

[Question of Term Final Examination]

KHULNA UNIVERSITY

School: Science, Engineering & Technology Discipline: Chemistry Program: B.Sc. (Hon's)

Year: First Term: Second Examination Year: 2026 Session: 2024-2025

Course Code: 0531 18 Chem 1201 Course Title: Solution and Phase Equilibrium Chemistry

Total Marks: 60

Time: 3 hours

Credit: 3.0

- Use separate answer script for each section.
- Figures in the margin indicate full marks. Questions are of equal value.

Section A

There are **FOUR** questions in this section. Answer any **THREE** questions.

Question No.	Question Description	Marks
1. a)	Construct the expression of solubility product K_{SP} of Fe_3O_4 . Calculate the solubility of Fe_3O_4 if the K_{SP} is $4.50 \times 10^{-7} M^3$. [L6, CLO1]	5
b)	Define lattice enthalpy and hydration enthalpy. Lattice enthalpy and hydration enthalpy of KCl is -659 kJmol^{-1} and -633 kJmol^{-1} , respectively. How much heat should be released or absorbed when one mole of KCl is dissolved in water? [L2, CLO1]	5
2. a)	A solute, S, has a distribution ratio D between water and chloroform of 5.0. A 50 mL sample of a 0.05 M aqueous solution of the solute is extracted with 15.0 mL of chloroform. What volume of chloroform is needed to extract 99.9% of the solute? [L6, CLO1]	5
b)	How does fractional distillation work? Illustrate with diagram or figure. [L5, CLO2 & CLO3]	5
3. a)	Discuss the principle of distillation with explaining P - x and T - x plots. [L6, CLO3]	5
b)	A solution contains Cu^{2+} ions at a concentration of $3 \times 10^{-4} M$. Calculate the concentration of Cu^{2+} in: (i) nM ; (ii) KgL^{-1} ; and (iii) ppm [L4, CLO1]	5
4. a)	Compare a non-aqueous solvent with water in self-dissociation, neutralization, dissociation of acids and bases. [L2, CLO4]	4
b)	Show that, the total fraction of solute remaining after n -th extraction with same volume can be given by: [L1, CLO3]	6

$$(Q_{org})_n = \left(\frac{DV_{org}}{DV_{org} + V_{aq}} \right)^n$$

Section B

There are **FOUR** questions in this section. Answer any **THREE** questions.

Question No.	Question Description	Marks
5.	a) Explain the relationship between depression of freezing point and the lowering of vapor pressure. Determine the molecular mass by utilizing depression of freezing point. [L5, CLO5]	5
	b) 18.2 g of urea is dissolved in 100 g of water at 50 °C. The lowering of vapor pressure is 5 mm (Hg). Calculate the molecular mass of urea. The vapor pressure of water at 50 °C is 92 mm (Hg). [L5, CLO5]	3
	c) "Mixture of acetone and chloroform show negative deviation from Raoult's law"- Explain why. [L2, CLO5]	2
6.	a) Explain Molecular Sieve theory of osmosis. [L2, CLO5]	5
	b) Calculate the osmotic pressure of 5% solution of glucose (Molecular weight of glucose is 180) at 18 °C. [L5, CLO5]	3
	c) Why the vapour pressure of a solution containing non-volatile solute is less than that of pure solvent? [L4, CLO5]	2
7.	a) Construct the Oswald's dilution law for weak electrolytes. [L6, CLO6]	5
	b) Calculate the effective concentration of a 0.0992 M solution of NaCl at 25 °C for which activity coefficient is 0.782. [L5, CLO6]	3
	c) Make a list of the factors which influence the degree of dissociation. [L1, CLO6]	2
8.	a) Draw the phase diagram of one component water system and discuss the curve, point and areas of the diagram. [L6, CLO7]	5
	b) Identify the phase, component, and degree of freedom of the followings: [L2, CLO7]	3
	(i) Mixture of a gases	
	(ii) NaCl solutions	
	(iii) Sulphur system	
	c) Explain efflorescence and deliquescence. [L2, CLO7]	2

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KHULNA UNIVERSITY

School: Science, Engineering & Technology **Discipline:** Chemistry **Program:** B. Sc. (Hon's)

Year: First **Term:** Second **Examination Year:** 2026 **Session:** 2024-2025

Course Code: 0531 18 Chem 1203 **Course Title:** Chemistry of Inorganic Reactions

Total Marks: 60

Time: 3 hours

Credit: 3.0

- Use separate answer script for each section.
- Figures in the margin indicate full marks. Questions are of equal value.

Section A

There are **FOUR** questions in this section. Answer any **THREE** questions.

Question No.	Question Description	Marks
1.	a) What are the signs that are used in a chemical reaction? [L1, CLO1]	2
	b) Classify the following reactions according to their type: [L3, CLO1]	1+1
	(i) $CaCO_3 \rightarrow CaO + CO_2$	
	(ii) $NaOH + HCl \rightarrow NaCl + H_2O$	
	c) Organize different steps to form a new substance. [L3, CLO1]	6
2.	a) How electronegativity and bond strength impact the strength of acids? [L1, CLO2]	3
	b) Analyze the statement – “All Arrhenius acids are Bronsted acids but all Arrhenius bases are not Bronsted bases”. Categorize different types of oxides with a table.[L4, CLO2]	4
	c) Explain ‘Magic acid’ and assess the properties of super acids. [L5, CLO2]	3
3.	a) Summarize the criterions of an ideal indicator. [L2, CLO2]	2
	b) Distinguish between end point and equivalence point of a titration process. [L4, CLO2]	2
	c) Determine the value of pH at the end point of ammonium formate solution where, K_a and K_b is 1.77×10^{-4} and 1.85×10^{-5} . [L5, CLO2]	3
	d) Develop an equation for the estimation of pH at the end point when weak base is titrated with strong acid. [L6, CLO3]	3
4.	a) In what conditions, oxidation number of hydrogen and oxygen show negative and positive value? [L1, CLO4]	1
	b) Elaborate following reaction as a redox reaction. [L6, CLO4]	3
	$K_2Cr_2O_7 + H_2SO_4 + FeSO_4 \rightarrow K_2SO_4 + Cr_2(SO_4)_3 + Fe_2(SO_4)_3$	

- c) (i) Applying Nernst equation, calculate the change of electrode potential at different stages when 100 mL 0.1M Fe^{2+} solution is titrated with 0.1M Ce^{4+} solution. Where, $E_{\text{anode}} = 1.52\text{V}$ and $E_{\text{cathode}} = 0.76\text{V}$. [L3, CLO4] 4+2
- (ii) Make use of the values of above titration – draw a redox titration curve. [L3, CLO5]

Section B

There are **FOUR** questions in this section. Answer any **THREE** questions.

Question No.	Question Description	Marks
5.	a) Name three common unidentate ligands. [L1, CLO3]	2
	b) Evaluate the importance of using EDTA as a standard chelating agent in complexometric titrations. [L5, CLO3]	4
	c) Apply Werner's theory to explain why $[\text{CoCl}_3 \cdot 6\text{NH}_3]$ reacts with 3 moles of AgNO_3 to give 3 moles of AgCl . [L3, CLO4]	4
6.	a) Write down the reaction and catalyst used in the Haber process. [L1, CLO5]	2
	b) Write the oxidation reaction of sulfur dioxide using nitric oxide catalyst. [L3, CLO5]	5
	$2\text{SO}_2 + \text{O}_2 \xrightarrow{\text{NO}} 2\text{SO}_3$	
	c) Define inorganic catalysts. Why divided catalysts are more reactive than undivided catalyst? [L2, CLO5]	3
7.	a) Show the formation of methyl radical during Kolbe electrolysis. [L3, CLO5]	3
	$\text{CH}_3\text{COO}^- \longrightarrow \text{CH}_3\cdot + \text{CO}_2$	
	b) Discuss why free radicals are usually short-lived. [L6, CLO5]	3
	c) Prove that redox and thermal process generates inorganic free radicals. [L5, CLO5]	4
8.	a) Define mass defect. [L1, CLO6]	2
	b) Describe the concept of binding energy per nucleon. [L2, CLO6]	4
	c) Apply the ESR equation to determine the magnetic field if frequency and G-value are given. [L3, CLO6]	4

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KHULNA UNIVERSITY

School: Science, Engineering & Technology **Discipline:** Chemistry **Program:** B.Sc. (Hon's)
Year: First **Term:** Second **Examination Year:** 2026 **Session:** 2024-2025
Course Code: 0531 18 Chem 1205 **Course Title:** Introduction to Organic Chemistry
Total Marks: 60 **Time:** 3 hours **Credit:** 3.0

- Use separate answer script for each section.
- Figures in the margin indicate full marks. Questions are of equal value.

Section A

There are **FOUR** questions in this section. Answer any **THREE** questions.

Question No.	Question Description	Marks
1.	a) Discuss the origin and development of organic chemistry. [L1, CLO1]	2
	b) Describe the ground state and excited state electronic configuration of carbon. Explain how the concept of hybridization accounts for the tetrahedral geometry of methane. [L2, CLO1]	3
	c) Explain the electron displacement effects (inductive, resonance, hyperconjugation) with examples. [L4, CLO2]	3
	d) Illustrate the Lewis structure of PCl_5 and SF_6 . [L2, CLO2]	2
2.	a) Arrange the following in order of increasing reactivity toward free radical halogenation: methane, ethane, propane, isobutane. Justify your answer. [L3, CLO3]	2.5
	b) Describe the Wurtz Reaction for the preparation of alkanes. What are the limitations of this method when preparing alkanes with an odd number of carbon atoms? [L2, CLO4]	3
	c) Starting from Ethyl bromide, how would you synthesize: [L5, CLO4]	2
	(i) n-Butane	
	(ii) Ethane	
	d) Compare the stability of cyclopropane, cyclobutane, and cyclohexane. Justify your answer. [L4, CLO2]	2.5
3.	a) Explain Saytzeff's Rule in the context of dehydrohalogenation. Why are more highly substituted alkenes generally more stable than less substituted ones? [L2, CLO5]	3
	b) "The hydrohalogenation of an unsymmetrical alkene produces two products, whereas the symmetrical alkene produces only one"- justify it. [L5, CLO3 & CLO4]	3
	c) Starting from an appropriate alcohol, show the steps required to synthesize 2,3-dimethyl-2-butene. State the reagents and conditions	2

- necessary. [L6, CLO4]
- d) Describe a simple chemical test (with observations) to distinguish between: [L4, CLO4] 2
- (i) n-Butane and 1-Butene.
- (ii) 1-Hexene and Cyclohexane.
4. a) Explain the bonding nature of the atoms in but-1-en-3-yne with suitable hybridization. [L2, CLO2] 2
- b) Discuss the stereoselective reduction of alkynes. Compare and contrast the mechanisms and products formed when an internal alkyne (e.g., 2-butyne) reacts with: [L5, CLO4] 3
- (i) H_2 in the presence of Lindlar's catalyst.
- (ii) Sodium in liquid ammonia
- c) Describe how Sodium Acetylide is prepared from ethyne. Show how this intermediate can be used as a nucleophile in an S_N2 reaction to synthesize higher alkynes from lower ones. [L3, CLO4] 2.5
- d) An unknown hydrocarbon (A) with the molecular formula C_5H_8 decolors bromine water and forms a white precipitate with ammoniacal silver nitrate. Upon hydration with $HgSO_4/H_2SO_4$, it yields 2-pentanone. Identify (A) and write all the reactions involved. [L6, CLO4] 2.5

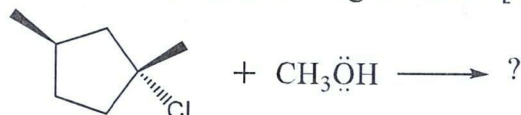
Section B

There are **FOUR** questions in this section. Answer any **THREE** questions.

Question No.	Question Description	Marks
5. a)	Why do primary and secondary alcohols readily undergo oxidation to carbonyl compounds, whereas tertiary alcohols are generally resistant to oxidation under standard conditions? Explain the structural basis for the difference in reactivity. [L2, CLO3]	5
b)	The reaction of 3,3-dimethyl-2-butanol with HCl yields 2-chloro-2,3-dimethylbutane as the major product rather than 2-chloro-3,3-dimethylbutane. Propose a mechanism to justify this rearrangement and explain the stability factors involved. [L5, CLO4]	5
6. a)	Illustrate why alkyl halides are the most versatile substrates in nucleophilic substitution reactions. Justify why halide anions are highly effective leaving groups in terms of bond polarity and conjugate base stability. [L2, CLO2]	4

- b) Discuss why the C-X bond in aryl halides is shorter and stronger than in alkyl halides. Relate your answer to hybridization and resonance. [L4, CLO3] 3.5

- c) Predict the major product and identify the specific mechanism of nucleophilic substitution for the following reaction. [L4, CLO5] 2.5



7. a) Design a stepwise chemical testing protocol to distinguish between unlabeled samples of ethanol, 2-propanol, and tert-butanol. Provide the specific reagents used, the expected visible observations for each alcohol, and write the balanced chemical equations for the positive reactions. [L6, CLO3] 5
- b) Arrange the following carbocations in increasing order of stability and justify your answer. [L5, CLO2] 5
- CH_3CH_2^+ ; $(\text{CH}_3)_3\text{C}^+$; CH_3^+ ; $(\text{CH}_3)_2\text{CH}^+$
8. a) Show thiols are more acidic than their corresponding alcohols. [L1, CLO2] 4
- b) Define organometallic compounds with suitable examples. [L1, CLO1] 3
- c) Explain why ferrocene is exceptionally stable compared to other iron-carbon compounds. [L2, CLO2] 3

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KHULNA UNIVERSITY

School: Science, Engineering & Technology Discipline: Chemistry Program: B. Sc. (Hon's)

Year: First Term: Second Examination Year: 2026 Session: 2024-2025

Course Code: 0541 18 Math 1251 Course Title: Algebra and Vector Analysis

Total Marks: 60

Time: 3 hours

Credit: 3.0

- Use separate answer script for each section.
- Figures in the margin indicate full marks. Questions are of equal value.

Section A

There are **FOUR** questions in this section. Answer any **THREE** questions.

Question No.	Question Description	Marks
1.	a) If α, β, γ are the roots of $2x^3 + 3x^2 - x - 1 = 0$. Find the equations whose roots are i) $\sum \frac{1}{2\alpha}$; ii) $\sum \alpha^2$ [L1, CLO1 & CLO2]	5
	b) State De-Cartes rule of sign. Using this rule find the possible roots of $f(x) = x^5 - 3x^4 + 3x^3 - 9x^2 - 4x + 12$ [L3, CLO1 & CLO2]	5
2.	a) Find the roots of the complex equation $z^5 = -2\sqrt{3} - 2i$ and also locate the roots on the complex plane. [L2, CLO2]	5
	b) i. Show that, $e^{\left(\frac{2+\pi i}{4}\right)} = \sqrt{\frac{e}{2}}(1+i)$ [L3, CLO2]	5
	ii. Find the polar form of $\left(\frac{1-2i}{2+3i}\right)^2$ [L3, CLO2]	
3.	a) Determine the eigenvalues and associated eigenvectors of the matrix, [L5, CLO4]	5
	$A = \begin{bmatrix} -3 & 2 & 2 \\ -6 & 5 & 2 \\ -7 & 4 & 4 \end{bmatrix}$	
	b) Find the inverse matrix of $A = \begin{bmatrix} 1 & 0 & 3 \\ 3 & 4 & -1 \\ 2 & 5 & -4 \end{bmatrix}$ using Block Method i.e. $\{A/I \rightarrow I/A^{-1}\}$ [L1, CLO1]	5
4.	a) Identify the solutions type of the given system of linear equations, if there exist any solutions then find it. [L3, CLO1]	5
	$\begin{aligned} 2x - 3y + 2z &= 13 \\ 3x + y - z &= 2 \\ 3x - 4y - 3z &= 1 \end{aligned}$	

- b) State Dimension theorem for rank and nullity. Find the nullity of

5

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 2 & 4 & 6 \\ 0 & 1 & 1 \end{bmatrix} \text{ [L1, CLO1]}$$

Section B

There are **FOUR** questions in this section. Answer any **THREE** questions.

Question No.	Question Description	Marks
5.	<p>a) Define unit vector. Show that the addition of vectors is associative, i.e. $\vec{A} + (\vec{B} + \vec{C}) = (\vec{A} + \vec{B}) + \vec{C}. \text{ [L 2, CLO1]}$</p> <p>b) Determine the angles α, β, and γ that the vector $\vec{r} = \hat{i} + \sqrt{2}\hat{j} + \hat{k}$ makes with the positive directions of the coordinate axes and prove that $\cos^2\alpha + \cos^2\beta + \cos^2\gamma = 1$. [L5, CLO3]</p> <p>c) Find the projection of the vector $\vec{A} = \hat{i} - 2\hat{j} + \hat{k}$ on the vector $\vec{B} = 4\hat{i} - 4\hat{j} + 7\hat{k}$. [L1, CLO1]</p>	<p>3</p> <p>4</p> <p>3</p>
6.	<p>a) Find the angle between the two planes by, $x - 2y + z = 0$ $2x + 3y - 2z = 0$ Also, determine the parametric equations of their line of intersection. [L5, CLO5]</p> <p>b) Determine whether the planes are parallel, orthogonal, or neither. If they are neither parallel nor orthogonal, then find the angle of intersection. [L5, CLO5]</p> $3x + y - 4z = 3$ $12z - 9x - 3y = 4$	<p>5</p> <p>5</p>
7.	<p>a) Define directional derivative. Determine the directional derivative of $\phi = 2xy^2z + xyz^2$ at $(1, 2, 3)$ in the direction of the tangent to the curve, $x = e^t, y = \sin 2t + 1, z = 1 + \cos t$ at $t = 0$. [L5, CLO4]</p> <p>b) Prove that the straight lines represented by the equation $f(x, y) = 0$ will be equidistant from the origin, if $f^4 - bcf^2 = g^4 - cag^2$. Where $f(x, y) = ax^2 + 2hxy + by^2 + 2gx + 2fy + c$. [L5, CLO3]</p>	<p>5</p> <p>5</p>

8. a) Develop canonical form of the following equation and determine the nature of the conics represented by it. 5

$$x^2 - 2xy + 2y^2 - x - 1 = 0. \text{ [L3, CLO3]}$$

- b) Find the shortest distance between the lines $\frac{x-3}{3} = \frac{y-8}{-1} = \frac{z-3}{1}$; $\frac{x+3}{-3} = \frac{y+7}{2} = \frac{z-6}{4}$. Find also equation and the points in which it meets the given lines. [L1, CLO1 & 5] 5

[Question of Term Final Examination]

KHULNA UNIVERSITY

School: Science, Engineering & Technology **Discipline:** Chemistry **Program:** B.Sc. (Hon's)

Year: First **Term:** Second **Examination Year:** 2026 **Session:** 2024-2025

Course Code: 0533 18 Phy 1253

Course Title: Electricity and Magnetism

Total Marks: 60

Time: 3 hours

Credit: 3.0

- Use separate answer script for each section.
- Figures in the margin indicate full marks. Questions are of equal value.

Section A

There are **FOUR** questions in this section. Answer any **THREE** questions.

Question No.	Question Description	Marks
1.	a) Define electric flux and electric potential. [L1, CLO1]	2
	b) Show that the potential energy due to a dipole in an external electric field is $U = - \underline{p} \cdot \underline{E}$, where the symbols have their usual meanings. [L2, CLO1]	5
	c) Mathematically deduce Gauss law from Coulombs law. [L5, CLO1]	3
2.	a) Define capacitance and dielectric constant. [L1, CLO2]	2
	b) Find an expression for Gauss law when a parallel plate capacitor is filled with dielectric of dielectric constant K. [L1, CLO1]	5
	c) Three capacitors have capacitance of 3, 2, and 1 μF , respectively. Series combination of second and third is connected in parallel to the first capacitor. Examine the equivalent capacitance of the circuit. [L4, CLO2]	3
3.	a) What is the difference between capacitor and charge condenser? [L1, CLO2]	2
	b) Evaluate the capacitance of a cylindrical surface and show that the capacitance is directly proportional to the length of the cylinder. [L5, CLO2]	4
	c) Estimate the storing energy in an electric field. [L5, CLO1]	4
4.	a) Briefly explain the conductivity and resistivity. [L2, CLO3]	2
	b) State and explain Kirchhof's law. [L1, CLO3]	3
	c) Discuss about ohmic and non-ohmic material with proper diagram. [L6, CLO3]	2
	d) Briefly explain Seeback effect in thermoelectricity. Demonstrate with the help of a suitable diagram. [L2, CLO4]	3

Section B

There are **FOUR** questions in this section. Answer any **THREE** questions.

Question No.	Question Description	Marks
5.	a) Illustrate the basic concept of magnetic force with proper explanation. [L5, CLO5]	3
	b) Summarize the properties of paramagnetic and ferromagnetic materials. [L2, CLO5]	4
	c) Write short notes on: [L1, CLO5]	3
	(i) Magnetic Flux	
	(ii) Magnetic coercivity	
	(iii) Hysteresis Loop	
6.	a) Illustrate Biot-Savart's law and hence calculate the magnetic field produced by a long straining wire with the help of Biot-Savart law. [L2, CLO5]	5
	b) Define self-induction and hence deduce the equation of mutual induction for two co-axial solenoids. [L6, CLO5]	5
7.	a) Develop the expression for the growth of current in a LR circuit. [L6, CLO6]	5
	b) Explain how complex number representation can be used in AC circuit analysis. [L4, CLO6]	3
	c) In a series LS circuit, the values of the various quantities are as follow: $\xi = 100$ volts, $f = 60$ c/sec, $R = 1$ ohm, $L = 1$ henry, and $C = 7.64 \mu\text{F}$. Calculate inductive and capacitive reactance. [L6, CLO6]	2
8.	a) Mathematically construct the equation of growth of current in a RC circuit connected with a DC power source. [L6, CLO6]	4
	b) Appraise the working principle and applications of an Ohmmeter. [L5, CLO7]	4
	c) Discuss the terms: [L2, CLO5]	2
	(i) Lorentz force	
	(ii) Impedence	

[Question of Term Final Examination]

KHULNA UNIVERSITY

School: Science, Engineering & Technology **Discipline:** Chemistry **Program:** B. Sc. (Hon's)

Year: First **Term:** Second **Examination Year:** 2026 **Session:** 2024-2025

Course Code: 0311 18 Econ 1259 **Course Title:** Principles of Economics

Total Marks: 60

Time: 3 hours

Credit: 3.0

- Use separate answer script for each section.
- Figures in the margin indicate full marks. Questions are of equal value.

Section A

There are **FOUR** questions in this section. Answer any **THREE** questions.

Question No.	Question Description	Marks																					
1.	a) "Economics is the science which studies human behavior as a relationship between ends and scarce means which have alternative uses"-Analyze the statement. [L5, CLO1]	4																					
	b) Differentiate macro and micro economics. [L2, CLO1]	3																					
	c) Explain the key differences between economic and free goods. [L2, CLO1 &CLO2]	3																					
2.	a) Assume, $Q_d = 20 - 2P$ and $Q_s = 10 + 3P$. Find out market equilibrium with equilibrium price and quantity. Show graphically. [L6, CLO1 &CLO2]	6																					
	b) Graphically show the reasons behind shift in the demand curve. [L6, CLO3]	4																					
3.	a) <table border="1"><thead><tr><th>Combination</th><th>Capital</th><th>Labour</th></tr></thead><tbody><tr><td>A</td><td>1</td><td>16</td></tr><tr><td>B</td><td>2</td><td>11</td></tr><tr><td>C</td><td>3</td><td>7</td></tr><tr><td>D</td><td>4</td><td>4</td></tr><tr><td>E</td><td>5</td><td>2</td></tr><tr><td>F</td><td>6</td><td>1</td></tr></tbody></table>	Combination	Capital	Labour	A	1	16	B	2	11	C	3	7	D	4	4	E	5	2	F	6	1	6
Combination	Capital	Labour																					
A	1	16																					
B	2	11																					
C	3	7																					
D	4	4																					
E	5	2																					
F	6	1																					
	Find out MRTS and show corresponding Isoquant curve. [L6, CLO6]																						
	b) Model three types of returns to scale with appropriate example. [L3, CLO3]	4																					
4.	a) Differentiate GDP and GNP. [L4, CLO2]	2																					
	b) What do you mean by business cycle? [L1, CLO5]	2																					
	c) Briefly describe circular flow of income in a two sector economy model. (Use Graph) [L3, CLO2-4]	6																					

Section B

There are **FOUR** questions in this section. Answer any **THREE** questions.

Question No.	Question Description	Marks
5.	a) Briefly describe the industrial policy of Bangladesh. [L4, CLO3]	5
	b) Discuss the significance thrust sector industries of Bangladesh. [L6, CLO4]	5
6.	a) Explain material balance model from economics point of view with appropriate diagram. [L2, CLO4]	6
	b) Describe how the knowledge of economics can be helpful in managing the environmental issues. [L5, CLO5]	4
7.	a) “We should use more and more renewable resources instead of non-renewable one for sustainable future” – explain the statement. [L4, CLO5]	5
	b) Explain how ecology and economics are deeply related to each other to optimize the combined outcomes. [L4, CLO5]	4
8.	a) Discuss the Pollution Haven Hypothesis with appropriate examples from pollution-intensive industries such as chemicals, tanning, or textiles. [L6, CLO3]	5
	b) Utilize pollution reduction and pollution prevention approaches and explain which one is more effective for sustainable industrial development. [L3, CLO5]	5