



Intensity of light emitted by a sample as a function of wavelength		
Emission spectra	(c) Electromagnetic spectrum	(d) Electromagnetic radiation
Device that allows ions to flow without extensive mixing of solution in electrochemical cell is		
Conductivity bridge	(c) insoluble-salt electrodes	(d) ammeter
Number of millimoles contained in 58.5 gm NaCl equal..... (Na=23, Cl=35.5)		
10	(c) 10	(d) 1
Determination of the sum of all organically bound carbons		
DOC	(c) TOC	(d) DOC
Analysis which helps in finding the spatial arrangement of atoms in a molecule.		
Volumetric	(c) Instrumental	(d) Structural
Reaction: $Cu(s) + 2Ag^+(aq) \rightarrow Cu^{2+}(aq) + 2Ag(s)$ is		
$Ag^+(aq)$	(c) $Ag^+(aq)$	(d) $Cu(s)$

3is a plot of the amount of light emitted by a sample as a function of wavelength	
	(a) Emission	(b) Emission spectrum
4	Device that allows ions to flow without extensive mixing of solution in electrochemical cell is	
	(a) conductivity bridge	(b) salt bridge
5	The number of millimoles contained in 58.5 gm NaCl equal..... (Na=23, Cl=35.5)	
	(a) 1000	(b) 10
6enables the determination of the sum of all organically bound carbons	
	(a) COD	(b) BOD
7analysis is the chemical analysis which helps in finding the spatial arrangement of atoms in a molecule.	
	(a) Surface	(b) Gravimetric
8	The reducing agent in the reaction: $Cu(s) + 2Ag^+(aq) \rightarrow Cu^{2+}(aq) + 2Ag(s)$ is	
	(a) $Ag(s)$	(b) $Cu(s)$

14	In electrolytic cell, the reaction isand.....current			
	(a) spontaneous-required	(b) nonspontaneous-required	(c) spontaneous-produce	(d) nonspontaneous-produce
15	0.8 moles in 25ml equal mole/L			
(a)	32	(b) 3.2	(c) 0.32	(d) 0.032
16	Electrochemistry deals with the interconversion between.....			
(a)	electrical and chemical energy	(b) kinetic and chemical energy	(c) thermal and chemical energy	(d) kinetic and electrical energy
17 is used during the titration between strong acid & weak base			
(a)	Any indicator	(b) Methyl orange	(c) Phenolphthalein	(d) Mixed indicator
18	Re-dissolution of coagulated colloids by washing and removing inert electrolyte is.....			
(a)	peptization	(b) coagulation	(c) agglomeration	(d) nucleation
19	Metal electrode is consideredelectrode			
(a)	first kind	(b) second kind	(c) third kind	(d) fourth kind
20	Determination of COD in wastewater samples is an example for titration			
(a)	neutralization	(b) precipitation	(c) complexometric	(d) (redox)
21	Determination of dissolved oxygen is an application of			
(a)	potentiometry	(b) conductometry	(c) voltammetry	(d) polarography
22 caused by unknown and unpredictable changes in the experiment			
(a)	Random Errors	(b) Systematic Errors	(c) Gross errors	(d) determinate errors
23 the point at which the reaction is just complete.			
(a)	Start point	(b) End point	(c) Equivalent point	(d) Intermediate point
24	Precipitate heated for hour(s) in contact with solution from which it was formed is called.....			
(a)	digestion	(b) co-precipitation	(c) coagulation	(d) agglomeration
25	Suspended colloidal particles coalesce to form larger filterable particles is called.....			
(a)	co-precipitation	(b) post-precipitation	(c) agglomeration	(d) Nucleation

Question 2 [22.5 marks]

- (a) Give one difference between each two pair of the following: [6 marks]
- Flame emission and atomic absorption spectrophotometer.
 - Atomic and molecular spectra
 - Nephelometer and turbidimeter
- (b) Mention with drawing the key parts of a pH meter [5 marks]
- (c) Deduce the equation: $A = \epsilon CL$ [5 marks]
- (d) Illustrate the main component of TOC Analyzer and how can you determine the TOC in water sample? [6½ marks]

Best wishes

Prof. Dr. Mervat M. El-Sonbati



Faculty of Science
Environmental Sciences Department



Semester: Jan. 2025
Date: Monday 13/1/2025

Final Exam in “Environmental Chemistry 308 ENV” (*Part II*)
for 3rd. year Environmental Sciences Students
Allowed Time 1½ hours

Answer All the Following Questions:

Total Mark: 52.5 Marks

Question [1]: (19 Marks)

- a) Compare between the *FID* and the *Ultra-violet* detectors in chromatographic techniques. [5 Marks]
- b) Draw a detailed schematic diagram of a Gas Chromatograph. [3 Marks]
- c) Choose the correct answer for each of the following: - [4 Marks]
- i) What makes the liquid pass through the column in HPLC?
- 1- Electricity.
 - 2- Gravity.
 - 3- A pump.
 - 4- The capillary forces.
- ii) What are the solid particles used in chromatography called?
- 1- The solid phase.
 - 2- The particular phase.
 - 3- The column phase.
 - 4- The stationary phase.
- iii) What is the liquid used in chromatography called?
- 1- The pumped phase.
 - 2- The transparent phase.
 - 3- The mobile phase.
 - 4- The solution phase.
- iv) Chromatographic retention is due to:
- 1- Adsorption of the analyte to the stationary phase.
 - 2- Different injection times by the auto-sampler.
 - 3- Differences in absorbance in the UV detector.
 - 4- Deviations in the flow from the pump.

d) Discuss the injections techniques commonly used in capillary GC, and use drawing when applicable, then address the advantages and drawbacks for each technique. [5 Marks]

e) Comment on the properties of the eluent in column chromatographic separation techniques. [2 Marks]

Question [2]: (19 Marks)

a) Conditioning of the column in the gas chromatographic separation is a very important process: -

i. Why is this process needed? [1 Mark]

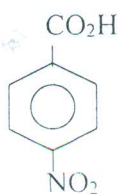
ii. How it is carried out? [3 Marks]

b) **Deduce** the order of separation of the organic compounds in the following samples by applying of HPLC technique, and using of silica gel as a stationary phase.

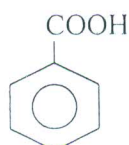
* **Suggest** a suitable eluent or mixture of eluents for the separation of these compounds and **give reasons** for your deduction, **then draw** a simple chromatogram for the separated compounds: -

- Sample (I):

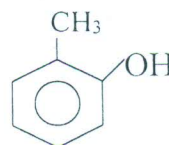
[7.5 Marks]



(i)



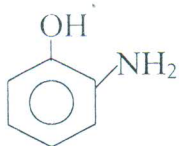
(ii)



(iii)

- Sample (II):

[7.5 Marks]



(i)



(ii)



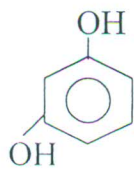
(iii)

Question [3]: (14.5 Marks)

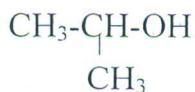
a) Write a short informative note on the capillary column in Gas Chromatograph. [3 Marks]

b) **Deduce** the order of separation of the organic compounds in the following mixture by applying of HPLC technique, and using of a polar stationary phase.

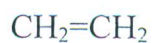
* **Suggest** a suitable eluent or mixture of eluents for the separation of these compounds and **give reasons** for your deduction: [11.5 Marks]



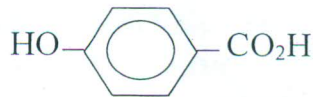
(i)



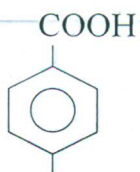
(ii)



(iii)



(iv)



NO₂

(v)



(vi)

-----Best Wishes-----

Assoc. Prof. Dr. Khaled H. El-Ezaby