

المعتمد

 <p>جامعة دمياط Damietta University</p>	<p>Damietta University Faculty of Science Environmental Sciences Department</p>	 <p>كلية العلوم جامعة دمياط</p>	<p>First semester January:2023 Date: 1/1/2023 Total time: 3 hours</p>
<p>" Final Theoretical Exam of Environmental Chemistry (308 E)" For ³rd. year Environmental Sciences Program Students Examiners: Dr/Mervat El-Sonbati & Dr/Khaled El-Ezaby</p>			

Answer all the following questions

Total Mark: 105

Part (I) [52½] 1½ hour

Question [1] Choose the correct answer from the following [25 marks]:

1	If the compound is subjected to IR radiation..... transitions in ground state occur			
	(a) vibrational and rotational	(b) vibrational and electronic	(c) rotational and electronic	(d) electronic and spin
2	The higher temperature gas- fuel mixture in AAS is.....			
	(a) acetylene/Oxygen	(b) acetylene/Air	(c) hydrogen/Oxygen	(d) cyanogen/oxygen
3is a plot of the amount of light absorbed by a sample as a function of wavelength			
	(a) Absorption	(b) Absorption spectra	(c) Electromagnetic spectrum	(d) Electromagnetic radiation
4	Device that allows ions to flow without extensive mixing of solution in electrochemical cell is			
	(a) conductivity bridge	(b) salt bridge	(c) insoluble-salt electrodes	(d) voltammeter
5	Photoelectric cell convert.....			
	(a) current to light	(b) light to absorbance	(c) current to absorbance	(d) light to current
6	The units of conductance are.....			
	(a) ohm= seimen	(b) ohm ⁻¹ = seimen	(c) mho= ohm	(d) mho= µseimen
7	In a galvanic cell, if Metal (X) has E ⁰ = -2.8 and (Y) has E ⁰ = 1.8, So			
	(a) X is anode and Y is cathode	(b) X is cathode and Y is anode	(c) X is reduced and Y is oxidized	(d) all the previous are correct
8is a conductor that emits or collects electrons in an electrolytic cell			
	(a) Diode	(b) Anode	(c) Cathode	(d) Electrode

The conductance of the solution depends on all the following except

(a) temperature

(b) pressure

(c) concentration of ions

(d) the size of the electrode

10 enables the determination of the sum of all organically bound carbons, therefore, a measure of organic pollution in a matrix.

(a) COD

(b) BOD

(c) TOC

(d) DOC

11 The conductance of solution is inversely proportional to.....of electrode

(a) Length

(b) width

(c) cross section surface area

(d) thickness

12 In the reaction: $M^{n+} + ne \rightarrow M$ the Nernst equation is

(a) $E = E^0 - (RT/nF) \ln ([M]/[M^{n+}])$

(b) $E = E^0 + (RT/nF) \ln ([M]/[M^{n+}])$

(c) $E = E^0 - (RT/nF) \ln ([M^{n+}]/[M])$

(d) $E^0 = E + (RT/nF) \ln ([M^{n+}]/[M])$

13 The light reflected by the dispersed or scattered particles is recorded by

(a) turbidimeter

(b) nephelometer

(c) spectrophotometer

(d) colorimeter

14 In galvanic cell, the reaction isand.....current

(a) spontaneous-required

(b) nonspontaneous-required

(c) spontaneous-produced

(d) nonspontaneous-produced

15 The reducing agent in the reaction: $Zn(s) + Cu^{2+}(aq) \rightarrow Zn^{2+}(aq) + Cu(s)$ is

(a) $Zn(s)$

(b) $Cu^{2+}(aq)$

(c) $Zn^{2+}(aq)$

(d) $Cu(s)$

16 Electrochemistry deals with the interconversion between.....

(a) kinetic and electrical energy

(b) kinetic and chemical energy

(c) thermal and chemical energy

(d) electrical and chemical energy

17 A Hollow Cathode Lamp is one of the components of.....

(a) atomic absorption spectrometer

(b) flame emission spectrometer

(c) turbidimeter

(d) nephelometer

18 Galvanometer translate the current to

(a) Percent transmission

(b) absorbance

(c) Percent transmission and absorbance

(d) light

19 The normal and most stable orbital configuration of an atom is thestate

(a) liquid

(b) gaseous

(c) excited

(d) ground

20 The cell notation for the reaction $Mg \rightarrow Mg^{2+} + 2e^-$ (anode), $Al^{3+} + 3e^- \rightarrow Al$ (cathode) is.....

(a) $Mg(s), Mg^{2+}(aq) || Al^{3+}(aq) | Al(s)$

(b) $Mg(s) | Mg^{2+}(aq) || Al^{3+}(aq) | Al(s)$

(c) $Mg(s) | Mg^{2+}(aq) || Al^{3+}(aq), Al(s)$

(d) $Mg(s) | Mg^{2+}(aq) | Al^{3+}(aq) | Al(s)$

The four step for obtaining the specific light in Hallow Cathode Lamp are.....

(a) ionization-sputtering- excitation- emission	(b) ionization-atomization excitation- emission	(c) ionization-sputtering- vaporization- emission	(d) ionization-sputtering- excitation- atomization
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22	The anode is the electrode at which.....occur		
	(a) reduction	(b) neutralization	(c) precipitation
			(d) oxidation

23	All the following are limitation of atomic absorption spectrophotometer except.....		
(a) multi-element analysis per run	(b) Time-consuming	(c) No information on chemical form of metal	(d) Destructive

24	Turbidimeter measure..... light		
(a) scattered	(b) absorbed	(c) reflected	(d) transmitted

25	UV / VIS radiation causetransition		
(a) electronic	(b) vibrational	(c) rotational	(d) spin

Question 2 [27½ marks]

a- Give one difference between each two pair of the following:

[4½ marks]

1- Flame emission and atomic absorption spectrophotometer.

2- Atomic and molecular spectra

3- Nephelometer and turbidimeter

b. Mention the basic steps involved in atomization of aqueous solution samples?

[6 marks]

c. Deduce the equation: $A = \epsilon CL$

[5 marks]

d. Mention the main component of TOC Analyzer and how can you determine the TOC in water sample

[7½ marks]

e. Explain the components of pH meter and how it works?

[4½ marks]

Dr. Mervat A. El-Sonbati



Faculty of Science
Environmental Sciences Department



Semester: Jan. 2023
Date: Sunday 1/1/2023

Final Exam in "Environmental Chemistry 308 ENV" (Part II)
for 3rd. level Environmental Sciences Students
Allowed Time 1½ hours

Answer All the Following Questions:

Total Mark: 52.5 Marks

Question [1]: (16 Marks)

a- Choose the correct answer for each of the following: -

[4 Marks]

i) What are the solid particles used in chromatography called?

- 1- The solid phase.
- 2- The stationary phase.
- 3- The column phase.
- 4- The particular phase.

ii) Chromatographic retention is due to:

- 1- Different injection times by the auto-sampler.
- 2- Adsorption of the analyte to the stationary phase.
- 3- Differences in absorbance in the UV detector.
- 4- Deviations in the flow from the pump.

iii) What makes the liquid pass through the column in HPLC?

- 1- The capillary forces.
- 2- A pump.
- 3- Gravity.
- 4- Electricity

iv) What is the liquid used in chromatography called?

- 1- The pumped phase.
- 2- The transparent phase.
- 3- The mobile phase.
- 4- The solution phase.

b- Compare between each pair of the followings:

- i. *Ultra-violet* and the *FID* detectors in chromatographic techniques. [5 Marks]
- ii. *Gas Chromatograph* and *HPLC* devices, by drawing detailed schematic diagrams. [5 Marks]

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

Question [2]: (16 Marks)

- a- Discuss and also use drawing to illustrate the injections techniques that commonly used in capillary GC, then mention to the advantages and drawbacks of each technique. [6 Marks]
- b- Conditioning of the column in the gas chromatographic separation is a very important process: -
- i. When it is needed? [1 Mark]
 - ii. How it is carried out? [2 Marks]
- c- Define the retention time in the chromatographic separation processes. [2 Mark]
- d- Write shortly on the specifications and packing of the capillary column in Gas Chromatograph. [5 Marks]

Question [3]: (20.5 Marks)

Deduce the order of separation of the organic compounds in the following virtual mixture by applying of HPLC technique.

* **Suggest** a suitable polar stationary phase, and 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: -

- i) *p*-aminophenol
- ii) $\text{C}_2\text{H}_5\text{-CO-C}_2\text{H}_5$
- iii) $\text{HO-CH}_2\text{CH}_2\text{CH}_3$
- iv) *p*-aminotoluene
- v) $\text{CH}_2=\text{CH}_2\text{-CH}_3$
- vi) $\text{HOOC-CH}_2\text{CH}_2\text{-OH}$
- x) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-Br}$
- xi) $\text{CH}_3\text{-(CH}_2)_4\text{-Cl}$
- xii) $\text{HO-CH}_2\text{CH}_2\text{-CHO}$

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

Dr. Khaled H. El-Ezaby