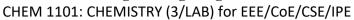
# AMERICAN INTERNATIONAL UNIVERSITY-BANGLADESH (AIUB)



Department of Natural Science (Chemistry) Faculty of Science & Technology

# **Engineering Program**





# LECTURE PLAN **Spring 2023-2024\_17 Weeks**

17th Week. Set-B Exam

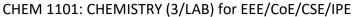
CHEMISTRY THEORY LECTURES:		
1st Week.	Introduction to atomic structure: Dalton, Rutherford, Wave and Atomic spectra;	
2 <sup>nd</sup> Week.	<i>Bohr atomic model</i> : Calculation of radius and energy of each orbit of hydrogen atom. Bohr explanation of hydrogen spectral series.	
3 <sup>rd</sup> Week.	Wave mechanical approach of the atom: dual nature of matters, de Broglie's equation, Heisenberg's uncertainty principle. Orbitals, Quantum numbers and Principle of electronic configuration. (Quiz-1)	
4th Week.	Modern periodic table: Main features of periodic table with special reference to group chemistry, Selected topics of organic chemistry.	
5 <sup>th</sup> Week.	Chemical Reactions: Concepts of acids and bases, electrolytes, oxidation-reduction, neutralization reactions. (Quiz-2)	
6 <sup>th</sup> Week.	Chemical bonds: Main types chemical bonds, Metallic bond, Hydrogen bond.	
7 <sup>th</sup> Week.	Molecular orbital theory: Main features, Bond order and Molecular orbital diagram of homonuclear and heteronuclear molecules. (Assignment-1)	
8th Week.	Mid-Exam	
9th Week.	Solutions and Solubility: Types of solution, Mechanism of dissolution, Properties of solvents, Factors affecting solubility, Gas laws: Boyle's law, Charles law, Gay-Lussac's law & Ideal gas law.	
9th Week.  10th Week	solvents, Factors affecting solubility, Gas laws: Boyle's law, Charles law, Gay-Lussac's law & Ideal gas law.	
10th Week	solvents, Factors affecting solubility, Gas laws: Boyle's law, Charles law, Gay-Lussac's law & Ideal gas law.  Solubility product & pH: Solubility product law, Application of solubility product	
10 <sup>th</sup> Week	solvents, Factors affecting solubility, Gas laws: Boyle's law, Charles law, Gay-Lussac's law & Ideal gas law.  Solubility product & pH: Solubility product law, Application of solubility product principle, Ionization of water, pH concept.  Electrochemistry: Principle of electrolysis, Kohlrausch's Law of electrolysis,	
10 <sup>th</sup> Week  11 <sup>th</sup> Week  12 <sup>th</sup> Week	solvents, Factors affecting solubility, Gas laws: Boyle's law, Charles law, Gay-Lussac's law & Ideal gas law.  Solubility product & pH: Solubility product law, Application of solubility product principle, Ionization of water, pH concept.  Electrochemistry: Principle of electrolysis, Kohlrausch's Law of electrolysis, conductometric titration, electrochemical cells, photolithography. (Quiz-3)  Phase rule and phase diagram: Phase rule and phase diagram of mono component	
10 <sup>th</sup> Week  11 <sup>th</sup> Week  12 <sup>th</sup> Week	solvents, Factors affecting solubility, Gas laws: Boyle's law, Charles law, Gay-Lussac's law & Ideal gas law.  Solubility product & pH: Solubility product law, Application of solubility product principle, Ionization of water, pH concept.  Electrochemistry: Principle of electrolysis, Kohlrausch's Law of electrolysis, conductometric titration, electrochemical cells, photolithography. (Quiz-3)  Phase rule and phase diagram: Phase rule and phase diagram of mono component systems. (Quiz-5)  Chemical kinetics and Chemical equilibrium: Rate of reaction, rate laws and	
10 <sup>th</sup> Week  11 <sup>th</sup> Week  12 <sup>th</sup> Week  13 <sup>th</sup> Week	solvents, Factors affecting solubility, Gas laws: Boyle's law, Charles law, Gay-Lussac's law & Ideal gas law.  Solubility product & pH: Solubility product law, Application of solubility product principle, Ionization of water, pH concept.  Electrochemistry: Principle of electrolysis, Kohlrausch's Law of electrolysis, conductometric titration, electrochemical cells, photolithography. (Quiz-3)  Phase rule and phase diagram: Phase rule and phase diagram of mono component systems. (Quiz-5)  Chemical kinetics and Chemical equilibrium: Rate of reaction, rate laws and order of reaction; equilibrium law and its characteristics. (Quiz-4)  Thermochemistry: Energy and its units, Enthalpy and Entropy change, Thermodynamic	

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#### **CHEMISTRY LAB EXPERIMENTS:**

Quantitative Inorganic Analysis: Volumetric titration: Acid-base titration, pH calculation, Redox titration, Es

Quantitative Inorganic Analysis: Volumetric titration: Acid-base titration, pH calculation, Redox titration Estimation of Cu & Fe Total hardness of water and Conductometric titration.		
<u>1</u>	1 <sup>st</sup> Week.	Introduction to chemistry laboratory: Laboratory rules and safety guidelines, Familiarize with common apparatus (demonstration) and modern periodic table, and discussion about report writing. Basics of chemical analysis e.g., qualitative vs quantitative analysis, primary and secondary standard substances, titration, standard solution, units of concentration, calculation of concentration, etc.
â	2 <sup>nd</sup> Week.	<b>Expt.1:</b> Standardization of sodium hydroxide (NaOH) solution with standard oxalic acid (HO <sub>2</sub> C-CO <sub>2</sub> H, 2H <sub>2</sub> O) solution.
2	3 <sup>rd</sup> Week.	<b>Expt.2:</b> Standardization of hydrochloric acid (HCl) solution with standard sodium hydroxide (NaOH) solution. ( <i>Quiz-1</i> )
4	4 <sup>th</sup> Week.	<b>Expt.3:</b> Standardization of hydrochloric acid (HCl) solution with standard sodium carbonate (Na <sub>2</sub> CO <sub>3</sub> ) solution and calculation of pH.
<u> </u>	5 <sup>th</sup> Week.	<b>Expt.4:</b> Determination of total Hardness of water using Eriochrome Black T (EBT) as indicator. ( <i>Quiz-2</i> )
-	6 <sup>th</sup> Week.	Makeup and Review Classes.
	7 <sup>th</sup> Week. 8 <sup>th</sup> Week.	Mid-term (Lab) Exam. Mid-term (Theory) Exam.
9	9 <sup>th</sup> Week.	<b>Expt.5:</b> Standardization of sodium thiosulphate $(Na_2S_2O_3)$ solution with standard potassium dichromate $(K_2Cr_2O_7)$ solution.
<u>1</u>	10 <sup>th</sup> Week.	<b>Expt.6:</b> Estimation of copper ions (Cu <sup>2+</sup> ) contained in a supplied solution by iodometric method.
<u>1</u>	11 <sup>th</sup> Week.	<b>Expt.7:</b> Determination of ferrous ions (Fe <sup>2+</sup> ) in a supplied solution by standard potassium dichromate ( $K_2Cr_2O_7$ ) solution. ( <i>Quiz-3</i> )

12 <sup>th</sup> Week.	<b>Expt.8:</b> Determination of conductance of a weak acid against a strong alkali solution.
13th Week.	<b>Expt.9:</b> Standardization of potassium permanganate (KMnO <sub>4</sub> ) solution with standard sodium oxalate (Na <sub>2</sub> C <sub>2</sub> O <sub>4</sub> ) solution. ( $\textit{Quiz-4}$ )
14th Week.	Makeup and Review Classes.
16th Week.	Final (Lab) Exam. Final (Theory) Exam. Set-B Exam and Results

#### **BOOK LIST FOR CHEMISTRY (LECTURE)**

**Texts**: **1**. B. S. Bahl, G. D. Tuli and Arun Bahl, "Essentials of Physical Chemistry" 24<sup>th</sup> ed. (1997), S. Chand & Compnay Ltd, ISBN: 81-219-0546-X; **2**. S. Z. Haider, "Introduction to Modern Inorganic Chemistry" 2<sup>nd</sup> ed. (2000), Friends International, ISBN: 984-30-0087-0

**References:** 1. M. M. Huque and M. A. Nawab, "Principles of Physical Chemistry" 3<sup>rd</sup> ed. (1974), Student Publication, ISBN: Not found; 2. A. Q. Chowdhury, "Chemistry Fundamentals" 3<sup>rd</sup> ed. (1995), AERS & Bureau of Research, Testing and Consultation (BUET), ISBN: Not found; 3. S. Z. Haider, "Selected Topics on Advanced Inorganic Chemistry" 4<sup>th</sup> ed. (2002), Student Publication, ISBN: Not found; 4. B. K. Sharma, "Electrochemistry", 5<sup>th</sup> ed. (1997-98), GOEL Publishing House, ISBN: 81-85842-96-5; 5. Maitland Jones, "Organic Chemistry", 1<sup>st</sup> ed. (1997), Norton Company, ISBN: 0-393-97079-5; 6. Jerry March, "Advanced Organic Chemistry", 4<sup>th</sup> ed. (1999-2000), John Wiley & Sons, ISBN: 9971-51-257-2; 7. O. P. Aggarwal, "Engineering Chemistry", 3<sup>rd</sup> ed. (1995), Khanna Publishers, Delhi

#### **BOOK LIST FOR CHEMISTRY (LAB)**

**Text**: 1. M. Mahbubul Huque and A. Jabber Mian, "Practical Chemistry" 2<sup>nd</sup> ed. (1972), Student Ways, ISBN: Not found

**References:** 1. J. Mendham, R. C. Denney, J. D. Barnes and M. Thomas, "Vogel'sText Book of Quantitative Chemical Analysis", 6<sup>th</sup> ed. (2000), Pearson Education Ltd, ISBN: 81-7808-538-0; 2. G. H. Jeffery, J. Bassett, J. Mendham, R. C. Denney, "Vogel's Text Book of Quantitative Chemical Analysis", 5<sup>th</sup> ed. (1989), Longman (ELBS), ISBN: 0-582-25167-2

#### **Evaluation Methods:**

- 1. Marks: Total marks 100, Contribution of Theory 60% and Lab 40%.
  - **Theory** (100%):
    - o Class Performance & Attendance, 20%
    - o Quizzes, 30% and Assignment, 10%
    - Mid/Final Exam, 40%

#### **Lab** (100%):

- o Class Performance & Attendance, 10%
- o Quizzes, 30%
- o Reports, 20%
- o Viva, 20%
- Mid/Final Exam, 20%
- 2. **Quiz**: In each term (Mid-term/Final-term) of the semester, 2 Quizzes tests and 1 Assignment will be taken in Theory Class of which <u>Best 1</u> Quiz and Assignment will count for results and <u>2</u> Quiz tests will be taken in Lab Class of which <u>Best 1</u> will count for results.
- 3. **Make-up Class/Quiz**: If any schedule class is postponed in case of unavoidable situation, the make-up class will be held immediately at a suitable time. There will be no make-up quiz or lab except a strong reason for that.
- 4. Grand Total: 40% of Mid-Term + 60% of Final-Term

## Course Requirements

- 1. Must appear at least *two quizzes* in theory and *one quiz* in lab before the Mid-term Exam and the same before the Final Exam.
- 2. Must appear at the Mid-term and the Final Exam both in theory and lab.
- 3. Students must have 80% attendance both in theory and lab to pass the course.