

Assiut University Faculty of Science Chemistry Department	Second Semester Final Examination Instrumental Analysis (C-445) Credit Hours System	June 2022 Time: 2 hours
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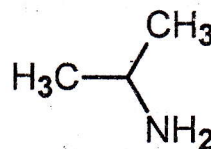
Answer the Following Questions: (60 Marks)

Question 1: Choose the Correct Answer: (50 Marks)

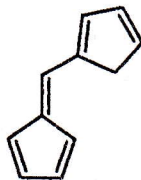
- The problem with data detection in direct current polarography is thatvaries over lifetime of drop.
(A) Potential (B) Time (C) Current (D) Scan rate
- Which of the following is (are) correct for solid electrodes based on carbon?
(A) Broad potential window (B) Low cost
(C) High background current (D) A and B
- is used in polarography to prevent the current passing through reference electrode.
(A) Auxiliary electrode (B) Working electrode
(C) Calomel electrode (D) Ag/AgCl electrode
- The modes of mass transport in voltammetric methods are
(A) diffusion and migration. (B) diffusion and convection
(C) migration and convection (D) diffusion, migration and convection
- In voltammetry voltage is applied between.....
(A) Working and Ag/AgCl electrodes (B) Working and Pt electrodes
(C) Ag/AgCl and Pt electrodes (D) None of these
- The dissolved oxygen present in experimental solution in acidic medium gets easily reduced at DME to form, in the first step.
(A) H_2O (B) H_2O_2 (C) Gelatin (D) $\text{O}_2 + 2\text{H}^+$
- Currents other than faradaic may also exist in an electrochemical cell that are unrelated to any redox reaction. These currents are called
(A) Capacitive current (B) Charging current
(C) Non-faradic current (D) All of the these
- are those which involve the transfer of across the electrode-solution-interface and obey Faraday's Law.
(A) Faradaic processes , electrons (B) non-faradaic processes , electrons
(C) Faradaic processes , protons (D) None of them
- When the potential applied to the electrode exceeds the of the electroactive species, a reduction will take place at the electrode surface.
(A) Reference , reduction potential (B) Working , reduction potential
(C) Working , oxidation potential (D) Auxiliary , reduction potential
- Which of the following influences the rate of the electrochemical reaction?
(A) Mass transport (B) Kinetics of electron transfer
(C) A & B (D) None of these

- 11- A sample contains Cd^{2+} and Zn^{2+} ions at different concentrations. The two ions can be distinguished in polarography by.....
- (A) Half wave potentials (B) Diffusion currents
(C) Limiting current (D) Faradic current
- 12- The supporting electrolyte is needed to
- (A) increase the resistance of the solution (B) eliminate electromigration effects
(C) maintain a constant ionic strength (D) both B and C
- 13- Voltammetry is based on the measurement of as function of applied potential
- (A) conductance (B) time (C) current (D) concentration
- 14- Equation of the polarographic wave derived by applying
- (A) Beer-Lambert's law (B) Nernst equation
(C) Ilkovic equation (D) Planck's equation
- 15- Widely used supporting electrolytes in voltammetric methods are
- (A) buffer solutions (B) potassium salts
(C) mineral acids (D) All of these
- 16- Half-wave potential ($E_{1/2}$) is a potential at which polarographic wave current is equal to one half of
- (A) migration current (B) diffusion current
(C) residual current (D) convection current
- 17- In pulse methods a sequence of potential steps (pulses), each with a duration of about 50 ms, is applied to the
- (A) non-polarizable electrode (B) Ag/AgCl electrode
(C) polarizable electrode (D) Pt wire electrode
- 18- The output of a voltammetric analysis of an electroactive analyte is
- (A) Current-time curve (B) Charge-time curve
(C) Current-potential curve (D) Charge-temperature curve
- 19- In polarography half wave potential and diffusion current is fundamental basis of and analysis, respectively.
- (A) Quantitative , qualitative (B) Qualitative , quantitative
(C) Current , voltage (D) Functional group , element
- 20- Ilkovic expressed the relation of the average diffusion current (I_d) to the various parameters by the equation
- (A) $I_d = 607 n D^{1/3} C m^{1/2} t^{1/6}$ (B) $I_d = 607 n D^{1/2} C m^{2/3} t^{1/6}$
(C) $I_d = 607 n D^{1/2} C m^{1/6} t^{2/3}$ (D) $I_d = 607 n D^{1/2} C m^{1/2} t^{1/6}$
- 21- In polarographic wave, the small current flows in the beginning and is carried by the supporting electrolyte and impurities present in the sample is called
- (A) Faradic current (B) Residual current
(C) Diffusion current (D) Limiting current
- 22- Amperometry is the measurement of at a constant voltage applied to the dropping mercury electrode.
- (A) Current (B) Time (C) Voltage (D) None of these

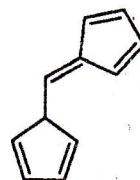
- 23- Which of the following is (are) solid electrodes based on carbon?
 (A) Carbon paste electrode (B) Graphite epoxy electrode
 (C) Glassy carbon electrode (D) All of these
- 24- is one of the most sensitive voltammetric techniques, which has been successfully applied for the determination of traces of various compounds at sub-nanomolar levels.
 (A) Adsorptive stripping voltammetry (B) Pulsed polarography
 (C) Cyclic voltammetry (D) Test polarography
- 25- The drug Flutamide (FLU) gives an adsorptive stripping voltammetric peak at a carbon-paste electrode. A 50.0 mL sample containing FLU yielded a peak height of $0.37 \mu\text{A}$. When 2.0 mL of $3.0 \mu\text{M}$ FLU was spiked to the sample, the peak increased to $0.80 \mu\text{A}$. Find the concentration of FLU in the sample.
 (A) $9.6 \times 10^{-8} \text{ M}$
 (B) $0.96 \times 10^{-6} \text{ M}$
 (C) 9.6 nM
 (D) None of these
- 26- Absorption of UV-visible energy by a molecule results in:
 (A) Vibrational transitions. (B) Electronic transitions.
 (C) Nuclear transitions. (D) None of these.
- 27- Choose the correct statement
 (A) Homoannular diene is a cyclic diene having conjugated double bond in different ring.
 (B) Double bond extending when no double bond is present other than conjugated.
 (C) Exocyclic double bond is a double bond in which one of the double bond atoms is a part of a ring.
 (D) Heteroannular diene is a cyclic diene having conjugated double bond in same ring.
- 28- What is a red shift?
 (A) The shifting of an absorption to lower energy
 (B) The shifting of an absorption to higher energy
 (C) The shifting of an absorption towards the blue end of the spectrum
 (D) The shifting of an absorption to shorter wavelength
- 29- What types of the major electronic transition are possible in the absorption of UV-visible spectroscopy?
 (A) Transitions involving π , σ , and n electrons.
 (B) Transitions involving charge-transfer electrons.
 (C) Transitions involving d and f electrons.
 (D) All of these.
- 30- Select one of the statements that is correct regarding the following compound:



- (A) $\sigma \rightarrow \sigma^*$ is forbidden.
 (B) $n \rightarrow \sigma^*$ is forbidden.
 (C) Both $n \rightarrow \pi^*$ and $\pi \rightarrow \pi^*$ are allowed.
 (D) Both $\sigma \rightarrow \sigma^*$ and $n \rightarrow \sigma^*$ are allowed.

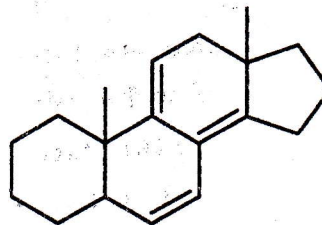
- 31- Which of the following is the principle of Atomic Absorption Spectroscopy (AAS)?
 (A) Solvent absorbs radiation and transmitted radiation is measured.
 (B) Radiation is absorbed by non-excited atoms in vapour state and are excited to higher states.
 (C) Colour is measured.
 (D) Density is measured.
- 32- Which of the following is not a component of the AAS instrument?
 (A) lines source of radiation. (B) Atomizer.
 (C) Deuterium lamp. (D) Nebulizer.
- 33- Which of the following options explains the process of 'sputtering' that occurs in Hollow Cathode Lamp?
 (A) Positive ions hit with negative ions and metal atoms from anode are ejected.
 (B) Positive ions hit with cathode surface and metal atoms from cathode are ejected.
 (C) Negative ions hit with cathode surface and metal atoms from anode are ejected.
 (D) Positive ions hit with negative ions and photons are ejected.
- 34- Which of the following is the function of the Hollow cathode lamp in AAS?
 (A) To convert sample in mist or aerosol.
 (B) To split the beam into two.
 (C) To reduce the sample into atomic state.
 (D) To emit a specific resonance line of the atoms in question.
- 35- A device that isolates a restricted region of the electromagnetic (EM) spectrum used for measurement in the UV-Vis spectrophotometer.
 (A) Signal Processor. (B) Wavelength Selector.
 (C) Light Source. (D) Photoelectric Transducer.
- 36- Which of the following molecules would you expect absorb at a longer wavelength in the UV-Vis region of the electromagnetic spectrum?
 (A) Molecule (I)
 (B) Molecule (II)
 (C) Both (I) and (II) absorb at the same wavelength.
 (D) Both (I) and (II) have no absorption.
- 

Molecule (I)



Molecule (II)
- 37- In the UV-visible spectroscopy, which one of the following statements is correct?
 (A) The cell path length is directly proportional to the concentration.
 (B) The absorbance is indirectly proportional to the concentration.
 (C) The absorbance does not change when the cell path length (cell thickness) increases.
 (D) The absorbance has no units.
- 38- Which of the following statement is correct about AAS?
 (A) Detect the Non-metal ions. (B) Detect the Metal ions.
 (C) Detect the Nobel gas ions. (D) Detect the Halogen ions.
- 39- In Atomic Absorption Spectroscopy, the addition of potassium salts can be used for elimination the
 (A) Spectral interferences. (B) Physical interferences.
 (C) Ionization interference. (D) All of these.

- 40- What is the disadvantage of Hollow cathode lamp?
- More expensive.
 - Need to use different lamp for each element tested.
 - Both A and B.
 - None of these.
- 41- In AAS, the Hg can be detected by using:
- Hydride generation technique.
 - Cold vapor technique.
 - Graphite furnace technique.
 - All of these.
- 42- What is the type of gas and its pressure used in the Hollow cathode lamp?
- N₂ at 1 – 5 torr
 - H₂ at 1 – 5 torr
 - Ne or Ar at 1 – 5 torr
 - Ne or Ar at 5 – 10 torr
- 43- The Hydride generation method can be used for the determination of:
- Arsenic (As)
 - Antimony (Sb)
 - Lead (Pb)
 - All of these.
- 44- The anionic interference of PO₄³⁻ or SO₄²⁻ in the determination of Ca²⁺ using AAS can be eliminated by:
- Addition of EDTA.
 - Using of releasing agents (Sr²⁺ or La³⁺)
 - Addition of KCl.
 - Addition of oxyanions such as sulfate or phosphate.
- 45- The formation of heat-stable Al/Mg compound in the determination of Mg²⁺ in presence Al³⁺ using AAS can be eliminated by:
- Addition of KCl.
 - Using of releasing agents (Sr²⁺ or La³⁺)
 - Using of protective agents (EDTA)
 - All of these.
- 46- What types of oxidants and fuel are used in flame AAS?
- Air-Propane or Air-Hydrogen.
 - Air-Acetylene.
 - Nitrous oxide -Acetylene.
 - All of these.
- 47- Using Woodward-Fieser's rule, calculate wavelength of maximum UV/Vis absorption for the following compound:
- 253 nm
 - 278 nm
 - 323 nm
 - 308 nm



- 49- The frequency of an electronic transition is $5.0 \times 10^{14} \text{ s}^{-1}$. What is the corresponding wavelength? ($c = 3.00 \times 10^8 \text{ m/s}$)
- (A) 300 nm
(B) 400 nm
(C) 500 nm
(D) 600 nm
- 50- Calculate the wavenumber corresponding to 600 nm wavelength.
- (A) $1.67 \times 10^6 \text{ m}^{-1}$
(B) $1.67 \times 10^9 \text{ m}^{-1}$
(C) $1.67 \times 10^{-6} \text{ m}^{-1}$
(D) 6000 m^{-1}

Question 2: (Oral Exam) (10 Marks)

Mark True (T) for right statement and False (F) for wrong statement.

- 51- The measurement of currents produced by electrochemical processes involving the an analyte can be used to determine concentrations.
- 52- The third electrode in electrochemical cell is a counter electrode, which is often a coil of silver wire.
- 53- It is desirable to make electrochemical measurements without current flowing through the working electrode.
- 54- Result of charging electrode is electric double layer by electrode surfaces.
- 55- The potentiostat's internal feedback circuits prevent current from flowing between the working electrode and Ag/AgCl electrode.
- 56- The correct order of AAS instrumentation is Lines source – Atomization – Monochromator – Detector – Read-out.
- 57- A hypsochromic shift in the λ_{max} of a species when recording a UV-Vis absorption spectrum means that the λ_{max} shifted to a higher wavelength or lower energy.
- 58- One of the disadvantages of graphite furnace technique is the analyte sample may be lost at the ashing stage and not completely atomized.
- 59- In AAS, the formation of stable refractory oxides of TiO_2 , V_2O_5 or Al_2O_3 by reaction with O_2 and OH species in the flame can be avoid by increase temperature of flame (increase atom production) or use less oxidant.
- 60- Two compounds A and B have molar absorptivity (ϵ) as 1800 and 18000 $\text{mol}^{-1} \text{ L cm}^{-1}$ respectively. Then compound A can be detected at very low concentrations than compound B.

♣ GOOD LUCK ♣

*Examiners: Prof. Dr. Mohamed Sayed Ibrahim
Prof. Dr. Hossieny Ibrahim*



Second Semester Final Examination
Subject: Selected Topics in Analytical Chemistry (C-444)

Answer the following questions: (ملحوظة: الامتحان في ثلاث صفحات)

[Final Examination (50 Marks)]

Question 1: Shade (T) for the correct statement or (F) for the wrong statement (20 Marks, 1 mark each)

1. The solubility of CO_2 is more complex than that of O_2 in water.
2. Gases become more soluble if their solutions are heated.
3. Solvent extraction involves the distribution of a solute between two miscible solvents.
4. Solvent extraction is very useful for the separation of organic substances only.
5. The distribution ratio depends on the initial concentration of the solute.
6. In acid media, the extraction of benzoic acid into ether is maximum.
7. The extraction efficiency of a metal chelate increased by increasing pH.
8. Fluorometry is a highly specific analytical technique.
9. In resonance energy transfer, the two participating molecules should be collide.
10. If the interfering substance does not absorb light, the fluorescence readings will decrease.
11. Fluorescence is a relaxation of an excited state by emission of a photon with a change in electron spin.
12. Triplet state is a many-electron states in which all electron spins are paired.
13. External conversion is a relaxation of an excited electronic state without emission of a photon due to intermolecular processes.
14. The conductance of a solution is directly proportional to its resistance.
15. As the number of ions increases the conductance of the solution decreases.
16. Equivalent conductance is the conductance of one gram of solute contained between two electrodes spaced one centimeter apart.
17. Conductometric titrations can be used for determination of highly colored solutions.
18. Coulometric analysis measures the quantity of conductivity required to carry out a chemical analysis.
19. Coulometric methods can't be used to produce volatile reagents in solutions.
20. The passage of one faraday of electricity will cause the reaction of one gram of substance.

Question 2: Shade the correct answer: (30 Marks, 2 mark each)

21. The presence of limestone as an underlying rock causes
 - A. Water hardness.
 - B. Water alkalinity.
 - C. Both hardness and alkalinity.
 - D. None is true.
22. Given that, the atmosphere contains 0.21 atm O_2 and the value of K_H for the dissolution of O_2 in water is $1.3 \times 10^{-3} \text{ mol L}^{-1} \text{ atm}^{-1}$, calculate the amount of oxygen dissolved in water in ppm units.
 - A. 6.3
 - B. 8.7
 - C. 9.5
 - D. 11.8

23. Given that, the concentration of CO_2 dissolved in water equilibrated with air is $1.0 \times 10^{-5} \text{ mol L}^{-1}$. What is the pH of this water? ($K_{a1}(\text{H}_2\text{CO}_3) = 4.2 \times 10^{-7}$)
- A. 3.62
B. 4.50
C. 5.67
D. 7.35
24. Ninety percent of a metal chelate is extracted when equal volumes of the aqueous and organic phases are used. What will be the percent extracted if the volume of the organic phase is doubled?
- A. 92.5%
B. 95%
C. 97%
D. 99%
25. The distribution ratio between 3M HCl and tri-n-butylphosphate for PdCl_2 is 2.3. How many extractions must be performed with separate 10 mL portions of tri-n-butylphosphate to remove 99% of PdCl_2 from a 25 mL of $7.0 \times 10^{-4} \text{ M}$ PdCl_2 solution?
- A. 2
B. 3
C. 4
D. 5
26. Spectrofluorimetric determination of levocetirizine dihydrochloride is based on:
- A. Complexation reaction.
B. Oxidation reduction reaction.
C. Charge transfer reaction.
D. Precipitation reaction.
27. In spectrofluorimetric determination of mosapride Citrate, is based on the formation of:
- A. Binary complex
B. Charge transfer complex.
C. Ternary complex.
D. None of them.
28. The reaction of some metal ions with calcein resulting in:
- A. Quenching of fluorescence.
B. Enhancement of fluorescence.
C. No effect on the fluorescence.
D. A and B are true.
29. Spectrofluorimetric determination of sulfasalazine is based on:
- A. Precipitation reaction.
B. Charge transfer reaction.
C. ligand exchange reaction.
D. Oxidation reduction reaction.
30. Paroxetine hydrochloride act as:
- A. n-electron donor.
B. π -electron acceptor.
C. Chelating agent.
D. None of them.
31. In the conductometric titration of strong acid against weak base, after end point has been reached, the conductivity will:
- A. Increase.
B. Decrease.
C. Become constant.
D. Increase then decrease.
32. In the conductometric titration of weak acid against strong base, after end point has been reached, the conductivity will:
- A. Decrease.
B. Become constant.
C. Increase then decrease.
D. Increase.
33. In the conductometric titration of mixture of a strong acid and a weak acid against a strong base, there are:
- A. One break point.
B. Two break points.
C. Three break points.
D. No break point.

34. What is the equivalent weight of an organic acid if 0.04 g in alcohol – water mixture required a constant current of 50 mA for 500 sec to generate sufficient hydroxyl ion to reach a phenolphthalein end point?

A. 54.4 g/eq.

C. 254.4 g/eq.

B. 154.4 g/eq.

D. 354.4 g/eq.

35. How long should a constant current of 100 mA be passed through a solution to prepare 100 mL of a solution of 0.01 M Ni^{2+} using an anode of pure nickel?

A. 930 sec.

C. 39 sec.

B. 390 sec.

D. 1930 sec.

[Oral Examination (10 Marks, 1 mark each)]

Question 3: Shade (T) for the correct statement or (F) for the wrong statement

36. The pH is a good guide for the alkalinity of water.

37. The water hardness can be measured by titration against EDTA.

38. Soft water contains high concentrations of Ca^{2+} and Mg^{2+} ions.

39. Fluorescence output is linear to sample concentration over a narrow range.

40. In inner filter effect, the incident exciting light is absorbed at the front face of the sample.

41. Many fluorescent molecules do not affected by light.

42. Resonance fluorescence is a relaxation of an excited state by emission of a photon of the same frequency as the excitation frequency.

43. The conductance of a solution increases by increasing temperature.

44. Conductometric titrations are suitable for detection of end point in neutralization reactions.

45. Coulometric techniques are very useful in the analysis of radioactive materials.

GOOD LUCK

The Examiners: *Prof. Dr. Hassan Sedaira*

Dr. Doaa Abdel-rahman Mohamed

Answer the following questions:

1 –A) Complete the following with the correct choice (between brackets) (10 marks)

- i) Inert complexes are thermodynamically.....(stable – unstable)
- ii) Soft Lewis base ligands have proton affinity. (very high – very small)
- iii) The nucleophilic discrimination factor characterizes the sensitivity of the rate constant toof the ligand.(size – nucleophilicity- polarizability)
- iv) Strong field $3d^3$ and $3d^6$ complexes are generally(inert- labile).
- v) In interchange substitution mechanism, the entering and leaving groups exchangeformation of an activated complex. (with - without)
- vi) Themechanism plays a central role in octahedral substitution reactions. (associative – dissociative – interchange)
- vii) The equilibrium constant favors the encounter if the reactants are and oppositely charged. (small - large)
- viii) The K_1 pathway inmechanism of square planar substitution reactions is two-step mechanism. (intimate – stoichiometric)
- ix) Octahedral substitutions can acquire a distinct associative character in case ofcentral metal ions. (small – large)
- x) Substitution reaction of hexaquoNi(II) complex is considered as a model for I_d reaction with.....response to the nucleophilicity of the entering group. (high – low – very low)

2-A) Put ($\sqrt{}$) or (X) in front of each of the following: (10 marks)

- i) For determination of stability constants in solution, $n+1$ independent concentrations are needed ().
- ii) Complexes of trivalent f-block metal ions are labile ().
- iii) Most stable complexes are those of soft Lewis acids and hard Lewis bases ()
- iv) The formation constants of complexes correlate well with Lewis basicity if steric factors considered. ()
- v) Steric crowding at the center of the reaction inhibits the associative reaction()
- vi) Intimate mechanism of substitution in square planar complexes is dissociative.
- vii) Good donors stabilizes the reduced coordination number in octahedral substitution reactions.()
- viii) The increase of coordination number in a dissociative reaction relieves the crowding in the activated complex.()
- ix) In Eigen- Wilkins mechanism, the first step is the rate determining step.()
- x) For Co(III) and Cr(III) octahedral complexes both cis and trans ligands affect rates of substitution.().

بقية الاسئلة بالخلف

- 3a) Derive the equation for calculating the K_f of 1:1 complexes from spectrophotometric measurements. (4 marks)
- b) Answer only One of the following: (4 marks)
- Write briefly on the nucleophilicity parameter.
 - Write briefly on the trans effect in substitution of square planar complexes.
- c) Write briefly on ONE only of the following:
- Trends in successive formation constants. (4 marks)
 - Class A and class B metals according to the Chatt- Ahlrand generalization for stability correlations. (4 marks)
- 3) Put ($\sqrt{\quad}$) or (X) in front of each of the following: (18 marks)
- The effective atomic number(e.a.n.) rule is agreed with all complexes without any exceptions. ()
 - Carbon monoxide (CO) is considered one of the most important π acceptor ligands. ()
 - $\text{Fe}(\text{CO})_5$ and $\text{Ni}(\text{CO})_4$ are polynuclear metal carbonyls ()
 - $\text{Fe}_3(\text{CO})_{12}$ is heteronuclear carbonyl compound. ()
 - $\text{MnRe}(\text{CO})_{10}$ is homonuclear carbonyl compound. ()
 - CO can form double bridge and triple bridge carbonyl groups with metals in addition to linear M-C-O groups. ()
 - The double bridge carbonyl compounds occur fairly frequently and always in conjunction with M-M bond. ()
 - Stability of nonbridged structure increased as the metal atom size increased.()
 - $(\text{OC})_5\text{Mn-Mn}(\text{CO})_5$ is nonbridged compound. ()

GOOD LUCK

أ.د. سحر الجيار

أ.د. سعيد إبراهيم



Final Exam in Selected Topics of Organic Chemistry 414C
For Fourth Year Science Students

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Question (1): Show which sentence is (True) and which is False for the following: (50 marks)

1. Protosil is active *in vivo* and not *in vitro*. (T/F)
2. The beriberi factor in humans was known as vit. B₁. (T/F)
3. Thiamine is thermostable vitamin. (T/F)
4. Histamine is released from mast cells when allergen breaks down the bridge between antibodies molecules. (T/F)
5. The release of histamine is induced by specific allergens. (T/F)
6. Insect venoms represent antibodies. (T/F)
7. Antihistamines cause eyes to itch, burn, or become watery. (T/F)
8. Histamine is converted to N-methylhistamine by an enzyme called diamine acetic acid. (T/F)
9. The structure of cimetidine contains a sulfur atom. (T/F)
10. H₁ receptors are found in the smooth muscle of the bronchi. (T/F)
11. PUD is the abbreviation of peptide urethane disease. (T/F)
12. Omeprazole and lansoprazole are a class of drugs known as the H₂ Receptor antagonists or H₂ Blockers. (T/F)
13. The structure of omeprazole contains benzopyrazole ring, S=O group and a pyridine\ ring. (T/F)
14. Sodium penicillinate is a dextrorotatory compound. (T/F)
15. Penicillin loses its activity in alcoholic solutions. (T/F)
16. The structure of sulfa drugs should contain a sulphonyl group. (T/F)
17.
$$\text{C}_{12}\text{H}_{18}\text{ON}_4\text{Cl}_2\text{S} + \text{Na}_2\text{SO}_4 \longrightarrow \text{C}_6\text{H}_9\text{ONS} + \text{C}_6\text{H}_9\text{O}_3\text{N}_3\text{S} + 2\text{NaCl}$$

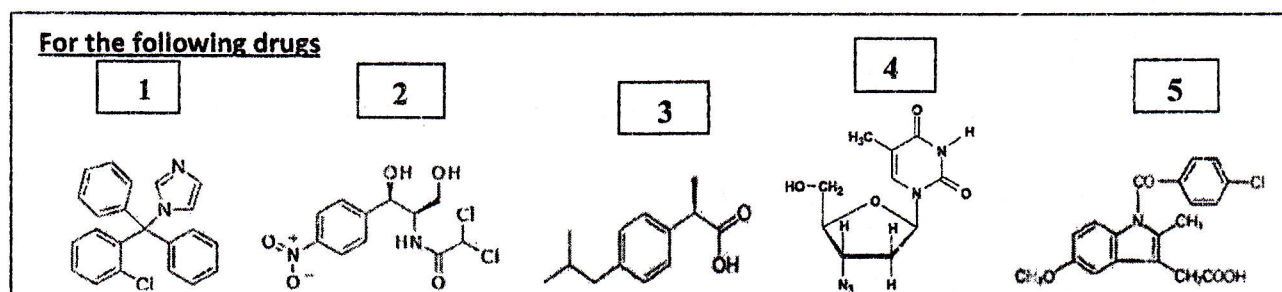
Vit B₁

A

B

 (T/F)
18. Cytosine, uracil, and thymine are types of the purines. (T/F)
19. Adenine and guanine are types of the pyrimidines. (T/F)
20. The genetic code consists of sets of three or four bases along the mRNA called codons. (T/F)
21. The start codon binds to a mRNA with methionine. (T/F)
22. Ribosomes move along mRNA adding amino acids to a growing peptide chain, this process is called translocation. (T/F)
23. One similarity between DNA and messenger RNA molecules is that they both contain the same sugar. (T/F)
24. Adenosine is type of nucleosides not nucleotides. (T/F)
25. Nucleosides consist of Phosphate and base. (T/F)
26. The transfer RNA carries genetic information from DNA to the ribosome. (T/F)
27. The messenger RNA brings amino acids to the ribosome to make the protein. (T/F)
28. During translocation process a section of DNA containing the gene unwinds. (T/F)
29. The effect of caffeine on brain is to keep dopamine level to be constant. (T/F)
30. The transfer RNA attaches to its specific amino acid, the process is called activation. (T/F)
31. The codon is located on the transfer RNA. (T/F)
32. In the RNA molecule, thymine is found in the place of uracil. (T/F)
33. During the process of transcription, H₂O molecule is produced. (T/F)
34. The actual site of protein synthesis is the ribosome. (T/F)

35. If the DNA template reads "ATA", TUT would be the corresponding sequence on the mRNA. (T/F)
36. Amino acids are held together by hydrogen bonds. (T/F)
37. How many codons are needed to specify three amino acids? Six codons. (T/F)
38. The chemical name of caffeine is 1,3,6-trimethylxanthine. (T/F)
39. There are three hydrogen bonds form when A and T pair. (T/F)
40. There is no tRNA with an anticodon for the "stop" codons. (T/F)
41. The ribosome reaches a "stop" codon: UGA, UAA, or UAG. (T/F)
42. Frame shift mutation is only an extra base adds to the normal DNA sequence. (T/F)



43. The chemical structure of Indomethacin is the structure number 1. (T/F)
44. The chemical structure of Ibuprofen is the structure number 3. (T/F)
45. The Drug number 2 is used as AIDS treatment. (T/F)
46. The chemical structure of Chloramphenicol is the structure number 4. (T/F)
47. The chemical structure of Clotrimazole is the structure number 5. (T/F)

For the following DNA sequence:

GAACCCTTT

48. The messenger RNA sequence is CCUAGCGGA. (T/F)
49. The sequence on the transfer RNA is GGAUCGCCU. (T/F)
50. Amino acids sequence is: Pro - Ser - Gly. (T/F)

Question (2): Oral (10 marks)

Show which sentence is (True) and which is (False) for the following:

51. Histamine is prepared from imidazole acetic acid by treatment with diamine oxidase enzyme. (T/F)
52. Isopropanol is less active than propanol. (T/F)
53. Smallpox is caused by a viral infection. (T/F)
54. Hydrogen bond joins complementary nucleotides in two strands. (T/F)
55. Phosphodiester bond links base to pentose in nucleotide. (T/F)
56. If the messenger RNA codon reads UAC, its complementary anticodon will be TUC. (T/F)
57. N-glycosidic bond joins adjacent nucleotides in one strand. (T/F)
58. Nucleic acids are the 2th type of macromolecules. (T/F)
59. A mutation results from mutagens such as radiation and chemicals. (T/F)
60. A retrovirus is a virus containing DNA. (T/F)

Good Luke

Examiners: Prof. Hussein El-Kashef & Dr. Ahmed Abdou O. Abeed



Faculty of Science
Chemistry Department

Final Examination for B.Sc. (Chemistry major)
Applied Organic Chemistry (412 C): (Polymers & Fibers & Material science)

Date: Saturday, 4/06/2022

(2 hours)

Answer the following questions : (50 points)

1) Mention the: Advantages, Disadvantages, and Uses for: (6 point)

i) Cotton iii) Silk iii) Polyesters

2) Is it possible to make polyethylene from cyclohexane? If not, say why? then show examples of ring opening polymerization? (6 point)

3) What are the three main types of degradable plastics? Why are they degradable? (6 point)

4) What is the significance of fiber evidence? How can using the fibers to reconstruct crime scenes? (6 point)

5) Compare between the step- and chain- growth polymerization, and also compare, giving reason, between the time needed in polymerization of these monomers: (Vinyl Chloride, Styrene, MMA). (8 point)

6) Why would a hole appear when a dilute alkali is spilt on a fabric made of i) Kevlar, or ii) Polyester. Discuss by equations, its mechanism? (6 point)

7) How does urea-methanal differ from nylon, Kevlar and Dacron, even though all of them are condensation polymers? (6 point)

8) Complete the following table: (6 point)

Polymer	Abbreviation	Structural formula of monomer	Structural formula of polymer	Uses
Polymethylmethacrylate	(i)	(ii)	(iii)	(iv)
Polyvinyl chloride	(v)	(vi)	(vii)	(viii)
Dacron	(ix)	(x)	(xi)	(xii)

Good Luck

Examiner:

Prof. Dr. Kamal Ibrahim Aly



Answer the Following Questions:

Section I

1-) Choose the correct answer

(5 Marks)

1. Selective catalyst should
 - (i) Increase the reaction rate
 - (ii) Change the reaction products
 - (iii) Increase the number of molecules adsorbed on the catalyst surface
 - (iv) Proceed the reaction to desired products.
2. According to the chemical approach, the desirable energy for decomposition of the intermediate complex is
 - (i) High energy
 - (ii) Low energy
 - (iii) Intermediate energy
 - (iv) None of them
3. What is not true for desirable characteristics of support
 - (i) Desirable mechanical properties
 - (ii) High surface area
 - (iii) Low cost
 - (iv) Unstable under reaction and regeneration conditions
4. How does a catalyst increase the rate of reaction?
 - (i) By forming an intermediate complex
 - (ii) By lowering activation energy
 - (iii) By increasing activation energy
 - (iv) By changing the equilibrium constant
5. Substances that decrease the activity of a catalyst are known as
 - (i) Promoters
 - (ii) Controllers
 - (iii) Poisons
 - (iv) Inhibitors
6. When n and p-type semiconductors are allowed to come into contact
 - (i) Some electrons will flow from n to p
 - (ii) Some electrons will flow from p to n
 - (iii) The impurity element will flow from n to p
 - (iv) The impurity element will flow from p to n
7. Thermal conductivity is corresponded to,.....
 - (i) Lattice vibration
 - (ii) Contribution from electrons
 - (iii) Small contribution from electrons
 - (iv) All of them
8. A solid having regular shape is
 - (i) Semicrystalline
 - (ii) Anisotropic
 - (iii) Amorphous
 - (iv) Crystalline
9. Which of the following is not characteristic of chemisorption
 - (i) It is irreversible
 - (ii) It is specific
 - (iii) It is multilayer phenomenon
 - (iv) Heat of adsorption is about 100 kJ

10. Which of the following statement is not true?

- (i) The value of adsorption enthalpy of physical adsorption is less than chemical adsorption
- (ii) Physical adsorption occurs due to Van der Waal's forces
- (iii) Chemical adsorption decreases at high temperature and low pressure
- (iv) Physical adsorption is reversible

2- Put (✓) or (×) for the following sentences

(5 Marks)

- 1- The rate of physical adsorption is greater than chemical adsorption ()
- 2- The heat of chemisorption is a measure of strength of the bonds formed between adsorbent and adsorbate ()
- 3- The adsorption of gas on solid depend on nature of solid ()
- 4- Isomorphism is a compound with two different crystal forms ()
- 5- The doping of NiO with monovalent metal decreases its electrical conductivity ()
- 6- The number of charge carriers that can result from ordinary donor or acceptor ionization is $[D] + [A]$ ()
- 7- A catalyst support is stable under reaction and regeneration conditions ()
- 8- Selective catalyst should proceed the reaction to products ()
- 9- Structure promoter changes the chemical composition of the catalyst ()
- 10- In impregnation method for synthesis of a catalyst requires more equipment ()

3- Write short notes on three only of the following:

(9 Marks)

- a) The factors are responsible for deactivation of a catalyst.
- b) The important characteristic properties of catalyst supports.
- c) The factors are influence in the amount of gas adsorbed on solid materials.
- d) Synthesis of γ -alumina from bauxite.

4- Answer two only from the following

(10 Marks)

- a- Mention the factors affecting thermal conductivity of solids and derive an equation that be used for calculation of specific heat of solids
- b- From adsorption isotherm data, apply the BET equation for calculation of specific surface area of a catalyst.
- c- Explain the precipitation method for manufacture of industrial catalyst and mention the forming operations.

5- Define the following terms

(4 Marks)

- (i) Turnover number (ii) Center of symmetry (iii) Schottky defect
- (iv) Non-stoichiometric compound

Section II

Q1- Complete the following sentences (choose only 20):

(10 marks)

- i- The major use for solid electrolytes is in and in
- ii- Porous disk sintered glass is used instead ofin an electrochemical cell.
- iii- Activity *is the*of ions depending onin solution.
- iv- Electrochemical potential of a metal involves both the and potentials of this metal.
- v- Each material has unique energy level.
- vi- Activity coefficient changes with and
- vii- When a metal is immersed in an electrolyte, charge transfer across the to equilibrate the levels of both metal and electrolyte.
- viii- theory predicts a dependence of the measured E.D.L. capacity on both potential and electrolyte concentration.
- ix- Types (of forms) of corrosion like and
- x- In any circuit there are potentials whenever two dissimilar materials come into contact.
- xi- Gibbs function relates to a potential as
- xii- The surface tension reaches a maximum at some potential when the is zero.
- xiii- Strong electrolyte like, weak electrolyte like..... while a non-electrolyte like
- xiv- is the process in which an ion is surrounded by water molecules arranged in a specific manner.
- xv- The non-ideality of solution (γ less than unity) gets worse with
- xvi- Currents at electrode surfaces: Faradic current represents by redox reactions.
- xvii- Currents at Electrode Surfaces: non-Faradic current represents.....
- xviii- The proper material of nitric acid storage tank is.....
- xix- Combined chemical attack and mechanical wear is.....
- xx- The amount of substance changed during electrochemical reaction is proportional to

xxi- The salt effect on the reaction: $[\text{Co}(\text{NH}_3)_5\text{Br}]^{++} + \text{OH}^- \rightarrow [\text{Co}(\text{NH}_3)_5\text{OH}]^{++} + \text{Br}^-$ is.....

xxii- The polarization cell consists of three electrodes; reference, and

Q2 a) Describe the energy profile of electrode reaction $\text{Ag}^+_{(\text{aq})} + \text{e}^- = \text{Ag}_{(\text{s})}$, in absence and in application of $\Delta\Phi$ potential to reduction process. Estimate the electrochemical rate equation for this electrode reaction. **(4 marks)**

b) Define the corrosion of metals and write short note about corrosion inhibitors.

(3 marks)

----- Good Luck -----

Prof. Dr. Abd Al -Aziz Ahmed Said, Prof. Dr. Abou-El-Hagag A. Hermas