APOLLO

FBISE Chemistry Class 9
Topical workbook - Volume 2 of 3

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

APOLLO

Stoichiometry

Domain B: Physical Chemistry

First Annual 2025 | Section C Q5 | 4 marks

Q.5	Describe following terms with two examples of each: درج شدہ کی وضاحت کریں اور دو دو مثالیں بھی دیں۔ **a)** Molecular formula مالیکیولر فارمولا **b)** Empirical formula ایمپریکل فارمولا	**2+2**	**OR**	Explain following methods of prevention of corrosion: کوروژن روکنے کے درج طریقے تفصیلاً بیان کریں: **a)** Sacrificial protection سیکریفیشل پروٹیکشن **b)** Galvanizing گیلوینائزنگ	**2.5 + 1.5**

Second Annual 2025 | Section A Q7 | 1 mark

7.	Number of atoms in 2 moles of O_2 are: دو مول O_2 میں کتنے ایٹمز ہوتے ہیں؟	3.01×10^{23}	6.022×10^{23}	1.204×10^{24}	2.0×10^{23}

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

(x)	What is a mole? Calculate the number of moles in: مول (Mole) کیا ہوتا ہے؟ درج شدہ میں مولز کی تعداد معلوم کریں۔ a. 48 g of ozone (O_3) b. 14 g of nitrogen gas (N_2)	**1+2**

2. Avogadro's constant represents the number of molecules in:	0.1 g of H_2	14 g of N_2	44 g of CO_2	10 g of H_2O

	refrigerator linked to depletion of ozone layer.				
i)	Why solids have high density and very low compressibility whereas gases have opposite behavior? Explain briefly.	1.5 + 1.5	OR	Calculate the number of moles in a foil of Aluminum that weights 100 g.	03
ii)	An element exists as two isotopes: • ^{64}X (abundance 30%) • ^{66}X (abundance 70%) Calculate the average relative atomic mass of element X	03	OR	Determine the number of Protons and Neutrons in given Isotopes: a. $^{23}_{11}Na$ b. $^{37}_{17}Cl$ c. $^{13}_{6}C$	1+1 +1
v)	Identify the given substances as solution, suspension or colloidal: **a.** Air **b.** Sand in water **c.** Jelly	1+1 +1	OR	Briefly describe: **a.** How a catalyst affects the reaction rate? **b.** How a catalyst affects the activation energy?	1+2
v)	What is meant by 'element'? State one distinguishing feature that separates it from mixtures.	2+1	OR	How is ionic bond formed? Give one example of a compound having Ionic bond.	2+1
(vi)	Using the bond energies given below, calculate the enthalpy change (ΔH) for the reaction: $H_2 + Cl_2 \rightarrow 2HCl$ Bond energies: H–H = 436 kJ/mol , Cl–Cl = 242 kJ/mol and H–Cl = 431 kJ/mol	03	OR	Justify the following statements: **a.** Flourine has smaller shielding effect than Chlorine **b.** Flourine has high ionization energy than Chlorine	1.5 + 1.5
vii)	How is solubility affected by increasing temperature for given solutions: **a.** KCl in water (endothermic solution) **b.** $Ca(OH)_2$ in water (exothermic solution)	1.5 + 1.5	OR	$CuSO_4.5H_2O_{(blue\ solid)} \rightleftharpoons CuSO_{4(white\ solid)} + 5H_2O$ How heating will affect the equilibrium in given reaction?	03
viii)	Briefly state the trend of metallic character along the group. Also give reason.	1.5 + 1.5	OR	Write chemical reaction when an acid reacts with carbonate. Describe the visible change that may appear.	2+1
(ix)	State the general trends observed down the group for elements of Group-I for their density, and reactivity.	1.5 + 1.5	OR	Name the three main types of chemical fertilizers commonly used in agriculture.	1+1 +1
(x)	How are 'dissolved oxygen' and 'essential minerals' beneficial for aquatic life? Describe briefly.	1.5 + 1.5	OR	What are substitution reactions? Which type of compounds shows these reactions?	2+1

SECTION – C (Marks 18)

Note: Attempt the following questions. (3x6=18)

Q.3	Show covalent bond formation in given molecules using dot-and-cross structures: **a.** CO_2 **b.** H_2O **c.** CH_4	2+2 +2	OR	What is meant by 'molecular formula' and 'structural formula'? Give one example each. Show that $C_3H_6O_2$ can have more than one structural formula.	2+2 1+1
Q.4	Explain the terms 'Acid' and 'Base' according to the Bronsted–Lowry theory. Identify the acid and base in the reaction: $NH_3 + H_2O \rightleftharpoons NH_4^+ + OH^-$	2+2 +2	OR	Discuss the functions of carbohydrates and proteins in human body. (any three specific functions each)	3+3
Q.5	Compare metals and non-metals in terms of their: **a.** Thermal conductivity **b.** Electrical conductivity **c.** Malleability and ductility	2+2 +2	OR	How ethane can be prepared by: **a.** Hydrogenation of alkynes **b.** Reduction of alkyl Halides	3+3

SUPPLEMENTARY TABLE

Mass No	1	4	7	9	11	12	14	16	19	20	23	24	27	28	31	32	35.5	40	39	40
Symbol	H	He	Li	Be	B	C	N	O	F	Ne	Na	Mg	Al	Si	P	S	Cl	Ar	K	Ca
Atomic No	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20

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

Find the mass of 0.5 moles of NaCl.	03	OR	Derive the chemical formula of the compound formed between: **a.** Mg^{2+} and Cl^{-} **c.** Ca^{2+} and NO_3^{-1}	1x3

First Annual 2026 | Section A Q4 | 1 mark

The net ionic equation for forming silver chloride is:	$Na^{+} + Cl^{-} \rightarrow NaCl$	$AgNO_3 + NaCl \rightarrow AgCl + NaNO_3$	$Ag^{+}_{(aq)} + Cl^{-}_{(aq)} \rightarrow AgCl_{(s)}$	$Ag_{(s)} + Cl_{(g)} \rightarrow AgCl_{(s)}$

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

Calculate the number of molecules present in 2 moles of CO_2.	03

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

(vii)	Predict which one of the following pairs has the same mass?	1 mole of N_2O and 1 mole of CO_2	1 mole of H_2 and 1 mole NH_3	1 mole of H_2O and 1 mole of H_2O_2	1 mole of H_2SO_4 and 1 mole of HNO_3

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

(ix)	Calculate the number of atoms in each of the following samples. a. 3.4 moles of nitrogen gas b. 15 g of Sodium metal	2+1

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

	c. Atomic mass unit ایٹامک ماس یونٹ	
(ii)	Differentiate between empirical and molecular formula.	

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

	c. Electronegativity الیکٹرونیگیٹیویٹی			c. Sodium chloride in water سوڈیم کلورائیڈ پانی میں
(v)	Demarcate the modern periodic table into *'s'* and *'p'* block. Which law determines this demarcation? جدید پیریاڈک ٹیبل میں *'s'* اور *'p'* بلاک کی نشاندہی کریں۔ ساتھ ہی اس لا کا نام بتائیں جس کی وجہ سے جدید پیریاڈک ٹیبل کی درجہ بندی کی گئی۔	03	OR	A flask contains 0.25 M $NaOH$ solution. What mass of $NaOH$ is present per dm^3 of solution? ایک فلاسک میں 0.25 M $NaOH$ سلوشن ہے۔ اس میں $NaOH$ کی کتنی مقدار $1\,dm^3$ میں موجود ہے؟
(vi)	Recognize and justify the presence of more similar			Sketch a Daniel cell, labelling cathode, anode and

Second Annual 2025 | Section A Q12 | 1 mark

A compound with chemical formula Na_2XO_4 has the formula mass 142 amu. Atomic mass of the element X is: 142 amu کیمیائی فارمولا Na_2XO_4 والے ایک مرکب کا فارمولا ماس	46	32	16	8

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

	49.33.124ml [ ]	
OR	Calculate the number of moles in 132g of propane (C_3H_8). 132 گرام پروپین (C_3H_8) میں کتنے مول موجود ہوں گے؟	03
	What is shielding effect? Discuss its trend across	

Second Annual 2025 | Section C Q3 | 4 marks

Q.3	Calculate the number of moles in: **a.** 3.011×10^{22} molecules of formaldehyde (CH_2O)

Q.3	Calculate the number of moles in: **a.** 3.011×10^{22} molecules of formaldehyde (C **b.** 1.25×10^{22} molecules of benzene (C_6H_6)

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

(x)	A student has 0.5 moles of NaCl. Calculate the mass of NaCl in the sample. ایک طالب علم کے پاس NaCl کے 0.5 مول موجود ہیں۔ اس میں NaCl کا ماس معلوم کریں۔	**03**

First Annual 2026 | Section C Q5 | 4 marks

.5	Differentiate between empirical and molecular formula. Give examples.	

First Annual 2026 | Section A Q2 | 1 mark

2.	The atomic mass of Sodium is 23. What is the gram atomic mass of Sodium?	1 g	11.5 g	23 g	46 g

First Annual 2026 | Section A Q8 | 1 mark

3.	Avogadro's number represents the number of:	Grams in one mole	Particles in one mole	Litres of gas	Ions in one gram

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

OR	Differentiate between an empirical formula and a molecular formula. Give one example for each. ایمپریکل فارمولا اور مالیکیولر فارمولا میں فرق کریں۔ ہر ایک کی ایک مثال دیں۔	1.5 + 1.5

APOLLO

Electrochemistry

Domain B: Physical Chemistry

FBISE model paper | Section A Q8 | 0.5 marks

8.	Which change is an example of oxidation?	chloride ions to chlorine atoms	copper(II) ions to copper atoms	iron(III) ions to iron(II) ions	oxygen atoms to oxide ions

FBISE model paper | Section A Q9 | 0.5 marks

9.	In which change is the nitrogen reduced?	NH_3 to NO	NH_3 to NO_3^-	N_2 to NH_3	N^{3-} to N

2

FBISE model paper | Section A Q35 | 0.5 marks

35.	Which series of changes includes both oxidation and reduction?	$C \rightarrow CO \rightarrow CO_2$	$PbO_2 \rightarrow PbO \rightarrow Pb$	$N_2 \rightarrow NH_3 \rightarrow NO$	$C_2H_2 \rightarrow C_2H_4 \rightarrow C_2H_6$

FBISE model paper | Section A Q36 | 0.5 marks

36.	A colourless gas is passed into each of three different solutions. The results for each solution are shown in the table. Solution / Result Potassium iodide / Stays Colourless Acidified potassium dichromate / Orange to green Acidified potassium permanganate / Purple to colourless What is the colourless gas?	an acid	an alkali	an oxidising agent	a reducing agent

OR	**Calcium ions (Ca^{2+}) combine with chloride ions (Cl^{-}) to form a compound, and a molecule is shown where one carbon atom is joined with two oxygen atoms. If 11.1 g of the ionic compound and 4.4 g of the molecular substance are given, write the correct formula and name of the ionic compound, find the formula of the molecular substance from its structure, and calculate the number of moles in each sample using the relation moles = mass / molar mass.**	**1+ 1+ 2+ 2**

Q8	**Draw a well-labelled reaction pathway diagram for an exothermic and endothermic reaction, clearly showing reactants, products, activation energy, and enthalpy change with proper labelling.** **Briefly interpret through energy diagram that how the catalyst affects the energy profile.**	**2** **+2** **+2**

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

	Identify the oxidizing and reducing agents in the following reaction: درج ری ایکشن میں آکسیڈائزنگ اور ریڈیوسنگ ایجنٹ کی شناخت کریں: $H_2S + Cl_2 \longrightarrow S + 2HCl$	03

First Annual 2025 | Section C Q5 OR | 4 marks

OR	What is corrosion? Write its chemical reaction. Describe any one method to prevent corrosion. کوروژن کیا ہے؟ اس کی کیمیائی مساوات لکھیں۔ نیز اس کی روک تھام کا کوئی ایک طریقہ بیان کریں۔	1+1 +2

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

OR	Identify the oxidizing and reducing agents in the following reaction: درج ری ایکشن میں آکسیڈائزنگ اور ریڈیوسنگ ایجنٹ کی شناخت کریں: $2KI + Cl_2 \longrightarrow 2KCl + I_2$

First Annual 2025 | Section C Q5 OR | 4 marks

2+2	OR	Explain following methods of prevention of corrosion: کوروژن روکنے کے درج طریقے تفصیلاً بیان کریں: a) Sacrificial protection سیکریفیشل پروٹیکشن b) Galvanizing گیلوینائزنگ	2.5 + 1.5

Second Annual 2025 | Section A Q5 | 1 mark

5.	Identify the reducing agent in given reaction: $Fe_2O_3 + 3CO \longrightarrow 2Fe + 3CO_2$ درج تعامل میں ریڈیوسنگ ایجنٹ کی شناخت کریں:	Fe_2O_3	CO	Fe	CO_2

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

OR	How the sum of oxidation numbers in given polyatomic ions is equal to charge on the ion? Calculate: درج پولی اٹامک آئنز کا چارج کس طرح اس کے ایٹمز کی آکسیڈیشن نمبر کے مجموعہ کے برابر ہے؟ کیلکیولیٹ کریں: a. NH_4^{+1} b. CO_3^{-2}	03

First Annual 2026 | Section A Q3 | 1 mark

3. The sum of oxidation numbers of all atoms in a sulfate ion (SO_4^{2-}) must be:	–2	–1	0	+2

First Annual 2026 | Section A Q3 | 1 mark

In the given reaction $2Na + Cl_2 \rightarrow 2NaCl$ sodium changes its oxidation state from 0 to +1, it is the process of:	Oxidation	Reduction	Elimination	Addition

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

Derive the chemical formula of the compound formed between: **a.** Mg^{2+} and Cl^- **c.** Ca^{2+} and NO_3^{-1} **b.** Al^{3+} and SO_4^{-2}	**1x3**
Write the dissociation equations of sulfuric acid	1.5

First Annual 2026 | Section C Q4 | 6 marks

Q.4	Identify the oxidizing and reducing agents in given reactions by assigning their oxidation states (H=+1, O= –2) **a.** $WO_3 + 3H_2 \rightarrow W + 3H_2O$ **b.** $H_2S + Cl_2 \rightarrow 2HCl + S$	**3+3**
Q.5	a. What is meant by exothermic reaction and	

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

(v)	Identify which of the following element in the given reaction is oxidized $H_2S+Cl_2 \rightarrow 2HCl + S$	H	Cl	S	S and Cl_2

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

OR	Identify oxidizing agents in each of the following reactions. a. $2NH_3+3CuO \rightarrow 3Cu+N_2+3H_2O$ b. $2FeCl_2+Cl_2 \rightarrow 2FeCl_3$	1.5+1.5

First Annual 2025 | Section C Q5 OR | 4 marks

Q.5	Analyze the bond formation between magnesium (*Mg*) and fluorine (*F*). میگنیشیم (Mg) اور فلورین (F) میں بانڈ کس طرح بنتا ہے؟ تجزیہ کریں۔	**04**	**OR**	Explain electroplating of following metals on steel. i ***Zinc (Zn)*** زنک ii ***Tin (Sn)*** ٹن درج شدہ میٹلز کی سٹیل پر الیکٹرو پلیٹنگ بیان کریں۔	**2+2**

Second Annual 2025 | Section A Q5 | 1 mark

Which atom will form an ion of charge −2? درج شدہ میں سے کون سا ایٹم 2− چارج کا آئن بنائے گا؟	$^{12}_{6}C$	$^{14}_{7}N$	$^{16}_{8}O$	$^{19}_{9}F$
Reducing agent when it undergoes oxidation, it:	Loses electron	Gained electron	Gains Hydrogen	Loses Oxygen

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

(i)	Differentiate between soft and hard metals with one example each. نرم اور سخت دھاتوں میں فرق کریں اور ایک ایک مثال دیں۔	2+1	OR	Determine the oxidation number of nitrogen in NO_2^{-1}? NO_2^{-1} میں نائٹروجن کی آکسیڈیشن اسٹیٹ معلوم کریں۔	03
(ii)	Briefly explain any three crystalline allotropes of carbon.			Find by calculation, the compound in which Sulphur	

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

(ii)	Briefly explain any three crystalline allotropes of carbon. کاربن کی کوئی سی تین کرسٹلائن صورتوں کی مختصر وضاحت کریں۔	1x3	OR	Find by calculation, the compound in which Sulphur (S) has oxidation state of +7. معلوم کریں کہ کس مرکب میں سلفر کی آکسیڈیشن اسٹیٹ 7+ ہے۔ a. SO_3 b. H_2SO_4 c. $H_2S_2O_8$	03
(iii)	Give three points for differentiating between voltaic cell and electrolytic cell.			Enlist any three uses of platinum.	

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

(iv)	What is corrosion? Enlist the methods for preventing corrosion. (any two) زنگ لگنا(corrosion) کیا ہے؟اس کو روکنے کے طریقے درج کریں۔(کوئی سے دو)	1+2

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

(viii)	Determine the oxidation number of B in H_3BO_3. H_3BO_3 میں B کا آکسیڈیشن نمبر معلوم کریں۔	03

First Annual 2026 | Section C Q5 OR | 4 marks

What is a redox reaction? How oxidation and reduction occur simultaneously? Explain with an example.

First Annual 2026 | Section A Q10 | 1 mark

10	In an electrolytic cell, the cathode is the electrode where:	Oxidation occurs	Electrons are lost	Reduction occurs	No reaction occurs

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

(ix)	Determine the oxidation number nitrogen in: درج شدہ میں نائٹروجن کا آکسیڈیشن نمبر معلوم کریں۔ a. NO_2 b. N_2O c. N_2O_3	03	OR	Identify the position of following in periodic table by their electronic configuration: a. $^{14}_{7}N$ b. $^{24}_{12}Mg$ پیریاڈک ٹیبل میں درج شدہ کی پوزیشن ان کی الیکٹرانک کنفیگوریشن کے ذریعے معلوم کریں۔	1.5 + 1.5

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

(v)	Describe oxidation state. How it differs from ionic charge?	2+1

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

OR	Briefly describe cathodic protection. (Diagram is not required)	03

APOLLO

Energetics

Domain B: Physical Chemistry

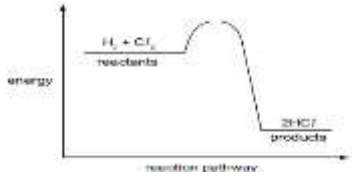
FBISE model paper | Section A Q18 | 0.5 marks

18.	Which of the following changes is endothermic?	$H_{(g)} + Cl_{(g)} \rightarrow HCl_{(g)}$	$H_2O_{(g)} \rightarrow 2H_{(g)} + O_{(g)}$	$H_2O_{(l)} \rightarrow H_2O_{(s)}$	$2H + O \rightarrow H_2O_{(l)}$

FBISE model paper | Section A Q19 | 0.5 marks

19.	The reaction $C_2H_4 + 3O_2 \rightarrow 2CO_2 + 2H_2O$ is exothermic because	more bonds are broken than are formed	more bonds are formed than are broken	the energy needed to break the bonds is greater than that released on forming new bonds	the energy needed to break the bonds is less than that released on forming new bonds

FBISE model paper | Section A Q20 | 0.5 marks

20.	The energy profile diagram for the reaction between hydrogen and chlorine is shown.  What information about the type of reaction and the sign of enthalpy change (ΔH) does the diagram show?	. endothermic and negative ΔH	endothermic and positive ΔH	exothermic and negative ΔH	exothermi c and positive ΔH

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

OR	What are the exothermic reactions? Give an example of exothermic chemical reaction. ایگزوتھرمک ری ایکشن کیا ہوتے ہیں؟ ایگزوتھرمک کیمیائی ری ایکشن کی ایک مثال دیں۔	**1+2**

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

(xi)	Calculate the enthalpy: انتھالپی معلوم کریں: $H_{2(g)} + I_{2(g)} \longrightarrow 2HI_{(g)} \quad \Delta H° = ?$ Bond energies: بانڈ انرجیز: *H–H=436 kJ/mol I–I=151 kJ/mol H–I=299 kJ/mol*	03

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

OR	Draw a labeled general pathway sketch of an uncatalyzed exothermic reaction.	03

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

OR	What are the endothermic reactions? Give an example of endothermic chemical reaction.	1+2

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

OR	Draw and label reaction pathway diagram of an exothermic or endothermic reaction showing activation energy, reactants and products.	03

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

OR	What kind of reaction occurs in respiration? Give its reaction. ریسپائریشن میں کس قسم کا کیمیائی تعامل ہوتا ہے؟ اس کی مساوات لکھیں۔	1+2

First Annual 2026 | Section A Q4 | 1 mark

4.	Dissolving ammonium nitrate in water causes the container to feel cold. This shows the process is:	Neutralization	Exothermic	Endothermic	Combustion

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

1+1 +1	OR	Briefly describe: **a.** How a catalyst affects the reaction rate? **b.** How a catalyst affects the activation energy?	1+2

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

[redacted]	[redacted]	
(vi)	Using the bond energies given below, calculate the enthalpy change (ΔH) for the reaction: $H_2 + Cl_2 \rightarrow 2HCl$ Bond energies: H–H = 436 kJ/mol , Cl–Cl = 242 kJ/mol and H–Cl = 431 kJ/mol	
[redacted]	How is solubility affected by increasing temperature	

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

1.5 + 1.5	OR	Which type of reaction has a positive sign of enthalpy change? Give one example for that reaction.	1+2
		State the trend in melting point and density of Group	1.5

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

What is meant by activation energy? How does a catalyst affect the activation energy of a reaction?	2+1

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

(iv)	What is activation energy? What is meant by a successful collision in a chemical reaction?	2+1

First Annual 2026 | Section C Q5 | 6 marks

	b. $H_2S + Cl_2 \rightarrow 2HCl + S$	
Q.5	a. What is meant by exothermic reaction and endothermic reactions? b. Calculate the enthalpy change (ΔH) for given reaction. $H_{2(g)} + F_{2(g)} \rightarrow 2HF_{(g)}$ Bond energy values for H-H, F-F and H-F bonds are 436 kJ/mol, 155 kJ/mol and 567 kJ/mol.	(1.5 + 1.5) +3

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

(viii)	What is the usual effect of an exothermic reaction on the temperature of the surroundings?	Temperature decreases	Temperature remains the same	Temperature increases	Temperature becomes zero	○ ○ ○

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

(i)	a. What type of energy change occurs during bond breaking? Name the process. b. Write one difference between bond breaking and bond making in terms of energy change.	1+2

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

OR	How does the energy profile diagram for an endothermic reaction differ from that of an exothermic reaction in terms of activation energy and enthalpy change?	1.5+1.5

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

Differentiate exothermic and endothermic reactions with one example each. ایگزوتھرمک اور اینڈوتھرمک ری ایکشنز میں فرق ایک ایک مثال کے ساتھ بتائیں۔	1.5 + 1.5

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

student has 0.5 moles of NaCl. Calculate the mass NaCl in the sample. ایک طالب علم کے پاس NaCl کے 0.5 مول موجود ہیں۔ اس میں NaCl کا ماس معلوم کریں۔	03	OR	Given the bond energies below, find the enthalpy change (ΔH) for the reaction: $H_{2(g)} + I_{2(g)} \rightarrow 2HI_{(g)}$ درج بانڈ انرجیز کی مدد سے درج ردِ عمل کے لیے (ΔH) معلوم کریں: H–H = 436 kJ/mol I–I = 151 kJ/mol H–I = 299 kJ/mol

APOLLO

Chemical Equilibrium

Domain B: Physical Chemistry

FBISE model paper | Section A Q34 | 0.5 marks

34.	A student studies the reversible dehydration equilibrium of a hydrated salt: $CuSO_4 \cdot 5H_2O_{(s)} \rightleftharpoons CuSO_{4(s)} + 5H_2O_{(g)}$ The blue copper(II) sulfate crystals slowly turn into a white powder when heated. The appearance of the white powder indicates that the equilibrium shifted toward:	The forward reaction, which is endothermic	The forward reaction, which is exothermic	The reverse reaction, which is endothermic	The reverse reaction, which is exothermic

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

(ix)	How a closed system may contribute to the establishment of equilibrium in reversible reactions? Give one example.	1+2	OR	How do the following air pollutants cause harm? درج شدہ ہوائی آلودگیاں کیسے نقصان دہ ہیں؟ a) Carbon monoxide b) Methane	03

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

(viii)	Write three conditions required for chemical equilibrium.	03

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

(viii)	What is a reversible chemical reaction? Give one example.	1.5 + 1.5

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

(ix)	What is chemical equilibrium? State the conditions for a reversible reaction to reach equilibrium in a closed system.	1+2

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

(viii)	State the physical change observed by adding water to $CuSO_4$. Also write its reversible balanced chemical reaction. پانی کو $CuSO_4$ میں شامل کرنے سے کیا فزیکل تبدیلی رونما ہوتی ہے؟ اس کا متوازن ریورسیبل کیمیائی	**03**

First Annual 2026 | Section A Q5 | 1 mark

shows the process is:

5.	For a reversible reaction, why might the reaction not go to completion?	Products never form	Forward reaction is faster than backward	Backward reaction occurs simultaneo-usly	Energy is not involved
6.	Which reaction products correctly show what happens when an acid reacts with a	Salt +CO_2+H_2O	Salt + H_2+NH_3	Salt + N_2+H_2O	Salt only

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

1.5 + 1.5	**OR**	$CuSO_4.5H_2O_{(blue\ solid)} \rightleftharpoons CuSO_{4(white\ solid)} + 5H_2O$ How heating will affect the equilibrium in given reaction?

First Annual 2026 | Section A Q4 | 1 mark

A reaction that does not go to completion is called:	Irreversible	Endothermic	Reversible	Exothermic

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

(vi)	$CoCl_2.6H_2O_{(pink\ solid)} \rightleftharpoons CoCl_{2(blue\ solid)} + 6H_2O$ Describe the effect of addition of water on equilibrium in given reaction.	03	OR	Write the dissociation equations of sulfuric acid (H_2SO_4) and sodium hydroxide (NaOH) in aqueous solution.	1.5 + 1.5

First Annual 2026 | Section A Q5 | 1 mark

. Which symbol shows a reversible reaction? → ⇌ = ↔

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

1+1 +1	OR	What is meant by reversible chemical reaction? Does it ever go to completion? Give reason.	1+1 +1

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

(v)	$CoCl_2.6H_2O_{(Pink\ solid)} \rightleftharpoons CoCl_{2(blue\ solid)} + 6H_2O$ How is above reaction affected by addition of water?	03

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

(vii)	Consider following equilibrium. $CoCl_2.2H_2O(s) + Heat \longrightarrow CoCl_2(g) + H_2O(g)$ Predict the direction of reaction when following changes are applied on this system at equilibrium. a. Heating the system. b. Addition of water c. Removal of water	1+1+1

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

(viii)	Give the ways a closed system contribute to the establishment of equilibrium in reversible reactions?	03

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

What is nutrition? Why is it essential for the proper functioning of the human body? غذائیت (Nutrition) کیا ہے؟ یہ انسانی جسم کے افعال کے لیے کیوں ضروری ہے؟	2+1	OR	Why is a closed system necessary for a reversible reaction to achieve equilibrium? Explain briefly. ریورسیبل ری ایکشن میں ایکولیبریم حاصل کرنے کے لیے کلوزڈ سسٹم کیوں ضروری ہے؟ مختصر وضاحت	03

(ix)	What happens when water is added to anhydrous copper(II) sulfate? How this change in physical condition redirects the reversible reaction?	1+2

APOLLO

Acids, Bases Chemistry and pH

Domain B: Physical Chemistry

FBISE model paper | Section A Q31 | 0.5 marks

31.	Ammonia gas is produced when solid ammonium chloride is heated with	calcium hydroxide	calcium sulphate	hydrochloric acid	magnesiu m nitrate

FBISE model paper | Section A Q32 | 0.5 marks

32.	The following equations represent reactions of dilute sulphuric acid. Which reaction is not 'typical' of a dilute acid?	$2KOH_{(aq)} + H_2SO_{4(aq)} \rightarrow K_2SO_{4(aq)} + 2H_2O_{(l)}$	$CUO_{(s)} + H_2SO_{4(aq)} \rightarrow CuSO_{4(aq)} + H_2O_{(l)}$	$Pb(NO_3)_{2(aq} + H_2SO_{4(aq)} \rightarrow PbSO_{4(s)} + 2HNO_3(aq$	$ZnCO_{3(s)} + H_2SO_{4(aq)} \rightarrow ZnSO_{4(aq)} + CO_{2(g)} + H_2O_{(l)}$

FBISE model paper | Section A Q38 | 0.5 marks

38.	A student tests a solution with litmus paper and it turns blue. The nature of solution is_____and having pH value of _____:	Acidic and 5	Basic and 10	Acidic and 10	Basic and 5

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

(i)	What is meant by strong acid? Give one example with equation.	1+2

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

(iv)	Write reaction of any one metal oxide with water (H_2O). Identify the nature of the product. ایک میٹل آکسائیڈ کا پانی (H_2O) کے ساتھ ری ایکشن لکھیں۔ نیز پراڈکٹ کی نیچر بھی بتائیں۔	2+1

First Annual 2025 | Section C Q4 | 6 marks

Q.4	Give balanced reactions of HCl with: HCl کے درج شدہ کے ساتھ بیلنس شدہ ری ایکشن لکھیں: i Zn ii $NaCO_3$ iii $NaOH$	2x3	OR

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

Q. 2 Attempt the following parts: (11 x 3

(i)	What is a strong base? Write equation that represents the dissociation of $NaOH$ in water. سٹرونگ بیس کیا ہے؟ وہ تعامل لکھیں جو $NaOH$ کی تقسیم کو پانی میں ظاہر کرے۔	1+2

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

OR	What is Bronsted Lowry acid? Give one reaction as example.	1+2

First Annual 2025 | Section C Q4 | 6 marks

Q.4	Write the balanced chemical reactions of ***NaOH*** with: ***NaOH*** کے درج شدہ کے ساتھ بیلنس شدہ کیمیائی ری ایکشن لکھیں۔ **a)** HCl **b)** NH_4Cl **c)** H_2SO_4	**2x3**

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

(i)	A student added HCl to Na_2CO_3 solution. Bubbles were observed. Identify the gas evolved. Write balanced chemical equation for the reaction. ایک طالب علم نے Na_2CO_3 کے محلول میں HCl ملایا۔ بلبلے دیکھے گئے۔	**1+2**

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

OR	Differentiate between a strong acid and a weak acid by explaining their dissociation in aqueous solution. Give one examples each. ایک سٹرونگ ایسڈ اور ایک کمزور ایسڈ میں فرق بیان کریں آبی محلول میں ان کی تحلیل پر زور دیتے ہوئے ہر ایک کی ایک مثال دیں۔	03

Second Annual 2025 | Section C Q4 | 6 marks

Compare the Arrhenius concept of acids and bases with Bronsted-Lowry concept. Give one example of each. آرہینئس اور برونسٹڈ لوری کے تیزاب اساس نظریات کا موازنہ کریں۔ ہر ایک کی ایک مثال بھی	4+2

First Annual 2026 | Section A Q6 | 1 mark

Which reaction products correctly show what happens when an acid reacts with a metal carbonate?	Salt $+CO_2+H_2O$	Salt $+ H_2+NH_3$	Salt $+ N_2+H_2O$	Salt only

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

1.5 + 1.5	OR	Write chemical reaction when an acid reacts with carbonate. Describe the visible change that may appear.	2+1
1.5		Name the three main types of chemical fertilizers	

First Annual 2026 | Section C Q4 | 6 marks

Explain the terms 'Acid' and 'Base' according to the Bronsted–Lowry theory. Identify the acid and base in the reaction: $NH_3 + H_2O \rightleftharpoons NH_4^+ + OH^-$	2+2 +2

First Annual 2026 | Section A Q5 | 1 mark

When a base reacts with an ammonium salt, it produces:	Hydrogen	Carbon dioxide	Oxygen	Ammonia

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

	[illegible]
OR	Write the dissociation equations of sulfuric acid (H_2SO_4) and sodium hydroxide (NaOH) in aqueous solution.
	Complete the given displacement reactions of

First Annual 2026 | Section C Q5 | 6 marks

Q.5	Write chemical reactions of HCl when it reacts with: **a.** Mg **b.** $CaCO_3$ **c.** NaOH	**2x3**

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

State Bronsted-Lowry acid base concept. Give example of reaction between HCl and NH_3.	1+1 +1

First Annual 2026 | Section C Q4 OR | 6 marks

Q.4	Identify the oxidizing and reducing agents in given reactions by assigning their oxidation states (H=+1, O= –2) **a** $WO_3 + 3H_2 \rightarrow W + 3H_2O$	**3+3**	**OR**	Differentiate between strong acid and a weak acid. Write dissociation equations for HCl and CH_3COOH in aqueous solution to support your answer.	**1+1** **+2** **+2**

OR	Define Bronsted-Lowry acids and bases with two examples each.	03

Q.4	Describe reactions of HCl with the following. A. Zn B. NaOH C. Na_2CO_3	2x3

Q.4	Give complete and balanced chemical reaction of NaOH with: HCl, NH_4Cl, H_2SO_4 NaOH کے درج شدہ کے ساتھ مکمل اور بیلنسڈ کیمیائی ری ایکشنز تحریر کریں:

APOLLO

Periodic Table & Periodicity

Domain C: Inorganic Chemistry

FBISE model paper | Section A Q39 | 0.5 marks

39.	Elements in the same group show similar chemical behavior. This similarity is due to:	Same atomic mass	Same number of shells	Same valence electrons	Same neutrons

FBISE model paper | Section A Q40 | 0.5 marks

40.	Which of the following elements has the largest atomic size?	Fluorine	Oxygen	Chlorine	Bromine

FBISE model paper | Section A Q50 | 0.5 marks

Scenario for MCQ (49-52)	**A scientist is analyzing an element X. She finds that its atom has 17 protons, 18 neutrons, and 17 electrons.**				
50.	Which group and period does element X belong to in the Periodic Table?	Group 1, Period 3	Group 17, Period 3	Group 7, Period 2	Group 17, Period 2

FBISE model paper | Section A Q51 | 0.5 marks

Scenario for MCQ (49-52)	**A scientist is analyzing an element X. She finds that its atom has 17 protons, 18 neutrons, and 17 electrons.**				
51.	The electronic configuration of element X is:	2, 8, 7	2, 8, 8	2, 7, 8	2, 7

Q.3	Briefly describe the following terms along with their trends in groups and periods. درج اصطلاحات کی مختصر وضاحت کریں۔ نیز پیریڈز اور گروپ میں ان کے رجحانات بھی لکھیں۔ **a)** Ionization energy آئیونائزیشن انرجی **b)** Electron affinity الیکٹران ایفینٹی	**3+3**	**OR**	Draw electron dot and cross structures for the following: درج شدہ کے الیکٹران ڈاٹ اور کراس سٹرکچر بنائیں۔ **a)** HCN **b)** Cl_2 **c)** CO_2	**2x3**

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

OR	How many electrons are found in valence shell of group – I and group – VII elements? What kind of ions do they form? Give one example of each.	03

First Annual 2026 | Section A Q7 | 1 mark

An element in Group I-A forms ions with charge:	–1	+1	+2	–2

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

03	OR	Justify the following statements: **a.** Flourine has smaller shielding effect than Chlorine **b.** Flourine has high ionization energy than Chlorine	1.5 + 1.5

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

viii)	Briefly state the trend of metallic character along the group. Also give reason.	1.5 + 1.5	OR	

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

(vii)	An element has electronic configuration 2,8,7 (atomic number=17). Identify its period, group number and number of valence electrons.	1+1 +1	OR	Complete the given displacement reactions of Halogens if they are possible: **a.** $Br_2 + 2KI \rightarrow$ **c.** $I_2 + 2KBr \rightarrow$

First Annual 2026 | Section C Q4 OR | 6 marks

OR	An element Z is located below Magnesium in Group II-A: **a.** Predict its relative reactivity in comparison to Magnesium **b.** Compare its metallic character with Magnesium **c.** Compare its Ionization energy with Magnesium
	What are substitution reactions? Why alkanes show

First Annual 2026 | Section A Q7 | 1 mark

The period number of an element depends on the number of:	Occupied shells	Electrons	Protons	Neutrons

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

(vi)	What is periodic table? On what basis are elements arranged in the modern periodic table?	**2+1**

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

OR	Identify the group and period number of the following unknown elements. a. $^{12}_{6}\boldsymbol{A}$ b. $^{39}_{19}\boldsymbol{B}$ c. $^{19}_{9}\boldsymbol{C}$	1+1+1

Q.3	Predict the trend of atomic size, ionization energy and electronegativity of group IIA of periodic table by using knowledge of chemical periodicity.	2+2+2	**OR**

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

How do following vary down the group? درج شدہ خصوصیات گروپ میں نیچے کی طرف کیسے تبدیل ہوتی ہیں؟ **a.** Atomic size اٹامک سائز **b.** Ionization energy آئیونائزیشن انرجی **c.** Electronegativity الیکٹرونیگیٹیویٹی	03	OR	Predict the solubility of following substances. درج شدہ مرکبات کی حل پذیری کی پیشین گوئی کریں۔ **a.** Methanol in water میتھنول پانی میں **b.** Oil in benzene تیل بینزین میں **c.** Sodium chloride in water سوڈیم کلورائیڈ پانی میں

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

(v)	Demarcate the modern periodic table into *'s'* and *'p'* block. Which law determines this demarcation? جدید پیریاڈک ٹیبل میں *'s'* اور *'p'* بلاک کی نشاندہی کریں۔ ساتھ ہی اس لا کا نام بتائیں	03

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

(vi)	Recognize and justify the presence of more similar chemical properties among the following two sets of elements. **a.** *Li, Na, K* **b.** *Li, C, F*	03

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

(vii)	Briefly explain the difference in ionization energies of alkali and alkaline earth metals.	03

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

(vii)	Briefly explain the difference in ionization energies of alkali and alkaline earth metals.	03	OR	Differentiate between period and group in the periodic table.	03

Second Annual 2025 | Section A Q3 | 1 mark

Among the alkali metals, the metals with the highest ionization potential is: الکلی دھاتوں میں آئنائزیشن کی سب سے زیادہ صلاحیت رکھنے والی دھات یہ ہے:	Li	Na	K	Rb

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

OR	Write the valence shell electronic configuration of elements present in: درج شدہ سے تعلق رکھنے والے عناصر کی ویلنس شیل الیکٹرانک ترتیب لکھیں۔		03

a.	Group III-A, Period 3	گروپ III-A، پیریڈ 3
b.	Group V-A, Period 3	گروپ V-A، پیریڈ 3
c.	Group VI-A, Period 2	گروپ VI-A، پیریڈ 2

(Chem-old)

Second Annual 2025 | Section C Q3 OR | 4 marks

Calculate the number of moles in: **a.** 3.011×10^{22} molecules of formaldehyde (CH_2O) **b.** 1.25×10^{22} molecules of benzene (C_6H_6) (الف) فارملڈیہائیڈ (CH_2O) کے $10^{23} \times 3.01$ مالیکیولز میں مولز کی تعداد معلوم کریں۔ (ب) بینزین (C_6H_6) کے $10^{23} \times 9.03$ مالیکیولز میں مولز کی تعداد معلوم کریں۔	**2+2**	**OR**	In each of the following oxides, identify which oxide is more basic. Discuss the reason also: درج آکسائیڈز میں سے کون سا زیادہ بیسک (basic) ہے؟ وجہ بھی بتائیں۔ a. Li_2 or Na_2O — Na_2O یا Li_2	**2+2**

Calculate the number of moles in: **a.** 3.011×10^{22} molecules of formaldehyde (CH_2O) **b.** 1.25×10^{22} molecules of benzene (C_6H_6) (الف) فارملڈیہائیڈ (CH_2O) کے $10^{23} \times 3.01$ مالیکیولز میں مولز کی تعداد معلوم کریں۔ (ب) بینزین (C_6H_6) کے $10^{23} \times 9.03$ مالیکیولز میں مولز کی تعداد معلوم کریں۔	**2+2**	**OR**	In each of the following oxides, identify which oxide is more basic. Discuss the reason also: درج آکسائیڈز میں سے کون سا زیادہ بیسک (basic) ہے؟ وجہ بھی بتائیں۔ a. Li_2 or Na_2O — Na_2O یا Li_2 b. Na_2O or Mgo — Mgo یا Na_2O	**2+2**

Second Annual 2025 | Section C Q4 OR | 2 marks

What is ionization energy? How it varies across the group II-A and period 2 of the periodic table? آئیونائزیشن انرجی کیا ہے؟ یہ گروپ II-A اور پیریڈ 2 میں کس طرح تبدیل ہوتی ہے؟	**2+4**			

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

(vii)	Why elements in the same group show similar chemical properties? Relate your answer to their electronic configuration. ایک ہی گروپ کے عناصر میں یکساں کیمیائی خصوصیات کیوں پائی جاتی ہیں؟ اپنے جواب کو الیکٹرانک	03

First Annual 2026 | Section A Q4 | 1 mark

Elements in group 1 and 2 belong to:	p-block	s-block	d-block	f-block

First Annual 2026 | Section A Q9 | 1 mark

9. Elements in the same group show similar properties because they have the same:	Mass number	Number of Valence electrons	Number of Neutrons	Atomic radii

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

Why alkali metals have lower ionization energies than alkaline earth metals? Explain briefly.	03

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

(iv)	What are p-block elements? Identify any two elements belonging to this block.	03

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

OR	Identify the position of following in periodic table by their electronic configuration: a. $^{14}_{7}N$ b. $^{24}_{12}Mg$	1.5 + 1.5