



# Course Book

<b>Course Description</b>	<b>Course overview:</b> The course deals primarily with the fundamental chemical and physical principles and their applications to the properties and transformations of materials, laws of chemical combination, atomic and molecular structure, chemical bonding, An introduction to the principles of chemical equilibrium and chemical change. Topics include chemical equilibrium, acid/base chemistry, and other ionic equilibrium, Introduction to basic quantitative chemical laboratory techniques, and principles of chemical reactions.
<b>Course objectives</b>	The student will be able to introduce to the main analytical tools through demonstrations. They should have a clear understanding of a typical analytical balance, the requirements of a good balance, weights, care and use of balance, methods of weighing and errors in weighing. The students should also be aware with the general apparatus required in various analytical procedures. The student will get information about the method of solution preparation with different concentrations.
<b>Student's obligation</b>	The student must to attend all lectures during the academic year and is permitted to absence only for three weeks, which amounts to 10% and when the percentage exceeded in any lecture he is considered as failed in that lecture. The student not allowed delaying the theoretical and practical examinations only after getting medical report. The student must do short examinations weekly in the form of (quiz) with writing reports after conducting the practical experiments.
<b>Required Learning Materials</b>	lecture halls with data show equipment for lecture presentations, white board, overhead projector, posters

<b>Evaluation</b>	<b>Task</b>		<b>Weight (Marks)</b>	<b>Due Week</b>	<b>Relevant Learning Outcome</b>
	Paper Review				
	Assignments	Homework	5	2	
		Class Activity	2		
		Report	10	1	
		Seminar			
		Essay			
	Project				
	Quiz		8	3	
	Lab.report		10	4	
Midterm Exam		25			
Final Exam		40			
Total		100			
<b>Specific learning outcome:</b>	<ol style="list-style-type: none"> <li>1. Ability to develop general knowledge</li> <li>2. Knowledge and understanding of the subject area and understanding of the profession</li> <li>3. Ability to identify, differentiate, pose and resolve problem</li> <li>4. Demonstrate the ability to think critically and solve problems in a laboratory setting</li> <li>5. Ability to apply knowledge in practice</li> <li>6. Ability to search for process and analyze information from a variety of sources</li> <li>7. Analysis of Specimens and Validation of Results</li> <li>8. Ability to act as ethical and responsible members of the health care team.</li> <li>9. Demonstrates research skills to investigate, evaluate or problem solve.</li> <li>10. Ability to make reasoned decision.</li> <li>11. Ability to design and manage projects.</li> <li>12. Capacity to generate new ideas (creative).</li> </ol>				
<b>Course References:</b>	<ol style="list-style-type: none"> <li>1. Fundamentals of Analytical chemistry, 2014-9th Edition by D.A. Skoog and D.M. West</li> <li>2. Chemistry, the central science, 2006 10 editions by brown.</li> <li>3- Introduction to General, Organic, and Biochemistry, 2013 – 11th Edition By Morris Hein, Scott Pattison, Susan Arena.</li> </ol>				

Course topics (Theory)	Week	Learning Outcome
<b>Introduction</b> to study the Analytical chemistry, importance, Analytical methods, Volumetric analysis using titrimetric method, standard solutions.	1	1,2
<b>The Matter:</b> what is the matter, states of the matter, properties and composition of the matter (element, mixture, compound)	2	1,2
<b>Structure of the matter:</b> Atom, structure, atomic weight, atomic number. <b>Isotopes:</b> types of the isotope, types of the radiation, uses of radioisotopes in the medicine	3	1,2
<b>Chemical bonding:</b> molecules, molecular weight, stability of the atoms, formation of the ions, ionic bond, covalent bond, polar and nonpolar covalent bonds	4	1,2,3,5,6,8 11,12
<b>Chemical equations and reactions:</b> balancing of the chemical reactions, types of chemical reaction, factors affecting the chemical reaction	5	1,2,3,5,6,8 11,12
<b>Liquid mixtures:</b> Solutions, factors affecting solubility of solute, osmolality, suspensions, colloidal solution	6	1,2,3,5,6,8 11,12
<b>Midterm exam</b>	7	
<b>Acids,</b> properties, chemical reactions, uses.	8	1,2,3,5,6,8 11,12
<b>Ionization:</b> Conductivity of the solutions, theory of ionization, ionization of water, <b>pH</b> and its important.	9	1,2,3,5,6,8 11,12
<b>Bases, Salts:</b> properties, chemical reactions, uses.	10	1,2,3,5,6,8 11,12
<b>Holiday Christmas</b>	11	
<b>Purification of chemical compounds,</b> methods of purification	12	1,2,3,5,6,8 11,12
<b>Buffer solution:</b> How do Buffers Work, preparation, Mechanism of buffer solution, Applications	13	1,2,3,5,6,8 11,12
<b>Indicators:</b> Characters of the indicator, Phenolphthalein, Methyl Orange, universal indicator	14	1,2,3,5,6,8 11,12
<b>Final examination</b>	15	

<b>Practical Topics:</b>	<b>Week</b>	<b>Learning Outcome</b>
Laboratory Safety, Glassware Safety	<b>1</b>	<b>1,2</b>
cleaning solutions and washing process of glasses	<b>2</b>	<b>1,2</b>
Glasses used in the laboratory, drawing and how are they used	<b>3,4</b>	<b>1,2</b>
Devices used in the laboratory, Centrifuge, Heating devices, balance, types and the process of weighing, precipitation and washing of a precipitate.	<b>5,6</b>	<b>1,2</b>
Solutions, preparation, dilution, methods of expressing concentration, (normality, molarity and formality)	<b>7</b>	<b>3,4,5,6,8,9,11</b>
Solutions, preparation, dilution, methods of expressing concentration, (molality, percentage solution, ppm)	<b>8</b>	<b>3,4,5,6,8,9,11</b>
Titration of Hydrochloric Acid with Sodium Hydroxide	<b>9</b>	<b>3,4,5,6,8,9,11</b>
<b>Midterm examination</b>	<b>10</b>	
Titration of potassium permanganate vs oxalic acid	<b>11</b>	<b>3,4,5,6,8,9,11</b>
Determination of Calcium percentage in the sample by titration method	<b>12</b>	<b>3,4,5,6,8,9,11</b>
Colorimetric analysis, photometer	<b>13</b>	<b>3,4,5,6,8,9,11</b>
<b>Final examination</b>	<b>14+15</b>	

### **Questions Example Design:**

#### **Theoretical part:**

#### **Q1- Fill in blanks with a suitable words:**

**(25 marks)**

- a- In ionic bonding, electrons are ..... from one atom to another.
- b- Analytical chemistry has applications in ..... and .....,
- c- Qualitative analysis is (investigating -----of a given sample) while the quantitative analysis is (investigation ----- are in the sample).

**Q2- Explain why?**

**(20 marks)**

- 1-  $I^{131}$  used for treatment of Goitre disease?
- 2- Formation of nonpolar covalent bond in  $H_2$  molecule?

**Q3- Define the following:**

**(15 marks)**

- a. Colloidal solution
- b. Isotopes

**Q4- a- Explain the classification of the matter as a diagram:**

**(40 marks)**

**b- Explain how the Helium is not regarded as one of the hydrogen isotopes.**

**Practical part:**

**Q1- Fill the following blanks with a suitable words:**

**(15 marks)**

a- Heating apparatus are:

- 1- .....
- 2- .....
- 3- .....
- 4- .....

b- Normality is .....

c- Take care with using concentrated acids like nitric and sulphuric, otherwise it caused.....

**Q2- Enumerate types of balances and the accuracy of each one? (10 marks)**

**Q3- Explain why?**

**(25 marks)**

- 1- Each student must have a laboratory coat?
- 2- Using the centrifuge widely in the laboratory?

**Q4- Find the molarity of NaOH solution in which 10gm dissolved in 0.5L (If you know the atomic weight of Na=23 , O=16 , H=1) ( 30 marks)**

**Extra notes:**

**External Evaluate:**

After checking of analytical chemistry  
course I found that its suitable for  
first class of MLT Dept students

Dr. Barkan Ahmed Sallih

Directorate of Quality Assurance and Accreditation

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Ph.D. Chemistry