Ethanol can be converted into propanoic acid in	

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

Briefly explain any three uses of sulphur in industry or in daily life.	**03**

First Annual 2026 | Section B Q2(vii) | 3 marks

Explain the role of NOx in the formation of Peroxyacetyl nitrate (PAN) with chemical reactions.	03

First Annual 2026 | Section B Q2(vii) | 3 marks

Explain the role of NO and NO_2 in the formation of peroxyacetyl nitrate (PAN), with equations.	03	**OR**	Give all of the possible reactions among free radicals in termination step of methane and chlorine.	1.5 + 1.5

FBISE model paper | Section B Q2(vii) | 3 marks

(vii)	Give role of NOx in the formation of PAN (Peroxyacetyl nitrate). Explain with chemical reactions.	1+2

First Annual 2026 | Section B Q2(xiv) | 3 marks

(xiv)	Briefly explain three uses of sulphur compounds.	**03**	**OR**	Describe the relative thermal stabilities of hydrogen halides in terms of bond strengths.	**03**

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Environm ental Chemistry Air

Domain D: Environmental Chemistry

FBISE model paper | Section B Q2 OR | 4 marks

		pH of the solution.	
2+2	**OR**	During a sunny day, nitrogen oxides and hydrocarbons released from vehicles react in the atmosphere to produce photochemical smog. Explain why sunlight is necessary for this process and the role of nitrogen oxides (NO_x) in the reactions. Write two effects of photochemical smog on living organisms.	**2 +2**

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

1.5 + 1.5	**OR**	What is acid rain? Describe its formation with the help of chemical reactions involved.	**1+2**

OR	Write down any three harmful effects of acid rain.	**03**

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Environm ental Chemistry -Water

Domain D: Environmental Chemistry

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

Explain briefly:				
Write down any three measures that ensure the preservation of water resources.	03	OR	How can iodoform test be applied to the alcohols? Describe by giving chemical equations.	1.5 + 1.5

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

	$\ldots(g)$ $\ldots(g)$ $\ldots(s)$	
(viii)	Write down three methods by which un-usable water can be converted into clean water.	03
(ix)	Write down three methods for the preparation of	

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Organic Chemistry

Domain E: Organic Chemistry

FBISE model paper | Section A Q14 | 0.5 marks

14.	Which type of isomerism is exhibited by the following pair of compounds A and B? **A:** $CH_3–O–CH_2–CH_2–CH_3$ **B:** $CH_3–CH_2–O–CH_2–CH_3$	Chain isomerism	Position isomerism	Functional group isomerism	Metamerism

FBISE model paper | Section A Q17 | 0.5 marks

17.	Which one of the following compounds has the same empirical formula and molecular formula?	$C_6H_{12}O_6$	C_6H_6	CH_3COOH	CH_3CH_2OH

FBISE model paper | Section A Q31 | 0.5 marks

31.	Which observation would provide the strongest evidence for catenation	Carbon forms four bonds with Hydrogen to form CH_4	Carbon forms double bond with oxygen to form CO_2	Carbon atoms linked together to form C_5H_{12}	Carbon forms triple bond with Nitrogen to form HCN

FBISE model paper | Section A Q43 | 0.5 marks

43.	What is the correct IUPAC name of the following compound? $CH_3CH(CH_3)CH_2CH(CH_3)CH_3$	2,4-dimethylpentane	3,3-dimethylpentane	2,3-dimethylpentan e	Hexane

FBISE model paper | Section B Q3 OR | 4 marks

2+2	**OR**	Use the rules of systematic nomenclature (IUPAC) to write the name of the following structures. $CH_2=C(CH_3)–CH_2–CH(CH_3)–CH_3$ $(CH_3)_2CH–CH(CH_3)–CH_2–OH$ $CH_3–C(O)–CH(CH_3)–CH_2–CH_3$ $CH_3–C(CH_3)_2–COOH$	**2+2**

First Annual 2025 | Section B Q2(i) OR | 3 marks

What is meant by Catenation? What is its importance in organic chemistry?	1+2

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

	occupied by 2000g of Cl_2 gas at STP.
(iv)	Why does carbon form a large number of organic compounds? Give three reasons.

Second Annual 2025 | Section A Q11 | 1 mark

	can be deduced from its.			number	composition
11.	Which of the following has no specific functional group?	Ethene	Propane	Butanol	Acetic Acid
	The reaction of methane with chlorine in the	Electrophilic	Free radical	Nucleophilic	

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

and Tertiary amines.	
What is Catenation? How is it important in organic Chemistry?	1+2

First Annual 2026 | Section B Q2(vi) OR | 3 marks

Which property of carbon is responsible for existence of large number of organic compounds in nature and how? Explain.	03

First Annual 2026 | Section A Q7 | 1 mark

Electrophile is a specie which is:	Electron pair donor	Proton acceptor	Proton donor	Electron pair acceptor
Which compound will NOT				

First Annual 2026 | Section B Q2(vi) OR | 3 marks

1.5 + 1.5	OR	What is catenation? Explain its importance in Organic chemistry.	1+2

First Annual 2026 | Section C Q5 | 6 marks

Consider an organic compound with molecular formula $C_5H_{11}O$. It exists in different isomeric forms. Draw possible isomers. Also write type of structural isomerism shown by them.	06

FBISE model paper | Section A Q1(xiv) | 1 mark

xiv.	Which one of the following is a nucleophile?	NH_4^+	SO_3	NH_3	NO_2^{1+}

FBISE model paper | Section B Q2(vi) OR | 3 marks

Catenation increases diversity of organic compounds. Define catenation and explain this statement with suitable examples.	1+2

First Annual 2026 | Section B Q2(ix) | 3 marks

(ix)	Write general formulae and functional group of following homologues series. a. Ketones b. Carboxylic acids c. Alcohols	1x3
(x)	Construct an energy cycle to calculate ΔH for	

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Hydrocar bons

Domain E: Organic Chemistry

FBISE model paper | Section A Q19 | 0.5 marks

19.	Chlorine reacts with methane in the presence of ultraviolet light, what happens first in the reaction mechanism?	The Cl–Cl bond is split homiletically.	The Cl–Cl bond is split heterolytically.	The C–H bond is split homiletically.	The C–H bond is split heterolytically.

FBISE model paper | Section A Q30 | 0.5 marks

30.	Which of the following reactions represents oxidation in organic chemistry?	$CH_3CH_2OH \rightarrow CH_3CH_3$	$CH_3CH_2OH \rightarrow CH_3CHO$	$CH_3CH_2CH_3 \rightarrow CH_2{=}CHCH_3$	$C_6H_6 \rightarrow C_6H_{12}$

FBISE model paper | Section A Q44 | 0.5 marks

44.	An organic compound X has the molecular formula C_5H_{10}. On ozonolysis, followed by treatment with water in the presence of zinc, it produces two different compounds: propanone and ethanal. What is the correct name of compound X?	Pent-1-ene	Pent-2-ene	2-Methylbut-1-ene	2-Methylbut-2-ene

FBISE model paper | Section A Q48 | 0.5 marks

48.	What is the structure of the product of the reaction between but-1-ene and bromine, Br2?	CH2Br–CH2–CH2–CH2Br	CH2Br–CH2–CHBr–CH3	CH3–CHBr–CH2–CH2Br	CH3–CH2–CHBr–CH2Br

FBISE model paper | Section A Q49 | 0.5 marks

49.	When propene ($CH_3–CH=CH_2$) undergoes hydrohalogenation with HBr, the major product is 2-bromopropane. Why does this major product form?	Because a primary carbocation is formed, which is more stable	Because a secondary carbocation is formed, which is more stable than a primary carbocation	Because hydrogen always attaches to the carbon with fewer hydrogens	Because the reaction avoids carbocation formation altogether

Q2	During the electrophilic reaction of propene with hydrogen bromide, two carbocations can be formed. Explain why the secondary carbocation is more stable than the primary carbocation. Name the major product and write the name and statement of the rule involved.	**2+2**	**OR**	During a sunny day, nitrogen oxides and hydrocarbons released from vehicles react in the atmosphere to produce photochemical smog. Explain why sunlight is necessary for this process and the role of nitrogen oxides (NO_x) in the reactions. Write two effects of photochemical smog on living organisms.

11.	Identify the step in the mechanism of free radical chlorination of ethane: $CH_3 - CH_3 + Cl^{\bullet} \longrightarrow CH_3 - CH_2^{\bullet} + HCl$	Initiation	Propagation	Substitution	Termination	○ ○ ○ ○

First Annual 2025 | Section B Q2(x) OR | 3 marks

	group-VI A of the periodic table.				
(x)	Describe the use of compounds of sulphur in any three chemical industries.	03	OR	State Markonikoff's rule by giving an example and its mechanism.	1x3
(xi)	Calculate the volume occupied by $3.011x10^{24}$ molecules of NH_3 gas enclosed in a container at	03	OR	How is Ethanol prepared from an/a: a) Alkene b) Alkyl halide c) Carboxylic acid	03

First Annual 2025 | Section C Q5 OR | 6 marks

Q.5	How can one identify the functional groups in the following compounds by chemical tests? Elaborate. a) CH_3CHO b) CH_3-CH_2-OH c) $CH_3-CH=CH_2$	2x3	OR	Why is Ethene more reactive than Ethane? Write down the reactions of Ethene with: a) H_2SO_4/H_2O b) Cl_2/H_2O	2+2 +2
Q.6	What is solubility product? Derive an expression for the solubility product of C_aF_2. How can the			Explain the occurrence of a chemical reaction with	

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

	Ethyl chloride from an alcohol.			be distinguished by applying Lucas test?	
(x)	Briefly explain the factors which affect the relative stability of primary, secondary and tertiary carbocation.	03	OR	Write down the reactions of Ethyl Amine $(C_2H_5 - NH_2)$ with: **a)** $CH_3CH_2 - Cl$ **b)** HNO_2 / HCl	1.5 + 1.5
(xi)	Differentiate between metallic and non-metallic				

First Annual 2025 | Section C Q3 OR | 7 marks

three tions. s of	1+3 +3	OR	Why are alkanes chemically less reactive? Describe the mechanism of free radical chlorination of Ethane to form Ethyl Chloride.	3+4

Second Annual 2025 | Section A Q12 | 1 mark

	functional group?				
12.	The reaction of methane with chlorine in the presence of sunlight is an example of:	Electrophilic addition	Free radical substitution	Nucleophilic substitution	Elimination
	According to Markovnikov's rule, the stability			Inductive	

Second Annual 2025 | Section A Q13 | 1 mark

	presence of sunlight is an example of:	addition	substitution	substitution	
13.	According to Markovnikov's rule, the stability of carbocations formed during electrophilic addition is explained by:	Resonance effect	Hydrogen bonding	Inductive effect of alkyl groups	Dispersion forces
	Which reagent is used to distinguish	Bayer's	Lindlar	Tollens'	

Second Annual 2025 | Section B Q2(xiv) | 3 marks

				b. $CH_3-CO-CH_3 \xrightarrow{} CHI_3$	
(xiv)	Describe the mechanism of free radical substitution in alkanes using example of methane with chlorine.	**03**	**OR**	How can Iodoform test be used to distinguish between: **a.** Methanol and Ethanol	**1.5 + 1.5**

Second Annual 2025 | Section C Q3 OR | 7 marks

1+3 +3	OR	State Markovnikov's rule. Write mechanism of reaction and identify the major product when propene reacts with Hydrogen Bromide.	2+4 +1

First Annual 2026 | Section B Q2(iii) | 3 marks

Complete the following reactions: a. $CH_3 - CH = CH_2 + HBr \rightarrow$ b. $C_2H_5 - Cl + KCN \rightarrow$	1.5 + 1.5

First Annual 2026 | Section B Q2(v) | 3 marks

Explain the formation of but-1-ene from: **a.** Butan-1-ol **b.** 1-Bromo butane	**03**

First Annual 2026 | Section B Q2(vii) OR | 3 marks

٤	Describe the mechanism of formation of chloroethane from ethane and chlorine.	**03**

First Annual 2026 | Section C Q5 | 6 marks

Q.5	Consider an organic compound with molecular formula $C_5H_{10}O$. it exists in different isomeric forms. Draw possible isomers. Also write types of structural isomerism shown by them.	**06**

First Annual 2026 | Section A Q14 | 1 mark

14.	Which of the following is a saturated organic compound?	C_6H_{14}	C_6H_{12}	C_6H_{10}	C_6H_6

First Annual 2026 | Section B Q2(v) | 3 marks

How can ethene be prepared from: **a.** Ethanol **b.** Bromoethane	**1.5** **+** **1.5**

First Annual 2026 | Section B Q2(vii) OR | 3 marks

Give all of the possible reactions among free radicals in termination step of methane and chlorine.	**1.5** **+** **1.5**

FBISE model paper | Section A Q1(vii) | 1 mark

vii.	When bromine reacts with propene in an organic solvent at room temperature, what is the mechanism by which the bromine attacks the	Electrophilic substitution	Electrophilic addition	Nucleophilic addition	Nucleophilic substitution	○ ○

FBISE model paper | Section B Q2(v) | 3 marks

(v)	Explain the preparation of ethene from, a. Ethanol b. Chloroethane	1.5+ 1.5

FBISE model paper | Section B Q2(vii) OR | 3 marks

Describe mechanism of the formation of CH_3Cl by the reaction of methane with chlorine.	03

First Annual 2026 | Section B Q2(vi) OR | 3 marks

a. $NaCl$ b. NH_4Cl	
Write down the mechanism of ozonolysis of alkenes. What are the products of ozonolysis of But-2-ene.	1+2

First Annual 2026 | Section C Q5 | 7 marks

	when the equilibrium is restored			
Q.5	a. Explain any two methods for the preparation of alkenes along with chemical reactions and conditions. b. Explain Markovnikov's rule with special reference to hydrohalogenation of alkenes.	(2+2) +3	OR	

APOLLO

Halogeno alkanes

Domain E: Organic Chemistry

FBISE model paper | Section A Q51 | 0.5 marks

51.	Compound X is an organic compound. It gives a precipitate with aqueous silver nitrate. All of this precipitate remains undissolved when an excess of dilute or concentrated aqueous ammonia is added. Which of the following could be the identity of X?	1-Chlorobutane	2-Chlorobutane	2-Bromobutane	Iodomethane

FBISE model paper | Section B Q5 | 4 marks

Q5	Define halogenoalkanes. Classify halogenoalkanes based on the position of the halogen-bearing carbon atom, also write example of halogenoalkane in each type.	**1+3**	**OR**	Describe dynamic reversible physical change is observed e at the molecular level

First Annual 2025 | Section A Q12 | 1 mark

12.	Identify the product formed when Ethyl Bromide is warmed with ***NaOH*** in ethanol:	$CH_2=CH_2$	CH_3-CH_2-ONa	CH_3-CHO	$CH_2=CH-Br$	◯	◯	◯	◯

First Annual 2025 | Section B Q2(iv) OR | 3 marks

	a) $Cl_2 > F_2$ **b)** $H_2 > HBr$ **c)** $N_2 > O_2$				
(iv)	Write down three differences between limiting and non–limiting reactants.	**03**	**OR**	Write down the reaction of Ethyl Bromide with $KOH_{(aq)}$, NH_3 and $AgNO_3$.	**03**
(v)	State any three differences between crystalline and non– crystalline solids.	**03**	**OR**	Briefly describe the terms 'shell', 'sub–shell' and 'orbital'	**03**

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

	STP.				
(xii)	Briefly describe β – elimination reaction by giving a suitable example.	**03**	**OR**	Write down the reactions of 1– Propanol with: **a)** $SOCl_2$ **b)** PCl_5 **c)** Conc. $H_2SO_4/180°$	**03**
(xiii)	Calculate K_c for the following reaction at equilibrium at 100°C			Calculate total entropy change when $NaCl$ dissolves in water under standard conditions:	

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

1.5 + 1.5	OR	Write chemical equation for the preparation of alkyl halides: **a.** From Alkenes **b.** From Alkanes

Write chemical equation for the preparation of alkyl halides:
a. From Alkenes
b. From Alkanes

Second Annual 2025 | Section B Q2(xii) | 3 marks

(xii)	Enlist the factors which affect the reactivity of alkyl halides. Write correct order of reactivity for them.	**2+1**
(xiii)	Write any three differences between boiling and	

		detect presence of carbonyl compounds.	
1x3	OR	Complete the given equations by identifying the major products: a. $CH_3 - Cl + KCN \rightarrow$	

detect presence of carbonyl compounds.

Complete the given equations by identifying the major products: a. $CH_3 - Cl + KCN \rightarrow$ b. $CH_3 - Cl + NH_3 \rightarrow$	1.5 + 1.5
How can iodoform test be ...	

	~~Ethyl acetate~~				
Q.5	Consider an organic compound with molecular formula $C_5H_{10}O$. it exists in different isomeric forms. Draw possible isomers. Also write types of	**06**	**OR**	Classify Halogenoalkanes based on the type of halogen atom and its position in carbon chain.	**06**

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**	Exp ang mol **a.** **b.**

First Annual 2026 | Section B Q2(iii) | 3 marks

Complete the following equations: **a.** $C_2H_5Cl + NH_3 \rightarrow$ **b.** $CH_3CH_2Br + NaOH \rightarrow$	**03**

First Annual 2026 | Section C Q5 OR | 6 marks

OR	Describe nucleophilic substitution reactions. How silver nitrate in ethanol identifies the halogen in alkyl halides? Explain with reaction.	**2x3**

How ethyl Bromide can be prepared from the following: **a.** ethene **b.** ethane **c.** ethanol Write complete balanced equations with conditions involved in each reaction.	**2x3**

b. ethane

c. ethanol

FBISE model paper | Section B Q2(iii) | 3 marks

(iii)	When Chloro ethane reacts with sodium hydroxide different products are formed under different sets of conditions used. Write down the structural formulae of the products which are formed under these conditions. Also write the type of each reaction.	1+1+1

First Annual 2026 | Section B Q2(vii) | 3 marks

(vii)	Explain the comparative reactivity of alkyl halides on the basis of bond energy and bond polarity. Which one is the decisive factor among the both?	2+1

Q.6	a.	Explain the following terms, with reference to SN reactions: Substrate Nucleophile Leaving group Substitution nucleophilic reaction	4+3	OR	a. b.
	b.	What are elimination reactions? Explain with the help of an example.			

APOLLO

Hydroxy Compoun ds

Domain E: Organic Chemistry

FBISE model paper | Section A Q7 | 0.5 marks

7.	Which reagent is used to convert butanone to butan-2-ol?	HI in the presence of phosphorous	Water in the presence of mercuric sulphate	$LiAlH_4$ in the presence of ether	$KMnO_4$ in the presence of Concentrated H_2SO_4

FBISE model paper | Section A Q29 | 0.5 marks

29.	Which reagent is used to convert an alkene into a diol?	NaOH	Acidified $KMnO_4$ (cold)	HBr	$NaBH_4$

FBISE model paper | Section A Q45 | 0.5 marks

45.	Carboxylic acids react with alcohols to form esters. Which acid and alcohol react together to form the following ester? $CH_3CH_2COOCH_3$	propanoic acid and ethanol	propanoic acid and methanol	ethanoic acid and ethanol	ethanoic acid and methanol

FBISE model paper | Section A Q47 | 0.5 marks

47.	What is produced when propan-2-ol is heated with an excess of potassium dichromate in the presence of sulfuric acid?	propane	propanoic acid	propene	propanone

FBISE model paper | Section A Q77 | 0.5 marks

Scenario for MCQ 77 to 80	**A research chemist is analyzing four unlabelled liquid samples (A, B, C and D), each containing a different pure alcohol. To identify them, the chemist subjects each sample to a series of diagnostic chemical tests, including mild oxidation using acidified potassium dichromate (VI) ($K_2Cr_2O_7$) and an iodoform test using alkaline aqueous iodine (NaOH + I_2).**				
77.	Sample A is identified as propane-1,2-diol. How are the two hydroxyl groups in this molecule classified?	One primary and one secondary	Two primary	Two secondary	One secondary and one tertiary

FBISE model paper | Section A Q78 | 0.5 marks

Scenario for MCQ 77 to 80	**A research chemist is analyzing four unlabelled liquid samples (A, B, C and D), each containing a different pure alcohol. To identify them, the chemist subjects each sample to a series of diagnostic chemical tests, including mild oxidation using acidified potassium dichromate (VI) ($K_2Cr_2O_7$) and an iodoform test using alkaline aqueous iodine (NaOH + I_2).**				
78.	When Sample B is warmed with acidified $K_2Cr_2O_7$, the solution rapidly changes from orange to green. Which alcohol could not be Sample B?	Ethanol	Propan-2-ol	2-Methylpropan-2-ol	Butan-1-ol

FBISE model paper | Section A Q79 | 0.5 marks

Scenario for MCQ 77 to 80		**A research chemist is analyzing four unlabelled liquid samples (A, B, C and D), each containing a different pure alcohol. To identify them, the chemist subjects each sample to a series of diagnostic chemical tests, including mild oxidation using acidified potassium dichromate (VI) ($K_2Cr_2O_7$) and an iodoform test using alkaline aqueous iodine (NaOH + I_2).**			
79.	Sample C gives a positive iodoform test, producing a yellow precipitate. Which structural feature must be present in Sample C?	$-CH_2OH$	$-CH(OH)CH_3$	$-C(OH)(CH_3)_2$	$-CH_2CH_2OH$

FBISE model paper | Section A Q80 | 0.5 marks

Scenario for MCQ 77 to 80		**A research chemist is analyzing four unlabelled liquid samples (A, B, C and D), each containing a different pure alcohol. To identify them, the chemist subjects each sample to a series of diagnostic chemical tests, including mild oxidation using acidified potassium dichromate (VI) ($K_2Cr_2O_7$) and an iodoform test using alkaline aqueous iodine (NaOH + I_2).**			
80.	Sample D has molecular formula $C_4H_{10}O$. It decolorizes acidified $K_2Cr_2O_7$ and gives a positive iodoform test. What is the exact identity of Sample D?	Butan-1-ol	Butan-2-ol	2-Methyl propan-1-ol	2-Methyl propan-2-ol

First Annual 2025 | Section B Q2(vii) OR | 3 marks

(vii)	Write down any three measures that ensure the preservation of water resources.	**03**	**OR**	How can iodoform test be applied to the alcohols? Describe by giving chemical equations.	**1.5 + 1.5**
(viii)	Why aqueous solution of Na_2CO_3 is basic whereas that of NH_4Cl is acidic? Justify by giving	**1.5**	**OR**	How can Ethyl amine be prepared from: a) An Alkyl halide b) A Nitrate c) An Amide	**03**

First Annual 2025 | Section B Q2(xi) OR | 3 marks

	three chemical industries.			its mechanism.	
(xi)	Calculate the volume occupied by $3.011x10^{24}$ molecules of NH_3 gas enclosed in a container at STP.	**03**	**OR**	How is Ethanol prepared from an/a: **a)** Alkene **b)** Alkyl halide **c)** Carboxylic acid	**03**
(xii)	Briefly describe β – elimination reaction by giving	**03**	**OR**	Write down the reactions of 1– Propanol with: **a)** $SOCl_2$ **b)** PCl_5 **c)** Conc. $H_2SO_4/180°$	**03**

First Annual 2025 | Section B Q2(xii) OR | 3 marks

	STP.				
(xii)	Briefly describe β – elimination reaction by giving a suitable example.	**03**	**OR**	Write down the reactions of 1– Propanol with: **a)** $SOCl_2$ **b)** PCl_5 **c)** Conc. $H_2SO_4/180°$	**03**
(xiii)	Calculate K_c for the following reaction at equilibrium at 100°C			Calculate total entropy change when $NaCl$ dissolves in water under standard conditions:	