

## Pharmaceutical analytical chemistry-1

### 1- Basic Information:

<b>Code</b>	: PA-211
<b>Level</b>	: First level (second year pharmacy)
<b>Department</b>	: Pharmaceutical Analytical Chemistry
<b>Unit</b>	: 2 + 1=3 (hrs)
<b>Lecture</b>	: two (hrs) /week
<b>Tutorial</b>	: (within practical classes)
<b>Practical</b>	: one (hr) /week
<b>Total</b>	: 3 units (hrs) / week

### 2- Aims of Course

-Explanation of the principles of basic and pharmaceutical analytical chemistry such as fundamentals of acid-base and precipitometric **titrations** as well as the gravimetric analysis, and explaining the application of these principles in the pharmaceutical analysis of drug substances.

-Teaching students how to select the suitable method for analysis of drug substances.

### 3- Intended Learning Outcomes of the Course (ILOs)

After successful finishing the course, students should be able to

#### a- Knowledge and Understanding:

a1- mention the principles of basic and pharmaceutical analytical chemistry such as fundamentals of acid-base and precipitometric **titrations** as well as the gravimetric analysis and calculation of the basic **statistical** parameters, and explain the application of these principles in the pharmaceutical analysis of drug substances.

a2- mention the suitable method for analysis of drug substances depending on basic understanding of physic-chemical properties of the chemical compounds.

#### b- Intellectual Skills:

b14-assess and interpret the possible interactions or interferences of some chemical compounds with the selected method of analysis of certain compounds depending on the studied principles.

#### c- Professional and practical Skills:

c7- handle properly the chemical compounds in the laboratory and be aware of the rules of good laboratory and storage practice to detect easily and minimize the errors of an applied analytical method.

**d- General and Transferable Skills:**

- d1- Apply the information technology skills, such as word processing and internet communication and online searches.
- d9- work effectively with the others as a team work in performing the report on the results of an analytical method.
- d12- manage the time in an analytical work effectively.

**4- Course Contents**

Topic	No. of hours	Lecture	Tutorial / Practical
1. Fundamentals of acid-base titrations.	11	7	4
2. Application of acid-base titrations in the pharmaceutical analysis of drug substances.	10	6	4
3. Fundamentals of precipitometric titrations	3	2	1
4. Application of the bases of precipitometric titrations in the pharmaceutical analysis of drug substances.	6	4	2
5. Fundamentals of gravimetric analysis	6	5	1
6. Application of gravimetric analysis in the pharmaceutical analysis of drug substances	4	3	1

**5- Teaching and Learning Methods**

- 5.1- Data show
- 5.2- Blackboard
- 5.3- Laboratory experiments
- 5.4- Group discussion problems
- 5.5- Tutorial discussions

**6- Teaching and learning methods for disables**

Office hours and specialist workers help them in the laboratory

**7- student Assessment**

**a- Student Assessment methods**

- 7.1-Written mid-term exam to assess a1-a2 and b14
- 7.2- Practical exam to assess c7, d9, d12
- 7.3- Final exam to assess a1-a2, b14, c7
- 7.4- Oral exam to assess a1-a2, b14 and c7
- 7.5- E-learning to assess d1

### **b- Student Assessment Schedule**

No.	Assessment	week
1.	Mid-term exam	9
2.	Practical exam	14
3.	Final exam	15
4.	Oral exam	15

### **c- Weighting of Assessments**

No.	Exam.	Mark	%
1.	Mid-Term Exam	15	10
2.	Final-Term Exam	70	46.7
3.	Final Oral Exam	20	13.3
4.	Final Practical Exam	30	20
5.	Gravimetric Sheet	5	3.33
6.	Semester Work (E-learning)	4	2.67
7.	Other types of assessment	6	4
	Total	150	100%

## **8- List of References**

### **a- Course notes ;**

Lecture notes and practical notes prepared by staff members of Pharm. Anal. Chem. Dept.

### **b- Essential Books (Text Books)**

- 1- Vogels Textbook of Quantitative Inorganic Analysis, 6<sup>th</sup> Edition Longman Scientific and Technical, USA (1998).
- 2- Christian G. D., "Analytical Chemistry ", John-Wiley and Sons, Inc New York (1994).
- 3- D. A. Skoog and d. M. west, "Fundamentals of Analytical Chemistry", 7<sup>th</sup> ed CBS Publishing Asia Ltd (2000).

### **c-Recommended Books**

- 1- Amer M. M., Pharmaceutical Analytical Chemistry Quantitative Analysis, Cairo.
- 2- Fifield & Keal D., Principles & Practice of Analytical Chemistry.

### **d- Periodicals, Web Sites, etc**

- 1- The Analyst
- 2- J. Pharm. & Biomed. Anal.
- 3- J. Assoc. off Anal. Chem.

Matrix of the Intended Learning Outcomes (ILOs) of the Course

Week	Topic		K&U	IS	PPS	GTS
	Theoretical	Practical				
1	Fundamentals of acid-base titration Theory	Introduction to how to use the tools of analytical work	a1	b14	C7	d1, d9, d12
2	Factors affecting ionization of acid and base and buffer solutions	Preparation and standardization of HCl	a1-a2	b14	C7	d1, d9, d12
3	Acid-base titration curves	Buffer solutions	a1-a2	b14	C7	d1, d9, d12
4	Detection of the end point in acid-base Titrations	Titration curves: 1-Strong acid & Strong base 2-Weak acid & Strong base 3-Strong acid & Weak base	a1-a2	b14	C7	d1, d9, d12
5	Application of acid-base titrations	Carbonate&bicarbonate mixture Ammonium chloride ( Formol titration )	a1-a2	b14	C7	d1, d9, d12
6	Application of acid-base titrations	Biphasic titration ( demonstration ) Determination of BaCl <sub>2</sub> Boric acid & borax mixtur	a1-a2	b14	C7	d1, d9, d12
7	Application of acid-base titrationsn;;	Potassium perulphate Mixture of CaO & CaCo <sub>3</sub>	a1-a2	b14	C7	d1, d9, d12
8	Non aqueous titrations	Determination of Anitine & aniline salts ( demonstr)	a1-a2	b14	C7	d1, d9, d12
9	Solubility product and factors affecting the solubility of the ppt	Determination of solubility product of Pbl <sub>2</sub> .	a1-a2	b14	C7	d1, d9, d12

Week	Topic		K&U	IS	PPS	GTS
	Theoretical	Practical				
10	Applications of precipitometric titrations	Mixture of chloride and iodide by Faj's method	a1-a2			
11	Applications of precipitometric Titrations	Mixture of Chloride and iodide dy Fajan s method ZnSO <sub>4</sub> by ferrocyanide	a1-a2	b14	C7	d1, d9, d12
12	Gravimetric analysis, requiremets & metho of separations & their applications	Gravimetricdetermination of Ni <sup>+2</sup>	a1-a2	b14	C7	d1, d9, d12
13		Practical Examination	a1		C7	d1, d9, d12

## Pharmaceutical analytical chemistry-2

### 1-Basic Information

<b>Code</b>	: PA-222
<b>Level</b>	: First level (second year pharmacy)
<b>Department</b>	: Pharmaceutical Analytical Chemistry
<b>Unit</b>	: 2 + 1=3 (hrs)
<b>Lecture</b>	: two (hrs) /week
<b>Tutorial</b>	: (within practical classes)
<b>Practical</b>	: one (hr) /week
<b>Total</b>	: 3 units (hrs) / week

### 2- Aims of Course

1. Explanation of the principles of basic and pharmaceutical analytical chemistry such as fundamentals of oxidation-reduction and complexometric **titrations**, and explaining the application of these principles in the pharmaceutical analysis of drug substances.
2. Teaching students how to select the suitable method for analysis of drug substances.
3. Explanation of the fundamentals of **statistical** evaluation of the results and teaching students how to interpret the results.

### 3- Intended Learning Outcomes of the Course (ILOs)

After successful finishing the course, students should be able to

#### a- Knowledge and Understanding:

- a1- mention the principles of basic and pharmaceutical analytical chemistry such as fundamentals of oxidation-reduction and complexometric **titrations**, as well as calculation of the basic **statistical** parameters and explain the application of these principles in the pharmaceutical analysis of drug substances.
- a2- mention the suitable method for analysis of drug substances depending on basic understanding of physic-chemical properties of the chemical compounds.

#### b- Intellectual Skills:

- bl4-Assess and interpret the possible interactions or interferences of some compounds with the selected method of analysis of certain compounds depending on the studied principles.

### c- Professional and practical Skills:

c7- handle properly the chemical compounds in the laboratory and be aware of the rules of good laboratory and storage practice to minimize the errors of an applied analytical method.

### d- General and Transferable Skills:

d1- Apply the information technology skills, such as word processing and internet communication and online searches.

d9- work effectively with the others as a team work in performing the report on the results of an analytical method.

d12- manage the time in an analytical work effectively.

## 4- Course Contents

Topic	No. of hours	Lecture	Tutorial / Practical
Fundamentals of oxidation-reduction titrations.	11	8	3
Application of oxidation-reduction titrations in the pharmaceutical analysis of drug substances.	10	6	4
Fundamentals of complexometric titrations	5	4	1
Application of the bases of complexometric titrations in the pharmaceutical analysis of drug substances.	6	4	2
Statistical validation of an analytical method	6	4	2

## 5- Teaching and Learning Methods

5.1- Data show

5.2- Blackboard

5.3- Laboratory experiments

5.4- Group discussion problems

5.5- Tutorial discussions

## 6- Teaching and learning methods for disables

Office hours and specialist workers help them in the laboratory

## 7- student Assessment

### a- Student Assessment methods

7.1-Written mid-term exam to assess a1-a2 and b14

7.2- Practical exam to assess c7, d9, d12

- 7.3- Final exam to assess a1-a2, b14, c7  
7.4- Oral exam to assess a1-a2, b14 and c7  
7.5- Review article to assess d1

### **b- Student Assessment Schedule**

No.	Assessment	week
1.	Mid-term exam	10
2.	Practical exam	11
3.	Final exam	15
4.	Oral exam	15

### **c- Weighting of Assessments**

No.	Exam.	Mark	%
1.	Mid-Term Exam	15	10
2.	Final-Term Exam	70	46.7
3.	Final Oral Exam	20	13.3
4.	Final Practical Exam	30	20
5.	Statistical Sheet	5	3.33
6.	Semester Work (Review article)	4	2.67
6-	Other types of assessment	6	4
	Total	150	100%

## **8- List of References**

### **a- Course notes ;**

Lecture notes and practical notes prepared by **staff** members of the department

### **b- Essential Books (Text Books)**

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Christian G. D., "Analytical Chemistry ", John-Wiley & Sons, Inc New York (1994).

D. A. Skoog and d. M. west, "Fundamentals of Analytical Chemistry", 7<sup>th</sup> ed CBS Publishing Asia Ltd (2000).

### **c-Recommended Books**

Amer M. M., Pharmaceutical Analytical Chemistry Quantitative Analysis, Cairo.

Fifield & Keal D., Principles & Practice of Analytical Chemistry.

### **d- Periodicals, Web Sites, etc**

- 1- The Analyst                      2-. Pharm. & Biomed. Anal.      3- J. Assoc. **off** Anal. Chem.



**Matrix of the Intended Learning Outcomes (ILOs) of the Course**

Week	Topic		K&U	IS	PPS	GTS
	Theoretical	Practical				
1	Fundamentals of oxidation-reduction theory	Introduction to how to use the tools of analytical work	a1	b14	C7	d1, d9, d12
2	Factors affecting oxidation potential	Preparation & Standardization of KMnO <sub>4</sub> -Determination of hydrogen peroxide -Determination of pot. persulphate	a1-a2	b14	C7	d1, d9, d12
3	Redox titration curve	Determination of Fe <sup>2+</sup> salts using: KMnO <sub>4</sub> - K <sub>2</sub> Cr <sub>2</sub> O <sub>7</sub> (external & internal indicator) -Ceric sulphate (demonstration)	a1-a2	b14	C7	d1, d9, d12
4	Detection of the end point in redox titrations	- Determination of ferrocyanide - Determination of Fe <sup>2+</sup> & Fe <sup>3+</sup> in mixture	a1-a2	b14	C7	d1, d9, d12
5	Properties of some oxidizing agents	- Determination of Copper sulphate - Determination of Phenol	a2	b14	C7	d1, d9, d12
6	Oxidation reduction in pharmaceutical analysis	Determination of glucose & sucrose mixture , Determination of ascorbic acid (Vit .C),	a2	b14	C7	d1, d9, d12
7	Applications of redox titrations	- Andrew, s method -Determination of glycerol	a2	b14	C7	d1, d9, d12
8	Co-ordination complexes Analytical importance of complexes	Determination of Ca & Mg mixture Determination of Zinc (xylenol orange & ErioT)	a1-a2	b14	C7	d1, d9, d12

Week	Topic		K&U	IS	PPS	GTS
	Theoretical	Practical				
9	Stability of metal-EDTA complexes EDTA titration curves	Determination of Aluminum (back titration)	a1-a2	b14	C7	d1, d9, d12
10	Metal ion indicators (metallochromic indicators) Types of EDTA titrations	Non-EDTA titrations Determination of bismuth Determination of mercuric nitrate Determination of mercuric chloride	a1-a2	b14	C7	d1, d9, d12
11	EDTA selectivity Chelation and biological action Titrations involving unidentate ligands	Practical Exam	a1-a2	b14	C7	d1, d9, d12
12	Accuracy, Precision and Q-test Linear regression and correlation	Errors, accuracy and precision Correlation and regression analysis	a1		C7	d1, d9, d12
13	Sampling Validation of analytical procedure Types of analytical procedure	(Statistical treatment)	a1		C7	d1, d9, d12