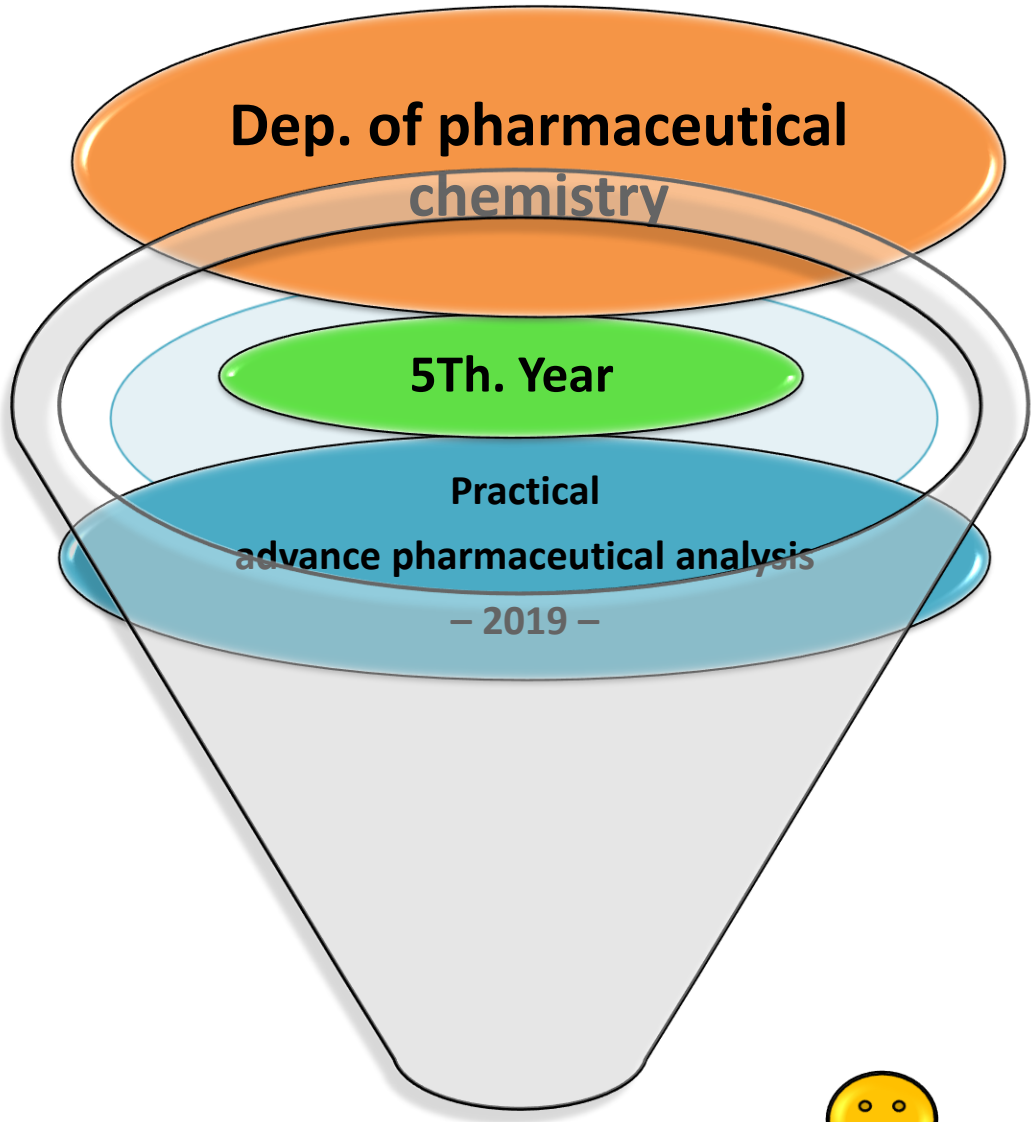
# University of Mustansiriyah
# College of Pharmacy




Ali Rasool Albakaa

# Laboratory Data Sheet of Experiment-1

## Fundamentals of Spectrophotometer

## Assay of tetracycline

Name: _____Section: ____

**1. Stock solution**

(1) Mass of TC =_____ mg

(2) Molecular weight of TC =_____ g/mol

(3) Moles TC = mass/molar mass =_____mol TC

(4) Molarity of stock solution (TC) = mol/L =_____ mol/L

(5) ppm of stock solution =_____ mg/L

**2. Preparation of standard solutions**

Standard solution (dilute 1.0 mL stock to 25mL):-

ppm = (1.0/25) x (stock solution concentration) = _____ mg/L

Same for concentration of solutions No.2, No.3 and No.4 with 2, 3 &4mL of stock solution

ppm for standard solution No.2 = _____ mg/L

ppm for standard solution No.3 = _____ mg/L

ppm for standard solution No.4 = _____ mg/L

**3. The absorption spectrum of TC:-**

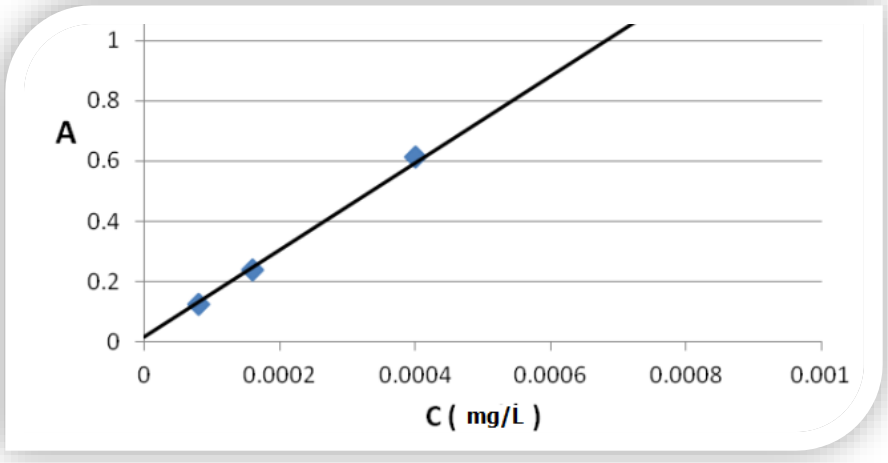
| No. of record | Wavelength | Absorbance |
|---|---|---|
| 1 | 400 | |
| 2 | 420 | |
| 3 | 440 | |
| 4 | | |
| 5 | | |
| 6 | | |
| 7 | | |
| 8 | | |
| 9 | | |
| 10 | | |
| 11 | | |
| 12 | | |
| 13 | | |
| 14 | | |
| Last | 600 | |

**Table2.for absorption spectrum of TC**

Make a graph of **A** vs **λ** at 20 nm wavelength intervals from 400 nm to 600 nm (as measured by the whole laboratory group), at absorbance begin larger reduce wavelength intervals to 5nm, Attach the graph with this lab report, and find $\lambda_{max}$ from graph?

1. **The calibration curve at $\lambda_{max}$ = nm**

| Standard | Concentration | Absorbance |
|---|---|---|
| 1 | | |
| 2 | | |
| 3 | | |
| 4 | | |
| unknown | | |




On the graph you can see that the trend line does not pass exactly through zero, this is as expected: it may be due to the statistics of the data point, which are not exactly on the straight line due to random errors in the concentration and/or the absorbance reading, or to the fact that there is a remaining solution absorbance (relative to the blank) for the standards, for these reasons, you should not choose the "set intercept" box when formatting the trend line.

Finally, note that the trend line slope is the Molar Extinction Coefficient (Molar Absorptivity)! The equation for this application should be read as **A = ε l C + constant**, with the constant = intercept.

**2.** Calculate concentration of the unknown solution from graph of calibration curve & from the equation **A = ε l C + constant?**

$$C_{unknown} = C_{graph} \times 5 \quad \textbf{(How?)}$$

3. Calculate the weight of TC in capsule?
4. Write an equation reaction (TC + $Fe^{+3}$)?

# Laboratory Data Sheet of Experiment-2
# Spectrophotometric determination of Aspirin in tablets
# By standard addition method

Name: _____ Section: ___

**1. Stock solution**

(1) Mass of Aspirin =_____ mg
(2) Molecular weight of Aspirin =_____ g/mol
(3) Moles Aspirin = mass/molar mass =_____mol
(4) Molarity of stock solution (Aspirin) = mol/L =_____ mol/L
(5) ppm of stock solution =_____ mg/L

**2. Preparation of standard solutions**

Standard solution (dilute 5.0 mL stock to 100mL):-
ppm = (5.0/100) x (stock solution concentration) = _____ mg/L
same for concentration of solutions #1, #2, #3, #4, #5, #6
ppm for #1 solution = _____ mg/L
ppm for #2 solution = _____ mg/L
ppm for #3solution = _____ mg/L
ppm for #4 solution = _____ mg/L
ppm for #5 solution = _____ mg/L
ppm for #6solution = _____ mg/L

**3. The absorption spectrum of Aspirin:-**

| No. of record | Wavelength | Absorbance |
|---|---|---|
| 1 | 400 | |
| 2 | 420 | |
| | | |
| | | |
| | | |
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| | | |
| | | |
| | | |
| | | |
| | | |
| | | |
| Last | 600 | |

**Table2.for absorption spectrum of Aspirin**

Make a graph of **A** vs **λ** at 20 nm wavelength intervals from 400 nm to 600 nm (as measured by the whole laboratory group), at absorbance begin larger reduce wavelength intervals to 5nm, Attach the graph with this lab report, and find $\lambda_{max}$ from graph?

1. **The standard addition curve at $\lambda_{max}$ = nm:-**

| Solution | Concentration | Absorbance |
|---|---|---|
| #1 | | |
| #2 | | |
| #3 | | |
| #4 | | |
| #5 | | |
| #6 | | |

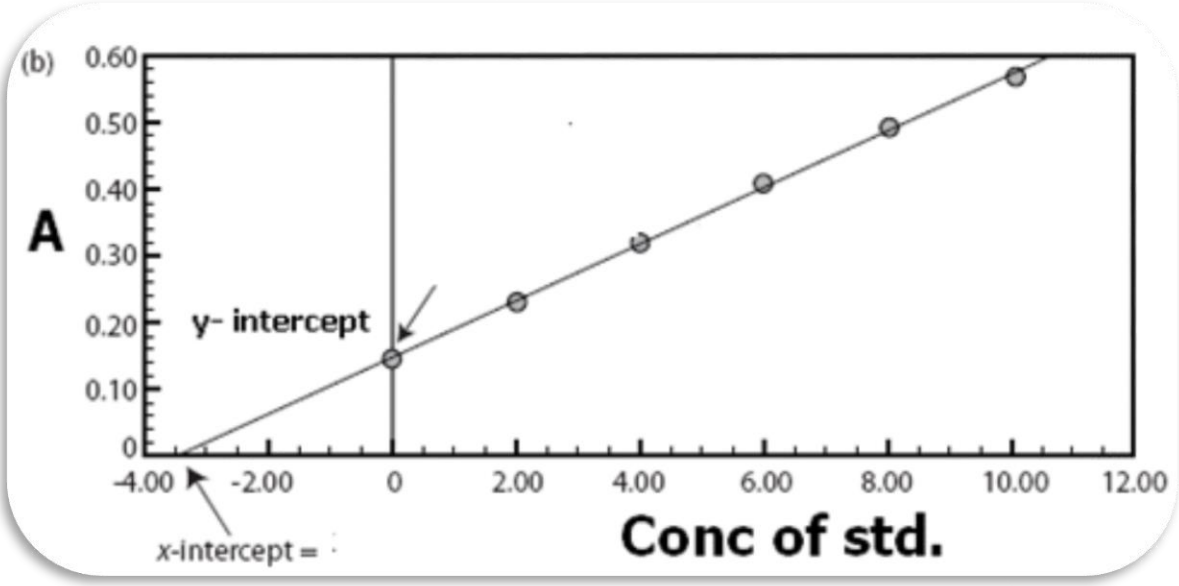


**Figure 2: The standard addition curve**

On the graph you can see that the trend line does not pass through zero, this is as expected: it may be due to the unknown addition.

**2.** Calculate concentration of the unknown solution from graph of a standard addition curve**?**

$$\mathbf{C_{unknown} = C_{graph} \times 10}$$ **(How?)**

3. Calculate the weight of Aspirin in tablet?
4. Write an equation reaction (sodium salicylate + $Fe^{+3}$)?

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# Laboratory Data Sheet of Experiment-3

## Titration of the ascorbic acid (vitamin C) in tablets

### By pH meter used first and 2nd derivatives

Name: _____ Section: ___

1. Ascorbic acid solution
(1) Mass of Ascorbic acid tablet =_____ mg
(2) Molecular weight of Ascorbic acid =_____ g/mol
(3) Normality of stock solution (Ascorbic acid) = Eq./L =_____ Eq./L
(4) ppm of Ascorbic acid solution =_____ mg/L
(5) Moles Ascorbic acid = mass/M.Wt. =_____mol
(6) Calculate the Ka of Ascorbic acid
(7) Calculate Wt.% of Ascorbic acid
(8) 1mL of (0.1N) NaOH = -------- mg of Ascorbic acid.

| No | V. of NaOH | pH | DV= **V2-V1** | DpH=pH2-pH1 | DpH/DV | V.A .=**V1+V2 / 2** |
|---|---|---|---|---|---|---|
| 1. | 0.0mL | | ----- | ---- | --- | --- |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |
| 5. | | | | | | |
| 6. | | | | | | |
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Using a computer data-sheet, **plot** the titration curve obtained and determine as exactly as possible the volume of titrant corresponding to the inflection point.

**For more aspiring students**:- The preciseness of determination of the inflection point can be very improved if calculating the second derivative of the titration curve.

Record all the numbers obtained, as well as the calculations made.

Note your observation concerning the comparison of your result with the factory value.

| No | V. A. | DpH/DV | DVA= **VA2-VA1** | $D^2pH$= (DpH/DV)2-(DpH/DV)1 | $D^2pH/DV^2$ | V.A**.A= (VA1+VA2 / 2)** |
|---|---|---|---|---|---|---|
| 1. | | | **------** | **------** | **-----** | **-----** |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |
| 5. | | | | | | |
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# Laboratory Data Sheet of Experiment-5

## Titration of the Sodium Citrate in tablets

### By pH meter used first and 2nd derivatives

Name: _____ Section: ___

1.Sodium Citrate solution
(1) Mass of Sodium Citrate tablet =_____ mg
(2) Molecular weight of Sodium Citrate =_____ g/mol
(3) Normality of Sodium Citrate solution = Eq./L =_____ Eq./L
(4) ppm of Sodium Citrate solution =_____ mg/L
(5) Moles Sodium Citrate = mass/M.Wt. =_____mol
(6) Calculate the Ka of Sodium Citrate.
(7) Calculate Wt.% of Sodium Citrate.
(8) 1mL of (0.1N) HCl = -------- mg of Sodium Citrae.

| No | V. of NaOH | pH | DV= **V2-V1** | DpH=pH2-pH1 | DpH/DV | V.A .=**V1+V2 / 2** |
|---|---|---|---|---|---|---|
| 1. | 0.0mL | | --- | ---- | ----- | ------- |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |
| 5. | | | | | | |
| 6. | | | | | | |
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Using a computer data-sheet, **plot** the titration curve obtained and determine as exactly as possible the volume of titrant corresponding to the inflection point.

**For more aspiring students**:- The preciseness of determination of the inflection point can be very improved if calculating the second derivative of the titration curve.

Record all the numbers obtained, as well as the calculations made.

Note your observation concerning the comparison of your result with the factory value.

| No | V. A. | DpH/DV | DVA= **VA2-VA1** | $D^2pH$=(DpH/DV)2-(DpH/DV)1 | $D^2pH/DV^2$ | V.A**.A= (VA1+VA2 / 2)** |
|---|---|---|---|---|---|---|
| 1. | | | **-----** | **------** | **----** | **------** |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |
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# Laboratory Data Sheet of Experiment-8

## Titration of the Sodium Salicylate in tablets

## By pH meter used first and 2nd derivatives

Name: _____ Section: ___

1. Sodium Salicylate solution
(1) Mass of Sodium Salicylate tablet =_____ mg
(2) Molecular weight of Sodium Salicylate =_____ g/mol
(3) Normality of Sodium Salicylate solution = Eq./L =_____ Eq./L
(4) ppm of Sodium Salicylate solution =_____ mg/L
(5) Moles Sodium Salicylate = mass/M.Wt. =_____mol
(6) Calculate the Ka of Sodium Salicylate.
(7) Calculate Wt.% of Sodium Salicylate.
(8) 1mL of (0.1N) HCl = -------- mg of Sodium Salicylate.

| No | V. of NaOH | pH | DV= **V2-V1** | DpH=pH2-pH1 | DpH/DV | V.A .=**V1+V2 / 2** |
|---|---|---|---|---|---|---|
| 1. | 0.0mL | | --- | ---- | ----- | ------- |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |
| 5. | | | | | | |
| 6. | | | | | | |
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Using a computer data-sheet, **plot** the titration curve obtained and determine as exactly as possible the volume of titrant corresponding to the inflection point.

**For more aspiring students**:- The preciseness of determination of the inflection point can be very improved if calculating the second derivative of the titration curve.

Record all the numbers obtained, as well as the calculations made.

Note your observation concerning the comparison of your result with the factory value.

| No | V. A. | DpH/DV | DVA= **VA2-VA1** | $D^2pH$=(DpH/DV)2-(DpH/DV)1 | $D^2pH/DV^2$ | V.A**.A= (VA1+VA2 / 2)** |
|---|---|---|---|---|---|---|
| 1. | | | **-----** | **------** | **----** | **------** |
| 2. | | | | | | |
| 3. | | | | | | |
| 4. | | | | | | |
| 5. | | | | | | |
| 6. | | | | | | |
| 7. | | | | | | |
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# Experiment- 6

## Infrared Spectroscopy Experiment

Name: _____ Section: ___

There are two general regions in the infrared spectrum, namely:-

*(a)* **Group frequency region:-**

Having a wavenumber from ----------

Here, the stretching and bending vibration bonds associated with ---------- or ---------- are observed frequently.

*(b)* **Fingerprint region:-**

Having a wavenumber from----------

Here, the vibration modes depend solely and strongly on ----------.

**Hooke's Law:** The vibration frequency of a bond is expected to increase when the when the reduced----------decreases and also ---------- increases.

**Hooke's Law** is expressed as: $\upsilon = \frac{1}{2\pi}\sqrt{\frac{K}{\mu}}$ **&** $\mu = \frac{m_1 m_2}{m_1 + m_2}$

**υ** ----------, ***K*** ---------- of the bond, $m_1$ and $m_2$ = ----------, μ ----------.

**Calculate $m_C$** = mass of the carbon atom= ----------

**Calculate $m_H$** = mass of the hydrogen atom= ----------

**Calculate $m_O$** = mass of the oxygen atom= ----------

**Calculate $m_N$** = mass of the nitrogen atom= ----------

Infrared spectroscopy measures----------of IR light absorbed by a sample and----------of the absorptions.

The vibration **frequencies** depend on

**I.** The **nature of the vibration** ---------- & ----------).
**II.** **Bond strengths.**
**III.** The **masses of the atoms involved in the vibration.**

**T**he **intensities** depend on

**I.** The **change in dipole moment** that accompanies the vibration.
**II.** The **number of bonds involved.**

The heavier atoms involved the lower energy.

What is the relating between **υ, ύ and λ with mass of atom?**