

**Benghazi University**  
**Faculty; Pharmacy**  
**Department; Pharmaceutical chemistry**  
**Course title; Analytical Chemistry**

**Course Specifications;**

**Program on which the course is given;**

**Academic year / level;**1<sup>st</sup>.year

**Date of course specification approval;**

**1. Basic Information;**

**Title;** Analytical Chemistry I

**Code;**

**Credit hours;** 4 hours

**Lecture; Theory (2 hrs) and or Tutorial ;( 1hr) Practical ;( 2hrs) Total; (4hrs) hour/week**

**2. Course Objectives;**

**2.1.** To provide a stronger background in chemical principles that is particularly important to analytical chemistry.

**2.2.** To develop an appreciation for the difficult task of judging the accuracy and precision of experimental data and how to sharpened it by the application of statistical methods.

**2.3.** To develop wide range of techniques that is useful in modern analytical chemistry.

**2.4.** To differentiate between quantitative and qualitative methods of analysis "classical and modern".

**3. Intended Learning Outcomes (ILOs);**

**a. Knowledge and understanding;**

**a.1.** Described different scheme for the systematic identification of cations in mixtures.

**a.2.** Describe different qualitative and quantitative techniques of analysis.

**b. Intellectual Skills;**

**b.1.** Differentiate between different methods of analysis.

**b.2.** Select suitable methods for quantitative and qualitative analysis.

**B.3.** Evaluate the data of analysis.

**c. Professional and practical Skills;**

**C.1.** Apply the given schemes for identification of cations in mixtures.

**C.2.** Design schemes for the analysis of cations in mixtures.

**d. General and Transferable Skills;**

**d.1.** Integration of different field of knowledge.

**d.2.** Problem solving

**d.3.** Team work.

**d.4.** independent learning.

#### 4.A. Theory contents;

No.	Topic	No. of hours
1.	<ul style="list-style-type: none"><li>• <b>Introduction</b></li><li>-Definition and role of analytical chemistry</li><li>• - Types and methods of analysis</li></ul>	(3hrs).
2.	<ul style="list-style-type: none"><li>• <b>Solutions</b></li><li>-Expressing solution concentration</li></ul>	(3hrs)
3.	<ul style="list-style-type: none"><li>• <b>Statistical treatment and Evaluation of analytical data.</b></li><li>-Validation steps, mean, median, mode, mean deviation, standard deviation, classification of errors, normal, reliability of result, confidence interval, comparison of results distribution, precision-accuracy and Q-test correlation slope.</li></ul>	(6hrs)
4.	<ul style="list-style-type: none"><li>• <b>Equilibria.</b></li><li>(i) Involving ions; Electrolytes and non-electrolytes, degree of ionization, ionization constant, and common ion effect.</li><li>(ii) Involving water; ionic product for water, PH, buffer solution, ionization constant, hydrolysis of salts, and degree of hydrolysis constant.</li><li>(iii) Chemical equilibrium, factors influencing rates, law of mass action, equilibrium constant, and Le Chatelier principle.</li><li>(iv) solubility equilibria, saturated and supersaturated solution, and solubility product.</li></ul>	(6hrs)
5.	<ul style="list-style-type: none"><li>• <b>Acid and Base.</b></li><li>-General properties—definitions of acids and bases, Arrhenius acids and bases, ionization of weak acid and bases, Bronsted-Lowry acid-base, Lewis acids and bases, strengths of acids and bases, and Levelling effect.</li></ul>	(6hrs)
6.	<ul style="list-style-type: none"><li>• <b>Colloids</b></li><li>electrical properties of colloids</li></ul>	(3hrs)
7.	<ul style="list-style-type: none"><li>• <b>Periodic table.</b></li><li>-main group elements, transition element, bonding type intermolecular forces.</li></ul>	(3hrs)
8.	<ul style="list-style-type: none"><li>• <b>Chemical Reaction.</b></li><li>Chemical equations, ionic reactions, oxidation –reduction reactions, oxidation numbers, balancing equation.</li></ul>	(4hrs)
9.	<ul style="list-style-type: none"><li>• <b>Complex ions and amphotric substances.</b></li><li>- Definition and terminology, coordination complexes and complexes ion, central ion and ligand, coordination number, types of ligands, formation constant, instability constant, ionization of complex, complex formation in qualitative analysis, and type of complexes.</li></ul>	(6hrs)

#### 4.B. Practical Contents;

<b>Topic No. of hour (3hrs) for each Experiment.</b>								
<b>1.Introduction</b> ( first aid, cuts, chemicals in eyes, burns(from fire or chemicals),Bench fire, person in fire, explosion, personal protection, conduct in the laboratory, tidiness and cleanliness, accident procedure,								
<b>2. Notes on the study of the reactions of cations.</b>								
<b>3. Detection of basic radicals in simple salts.</b>								
<b>4. Detection of basic radicals in mixtures.</b> (Preparation of salt solution)								
<b>5.Seperation of cations group I cations.</b>								
<b>6. Seperation of cations group II A cations.</b>								
<b>7. Seperation of cations group IIB cations.</b>								
<b>8. Seperation of cations group III cations.</b>								
<b>9. Seperation of cations group IV cations</b>								
<b>10. Seperation of cations group V cations</b>								
<b>11.Seperation of cations groupVI cations</b>								
<b>12.Design general schemes for the analysis.</b>								
<b>13. Apply the given schemes for identification of cations in mixtures.</b>								
<b>14. Separation and detection of Anions</b>								
<ul style="list-style-type: none"> <li>• <b>Teaching and learning methods.</b> ( demonstration and practical applications)</li> <li>• <b>Student Assessment Methods;</b> -detection for unknowns.</li> <li>• <b>Assessment Schedule.</b> Every week</li> <li>• <b>Weighing of assessments</b> <table style="width: 100%; border: none;"> <tr> <td style="padding-left: 20px;">-Practical of examinations</td> <td style="text-align: right;">30 marks</td> </tr> <tr> <td style="padding-left: 20px;">Attendance, Tidiness, discipline,</td> <td style="text-align: right;">10 marks</td> </tr> <tr> <td colspan="2" style="text-align: center;">-----</td> </tr> <tr> <td colspan="2" style="text-align: right;"><b>Total 40marks    100%</b></td> </tr> </table> </li> </ul>	-Practical of examinations	30 marks	Attendance, Tidiness, discipline,	10 marks	-----		<b>Total 40marks    100%</b>	
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<ul style="list-style-type: none"> <li>• <b>List of references</b> <ul style="list-style-type: none"> <li>--Vogel's qualitative inorganic analysis 6<sup>th</sup>. Edition.</li> <li>--Lengman Scientific &amp; Technical 1991.</li> </ul> </li> </ul>								

## 5. Teaching and Learning Methods;

(All methods below can be used)

5.1. Tutorial.

5.2. Presentation.

5.3 Data show.

## 6. Student Assessment methods;

### a. Assessment methods;

1. MSQ Assessment 1 to assess information of 10 weeks study.

2. MSQ Assessment 2 to assess information of 20 weeks study.

### b. Assessment schedule;

Assessment 1 10 weeks

Assessment 2 20 weeks

### c. Weighing of Assessments;

Assessment Examination: 40 marks/200

Final Examination; 120marks/200

Oral Examination None

Practical Examination 40marks/200

Other types of examination -----

200 marks Total 100%

## 7. List of References;

No.	Reference	Type
1.	Fundamentals of analytical chemistry, D.A. Skoog, 2004, 8 <sup>th</sup> .ed. Brookkole pub.	textbook
2.	Quantitative analysis, V. Alexyeyev, 2004, CBS pub.	periodical
3.	Undergraduate instrumental analysis, J.W. Robinson, 2005 6 <sup>th</sup> .ed, marcel dekker.	website

**Course co-ordinator: Dr. Naema Alremali**

**Head of Department; Dr. Ruwida snini**

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