

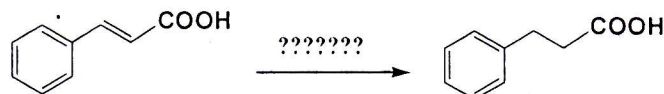
Chemistry Department
Final Exam of advanced synthetic Organic Chemistry – (3rd chemistry students (314 C)

Part I: Final Exam (50 marks)

Q1: Shade the correct answer; A, B or C (1 Mark each) (35 marks)

1. Preferential selective of one stereoisomer over another is defined as
A) stereoselectivity B) regioselectivity C) chemoselectivity)
2. Dissolving metal reduction of aromatic compounds is defined as :
A) Shapiro B) Birch C) Swern
3. Thermodynamic enolate could be formed using:
A) Strong base B) protic solvent C) low temperature
4. Diels Alder reaction is a type of
A) stereoselective B) chemoselective C) regioselective
5. To reverse the selectivity of diethyl ketone , we should add:
A) LDA B) HMPA C) LHMDS
6. The reaction of benzyl alcohol with jones reagent, gave.
A) benzaldehyde B) benzoic acid C) unreacted
7. The reaction of methyl bromide with enamine is defined as
A) electrophilic substitution B) nucleophilic substitution C) electrophilic addition

8. The suitable reagent for this reaction

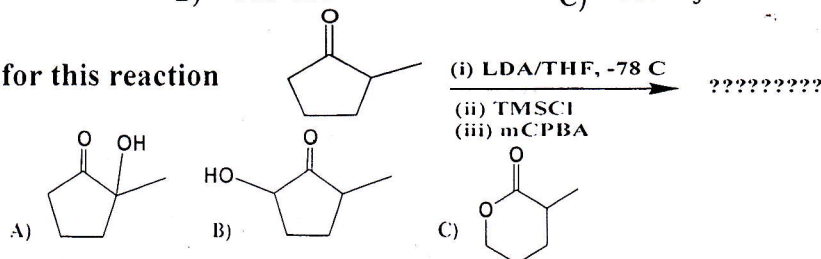


A) H_2/Pt

B) $NH=NH$

C) Li/NH_3

9. The main product for this reaction



10. Thermodynamic enolates can be accelerated by using

A) Low temp. B) protic solvent C) strong base)

11. Oxidation of secondary alcohol over primary obtained by using

A) MnO_2 B) PCC C) $AgCO_3$

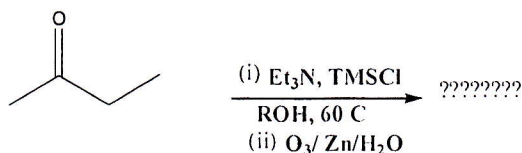
12. DMP is a selective reagent for the following reaction

A) Oxidation B) Reduction C) rearrangement

13. The suitable cleavage for the *o*-Nitrobenzyl ether

A) $AlBr_3$ B) Photolysis C) Mild Acid

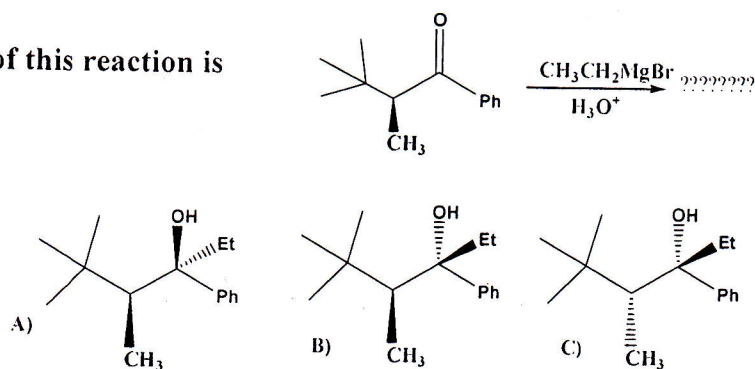
14. The main product of this reaction is



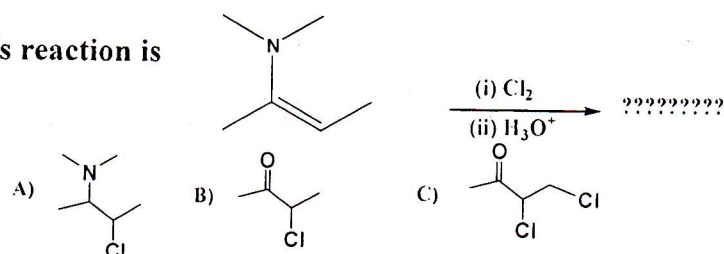
A) $HCOOH + CH_3CH_2CHO$ B) $CH_3COOH + CH_3CHO$ C) $CH_3CH_2COOH + HCHO$

الإمتحان فر كلوت مرقعات

15. The main product of this reaction is



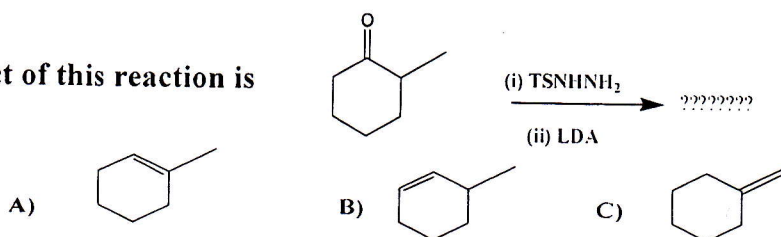
16. The main product of this reaction is



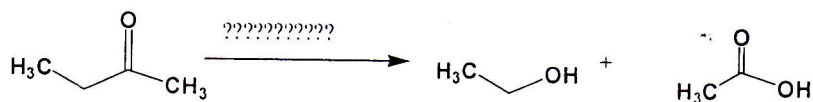
17. The suitable cleavage reagent for benzyl ester group is

- A) Hydrogenolysis B) Et_3N C) $\text{H}_2, \text{Pd/C}$

18. The main product of this reaction is



19. The suitable reagent for this reaction is

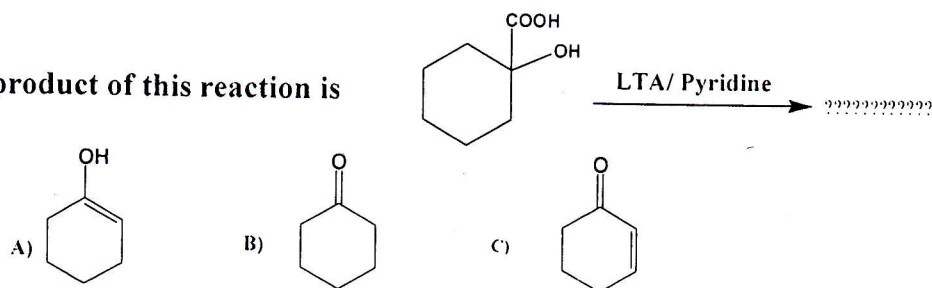


- A) LTA/pyridine B) mCPBA/ K_2CO_3 , MeOH C) DIBAL

20. The reaction of Isopropylmethyl ketone with LDA/THF, -78°C gave

- A) Cis enolate B) Trans Enolate C) Un substituted Enolate

21. The main product of this reaction is



22. The Suitable reagent for the conversion of primary alcohol to carboxylic acid is

- A) PDC/DCM B) Jones reagent C) MnO_2

23. Birch reduction of 1-Naphthalin sulphonic acid gave

- A) 1,4-Dihydro-naphthalene B) 5,8-Dihydro-naphthalene C) Decahydro-naphthalene

24. NaBH_4 as a reducing agent is inactive towards

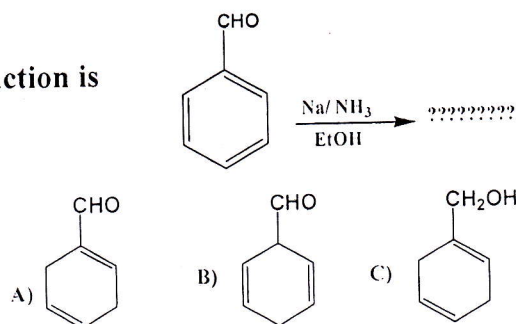
- A) Ketones B) Aldehydes C) nitriles

25. The oxidation of 1,2-diols, give carbonyl compounds by using

- A) DMSO b) LTA C) DMP

26. The cleavage reagent of methylthiomethyl ether (MTM) is:
 A) Na/NH_3 B) Oxidation C) $\text{HgCl}_2/\text{CH}_3\text{CN}$
27. Reaction of 2-methylcyclohexanone with thermodynamic condition and then with CH_3I
 A) 2,2-dimethyl--cyclohexanone B) 2,6-dimethyl--cyclohexanone C) 2,3-dimethyl--cyclohexanone

28. The Major product for this reaction is



29. Reduction of Alkynes to Cis Alkenes was done by using
 A) Na/NH_3 B) H_2/Ni C) $\text{H}_2/\text{Pd}/\text{BaSO}_4$, quinoline
30. Chair-Like Transition state explain the
 A) Degree of selectivity B) Trans and Cis enolate C) Majority of selectivity
31. MnO_2 is a selective to oxidize
 A) Isopropanol B) n-Propanol C) 1-Propene-3-ol
32. DIBAL is a good selective reducing agent for
 A) Acetone B) Acetylene C) Methylacetate
33. The reagent which used in Swern reaction is
 A) $\text{DMSO}/(\text{COCl})_2$ B) PCC/DCM C) $\text{CrO}_3/\text{H}_2\text{SO}_4$
34. The reduction of β -Keto ester to give β -hydroxy ester could be obtained via
 A) NH_3/Li B) NaBH_4 C) H_2/Pt
35. The reduction of 1,3-pentadiene to give 2-pentene was obtained by using
 A) $(\text{Ph}_3\text{P})_3\text{RhCl}$ B) $\text{NH}=\text{NH}$ C) DIBAL

Q2: Discuss the following by equations and mechanism (Only Three) (15 Marks)

- 1- Dess Martin periodinane method for oxidation of ethanol.
- 2- Shapiro reduction of 2-butanone
- 3- Protection of Amine group using BOC and method of cleavage
- 4- Enamine reaction of acetaldehyde with dimethyl amine

Part II: Oral Exam (10 Marks)

Q3: Shade (T) for the true statements or (F) for false statements: (1 Mark each)

- 1) In the Baeyer-Villiger reaction the preference for the migration of phenyl > cyclohexyl.
- 2) Both azide and nitrile groups were reduced by $\text{H}_2/\text{Pd}/\text{C}$ to Amines
- 3) Dissolving metal reduction could be considered as Radical reduction
- 4) Reaction of Diethylketone with Dihexyl Boron chloride in Et_3N gave cis boron enolate as major
- 5) Reaction of Isopropyl methyl ketone with $\text{Et}_3\text{N} / \text{ROH}$, 60°C , gave Kinetic enolate
- 6) Reaction of Diethylamino ethyl ketone with LDA, gave major cis enolate
- 7) Boron enolates is less selective than Li enolates.
- 8) Felkin-anh model of 3-methoxy butan-2-one, the OCH_3 group is considered as a large group.
- 9) Conversion of acetone to propane could be obtained using Diimide
- 10) The Only Alkene which gave 2-methylbutane with Wilkinson catalyst is 3-methyl-1-butene

Good Luck

Prof. Dr. Shawkat



Assiut University Academic Program: Microbiology + Chemistry & Microbiology
Faculty of Science Final Term Exam Studying Year : 2021/ 2022
Department: Botany & Microbiology Course Code B 369
Course Title: Industrial Microbiology Forth & third levels, Second semester
Total Degree: 50 marks Jun 2022 Allowable Time: Two hours

I- Choose the correct answer from the following answers:

(25 marks, one for each)

- 1- Isolation of product in any fermentation process is a step of:**
a) Up-stream process. b) Med-stream process.
c) Down-stream process. d) Folow-up process.
- 2- One of important characters in industrial fermentor is:**
a) Ease in handling. b) Ability to grow rapidly.
c) Corrosion resistant. d) Available 12 month per year.
- 3- GRAS is an important character of:**
a) Raw material b) Prepared mash
c) Industrial microbe d) Fermentor.
- 4- The ideal strategy for active dry Baker yeast production is:**
a) Feed batch fermentation b) Batch fermentation
c) Semi-continues fermentation d) Continues fermentation.
- 5- Baker yeast is:**
a) Biomass product b) Primary metabolic product
c) Secondary metabolic product d) Enzymatic product.
- 6- Ideal sugar concentration in prepared molasses for baker yeast production equal to:**
a) 7 % b) 14 %
c) 21 % d) 31 %
- 7- The drying temperature of active dry yeast is nearly:**
a) 20 °C b) 35 °C
c) 50 °C d) 55 °C
- 8- The suitable sugar concentration at the beginning of ethanol production cycle is:**
a) 1 – 5 % b) 7 – 10 %
c) 15 – 17 % d) 18 – 22 %.
- 9- Suitable temperature for ethanol fermentation depending on:**
a) Sugar concentration b) Yeast strain
c) Ethanol concentration d) Fermentation mode.
- 10- Theoretically ethanol yield from fermentable sugar by fermentation equal to:**
a) 41.1 % b) 51.1 %
c) 71.1 % d) 91.1 %.

- 11- Glycerol formed during ethanol fermentation in the presence of:
- Oxygen
 - Sodium sulfite
 - Sodium nitrite
 - Sodium nitrate.
- 12- Ethanol concentration at the beginning of vinegar production cycle is:
- 3.5 – 4.5
 - 5.5 – 6.5
 - 0.5 – 1.5
 - 0.0 – 0.5
- 13 - Clarification of vinegar achieved by using bentonite at:
- 1.000 %
 - 0.001 %
 - 0.010 %
 - 0.100 %.
- 14- Cider vinegar produced by bacterial acidification of:
- Concentrated apple juice
 - Diluted apple juice
 - Clarified apple juice
 - Fermented apple juice
- 15- 11 α -hydroxyallopergnane 3, 20-dione formed from progesterone by microbial:
- Hydroxylation
 - Dehydrogenation
 - Hydroxylation and Hydrogenation
 - Hydroxylation and dehydrogenation
- 16) Microbial Poly-hydroxylation of progesterone followed by dehydrogenation leads to the formation of:
- Cortisone
 - Cortisol
 - Prednisone
 - Andresen 3, 17 dione
- 17) Epoxidation of a steroid hormone lead to increase the:
- Activity
 - Production level
 - Productivity
 - Solubility
- 18) Dehydrogenation after side chain degradation of progesterone by *Trichurus* formed:
- Androsta-1,4 diene 3,17 dione
 - Δ^4 androsten 3,17 dione
 - Testosterone
 - Δ^4 dehydrotestosterone
- 19) The suitable carbon source for cephalosporin production is:
- Glucose
 - Lactose
 - Fructose
 - Molasses
- 20) Separation of penicillin from fermented mash can be achieved by:
- Ethyl acetate at pH 2 – 3
 - Acetone at pH 6 – 7
 - Distilled water at pH 2 – 3
 - Chloroform at pH 6 - 7
- 21) Gramicidin is one of:
- B-lactam antibiotics
 - Tetracycline's
 - Macrolide antibiotics
 - Polypeptide antibiotics
- 22) The mode of action of tetracycline is the inhibition of:
- Bacterial protein synthesis
 - Bacterial cell membrane
 - Bacterial cell wall
 - Bacterial DNA
- 23) Suitable beet molasses concentration at the beginning of citric acid production cycle is:
- 22 %
 - 33 %
 - 44 %
 - 55 %.
- 24) The ideal method for microbial citric acid production is:
- Submerged fermentation
 - Continues fermentation
 - Semi-continues fermentation
 - Surface culture fermentation.

25) The suitable carbon source for citric acid production is:

- a) Maltose
- b) Lactose
- c) Sucrose
- d) Fructose

II. Answer by True (T) or False (F) on the following statements

(25 marks, one for each)

26. Preparation of starter is one step of med-stream processes in industrial fermentation.

- a) T
- b) F

27. One of important characters in industrial fermentor is the economic volume.

- a) T
- b) F

28. Selection of raw materials for any fermentation process depend on sterilization requirements.

- a) T
- b) F

29. Active dry baker yeast is completely similar to instant active dry baker yeast.

- a) T
- b) F

30. Both living and non-living baker yeast can be used as animal feed additive.

- a) T
- b) F

31. The moisture content of prepared yeast cream is nearly 15 – 20 %.

- a) T
- b) F

32. The ideal drying method of fresh baker yeast is using the string-discharge filter operation.

- a) T
- b) F

33. Fermentation of sugarcane molasses at 17 % sugar produced ethanol at 11 % in the fermented mash.

- a) T
- b) F

34. Treatment of molasses for ethanol production achieved by only dilution into suitable concentration.

- a) T
- b) F

35. In ethanol fermentation, aeration is very important during yeast propagation.

- a) T
- b) F

36. Batch fermentation is the only strategy can be used for ethanol production.

- a) T
- b) F

37. Vinegar production is non-aerobic and exothermic fermentation.

- a) T
- b) F

38. Sterilization of vinegar achieved by microfiltration or pasteurization.

- a) T
- b) F

39. Vinegar is the result of starchy or saccharine material fermentation by acetic acid bacteria.

- a) T
- b) F

40. Testosterone can be produced from 11 α , 17 α - dihydroxy-progesterone by microbial hydroxylation.

- a) T
- b) F

Assiut university

June, 2022

Faculty of Science Chemistry Department

Time 3h

Final and oral exams of "Inorganic chemistry III" course code 324C for the third level students

ملحوظة: الامتحان يقع في اربع صفحات

Part I Final exam

Section I

(16 Marks)

Answer the following

A. Complete the following

(5 Marks)

- i. Sm^{2+} and Yb^{2+} liberate hydrogen from water indicative of theircharacter.
- ii- is the most stable divalent ion among the divalent lanthanides .
- iii. Breaking of bonds by emitted particles in a sample of a radioactive actinide element is equivalent to a process of.....
- iv- +5 oxidation state in actinide elements is very important for the element.....
- v- Very pure thorium can be obtained by thermal decomposition of

B. Give reason(s) for the following

(4 Marks)

- i. Properties of lanthanides are very similar
- ii. Zirconium and hafnium have almost the same atomic size and almost the same chemistry.
- iii. Actinides show higher oxidation states ranging from +4 to +7 while lanthanides exhibit a maximum oxidation state of +4.
- iv. Uranium ions give in aqueous solutions very complex species.

C. Answer FOUR of the following

(4 Marks)

Mark the correct sentence with ($\sqrt{\quad}$) and the false one with (x)

- i. Owing to the lanthanide contraction the basic character of the hydroxides decreases with increasing atomic number due to the decreased covalent character between the lanthanide ion and the hydroxide.
- ii. Sulphates of lanthanides are more soluble in cold water than in hot water.
- iii. Acid reactions of uranium salts increases due to hydrolysis in the order $\text{U}^{3+} > \text{UO}^{2+}$ and $\text{UO}^{2+} > \text{U}^{4+}$.
- iv. Actinide compounds are more basic than lanthanide ones.
- v. Smaller Sc^{+3} possesses greater polarizing power that induces greater covalent bonding with chelating ligands such as acetyl acetone

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D. Choose the correct answer A, B, C or D

(3 Marks)

- i. Oxidation state +7 is shown by :
a) Pa and U b) Np and Pu c) Am and Cm d) all of these pairs
- ii. Among the quadrivalent lanthanides, it was found that one of the following quadrivalent lanthanide ions is sufficiently stable in solution as well as in solid state:
a) Ce(IV) * b) Pr (IV) c) Tb(IV) d) Dy (IV)
- iii. The anhydrous lanthanide trichloride are obtained by heating the oxides or oxalates with:
a) Cl_2 b) HCl c) NH_4Cl d) the three reactions are possible.

Section II

(17 Marks)

A) For two only: answer the following:

(4Marks)

i- Write all steps of overall stability constant of substitution hexa water molecules in $[\text{Co}(\text{H}_2\text{O})]^{+3}$ with CN^- ions

ii-Discuss non-bonding orbitals in molecular orbital theory

iii-Write the configuration of d^5 in strong field in octahedral and tetrahedral

B) Complete of the following :

(3Marks)

i- In an octahedral field the two sets of d orbitals are labeledand

ii- The symbols e and t_2 refer to level . e refers to a level

iii- t_2 refers to a level . g refers to a system which possess a

C) For five only : Shade the correct answer i, ii, iii, or iv

(5Marks)

1- Cyanide ion ligands in MO of octahedral complexes has

i- π -acceptor ligands ii- π - donor ligands

iii- σ - acceptor ligands iv- σ - donor ligands

2- High spin of electrons in octahedral complexes have

i- Weak ligand and small Δ_o ii- Strong ligand and small Δ_o

iii- Strong ligand and high Δ_o iv- weak ligand and high Δ_o

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- 3- LFT for d^5 octahedral have low spin and
 i- $t_{2g}^3 e_g^2$ ii- $t_{2g}^5 e_g^0$ iii- $t_{2g}^4 e_g^1$ iv- $t_{2g}^2 e_g^3$
- 4- In tetrahedral field the higher energy set of orbitals $0.4 \Delta_t$ is labeled as t_2
 i- d_{xy}, d_{xz}, d_{yz} ii- $d_{x^2-y^2}$, and d_z^2 iii- $d_{x^2-y^2}$ iv- $d_{xy}, d_{xz}, d_{x^2-y^2}$
- 5- The correct order of the ligand field strength is
 i- $H_2O < Cl^- < CO < NH_3$ ii- $CO < NH_3 < Cl^- < H_2O$
 iii- $H_2O < CO < NH_3 < Cl^-$ iv- $Cl^- < H_2O < NH_3 < CO$
- 6- The CFSE for $[Co(Cl)_6]^{-4}$ is $18000 cm^{-1}$.then the CFSE for $[Co(Cl)_4]^{-2}$ will be
 i- $18000 cm^{-1}$ ii- $16000 cm^{-1}$ iii- $8000 cm^{-1}$ iv- $9000 cm^{-1}$

D) For five only : shade ($\sqrt{\quad}$) for true statements or (x) for false statements (5Marks)

- 1-All octahedral metal complexes will have the exact same MO diagram ,
only the number of d – electrons will change
- 2-The d- electrons in the t_{2g} and e_g^* MO theory is used in in determine
the field ligand and geometry of the metal complexes
- 3- Energy of t_{2g} is $0.4 \Delta_o$ less than the hypothetical degenerate orbital
- 4-The vivid colors are due to the electronic transition between d-orbitals of
the metal
- 5-The number unpaired electrons are present in $[CoF_6]^{-3}$ complex equal 4
- 6-Strong –field ligand know : Ligands whose orbitals interact strongly
with metal ions and e_g^* raised in energy and Δ_o is small

Section III

(17 Marks)

Answer the following questions:

- 1- Give reason(s) of only five of the following: (5 Marks)
 - i. $[NiCl_4]^{-2}$ and $Ni(CO)_4$ both have tetrahedral geometry but differ in their magnetic moment.
 - ii. Δ_o values for halide complexes generally decrease in the order:
 $F^- > Cl^- > Br^- > I^-$
 - iii. Tetrahedral crystal field splitting energy is about half of octahedral one.
 - iv. Type of hybridization of $[Cu(NH_3)_4]^{2+}$ complex ion is sp^2d .
 - v. $[Co F_6]^{3-}$ ion is paramagnetic while $[Co(CN)_6]^{3-}$ is diamagnetic.
 - vi. Splitting of d-orbitals in tetrahedral field is inverse the splitting in octahedral field.

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2- Answer **only three** of the following:

(12 Marks)

- a) i- Using VBT for $[\text{Ag}(\text{NH}_3)_2]^+$ ion predict type of hybridization and geometry of the ion.
 ii- On the basis of VBT show the geometry and magnetic moment of $\text{Ni}(\text{dmg})_2$ complex .
 (dmg = dimethylglyoximate ligand).
- b) i- Evaluate the values of CFSE in terms of Δ_0 or Δ_t for $[\text{Cr}(\text{NH}_3)_6]^{3+}$ and $[\text{CoCl}_4]^{2-}$ ions.
 ii- The magnetic moment of $[\text{Mn}(\text{CN})_6]^{3-}$ ion is 2.8 B.M., predict the type of hybridization and geometry of this ion and show whether it is inner or outer orbital octahedral one.
- c) i- Determine the number of unpaired electrons and CFSE of tetrahedral complexes of d^6 and d^9 electronic configurations.
 ii- Calculate the total pairing energy for $[\text{Cr}(\text{H}_2\text{O})_6]^{3+}$ in high and low spin states.
 (Given that mean pairing energy = $23,500 \text{ cm}^{-1}$).
- d) i- Give the electronic configuration of Rh^{+2} ion in an octahedral field for which $\Delta_0 > P$ or $\Delta_0 < P$.
 ii- "Diamagnetic $\text{Fe}(\text{CO})_5$ compound has trigonal bipyramidal geometry." [explain].

Part II Oral exam (10 Marks)

Mark correct sentence with ($\checkmark$) and the false one with (x).

(5Marks)

A.

- i. Uranium trifluoride is volatile and used for the separation of uranium isotopes.
- ii. The first and second ionization energies of lanthanides are close to those of calcium.
- iii. $[\text{NiCl}_4]^{2-}$ has square planar geometry while $[\text{Ni}(\text{CN})_4]^{2-}$ is geometrically tetrahedral.
- iv. 2-Crystal field splitting energy of $[\text{V}(\text{H}_2\text{O})_6]^{3+}$ is larger than that of $[\text{V}(\text{H}_2\text{O})_6]^{2+}$.
- v. 3-Water is a stronger ligand than OH^- anion.

B. Choose A, B, C or D from the following

(2Marks)

1. Both thorium and uranium nitrates are soluble in:
 A. Water B. Alcohols C. Ketones D. In all of them*
2. The stability of the lanthanide oxidation states is connected with the presence of:
 A. Empty, half filled or completely filled 4f orbital
 B. Thermodynamic factors C. kinetic factors D. all of them.

C. Explain why :

(3Marks)

i- The total number of unpaired electrons in two complexes
 $[\text{Cr}(\text{H}_2\text{O})_6]^{+2}$ and $[\text{Cr}(\text{CN})_6]^{-4}$ equal 6

ii- $[\text{Fe}(\text{H}_2\text{O})_6]^{+3}$ complex show zero crystal field stabilization energy

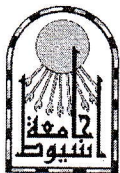
Atomic numbers: Sc=21, Ti=22, V=23, Cr=24, Mn=25, Fe=26, Co=27, Ni=28, Cu=29 Zn=30
 , Rh=45 and Ag=47

Good Luck

Examinars: Prof. Dr. Aref A. M. Aly

Prof. Dr. Mohamed Abd El-Hakeem

Prof. Dr. Asma I. El-Said



Assiut University

Applied Industrial Chemistry Program
2021-2022 Final Exam
Course Title : Instrumentation & Process Control
Course Code: Eng 300
Time: 2 H, Full Marks:50
Date:9 /6/2022



Faculty of Science
Chemistry Department

Answer The Following Questions

Question No. 1 (5 Marks).

- Define the following terminologies and give an example for each: sensor, and smart sensor.
- Draw the block diagram of open-loop and closed-loop control systems. State an example for each type.
- State only without explanation the requirements must be satisfied during the chemical plant operation.

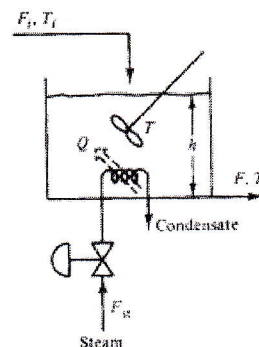
Question No. 2 (10 Marks).

- State the three general classes of needs that a control system to satisfy.
- Consider the tank heater system shown in the Figure. The operational objectives of the heater tank are:
 - To keep the Temperature T at desired value T_s .
 - To keep the volume of the liquid in the tank at desired value V_s .

Draw the following:

- Feedback temperature control for a tank heater scheme.
- Alternative volume control schemes.

What is difference between feedback and feed forward control systems?



Question No. 3 (15 Marks).

- What is meant by optimizing the performance of the chemical process? Give an example.
- A sensor resistance changes linearly from 500 to 1200 Ohm as pH changes from min to max values. Find a linear equation relating resistance and the pH. What is the resistance value for neutral substance? Show how these resistance variations can be converted into voltage.
- Describe the steps that you would go through in designing a control system for maintaining the pH of the liquid in a stirred tank at a desired value?

Question No. 4 (20 Marks).

- Define the following terms: accuracy, sensitivity and resolution.
- What is the classification of control valves based on: (i) the shape of the plug and seat, and based on: (ii) the actuator type. Find the proper valve size in inches and centimeters for pumping a water flow rate of 350 Liter/min with a maximum pressure difference of 100 psi.

Table1: Control valve coefficients

C_v	0.3	3	14	35	55	108	174	400	725
Valve Size (inches)	0.25	0.5	1	1.5	2	3	4	6	8

c. Describe the objects shown in Fig.(1) to Fig.(6), and explain its operation principles and applications:

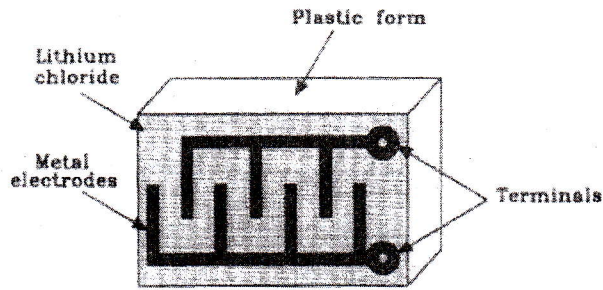


Fig.(1)

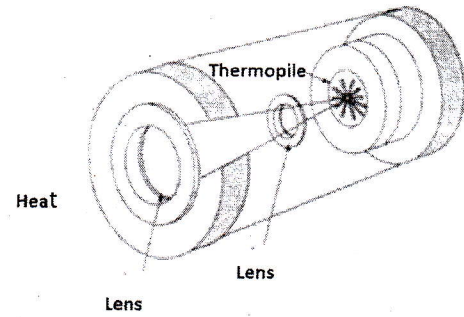


Fig.(2)

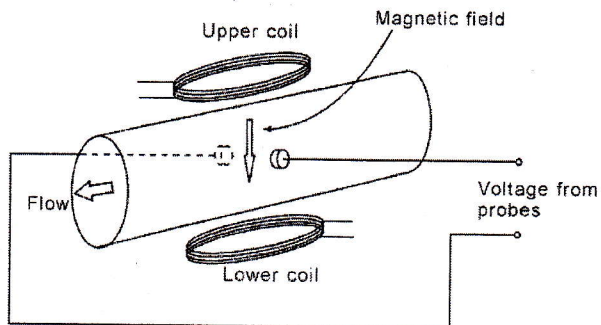


Fig.(3)

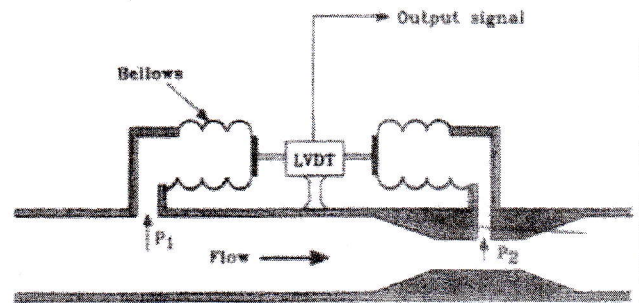


Fig.(4)

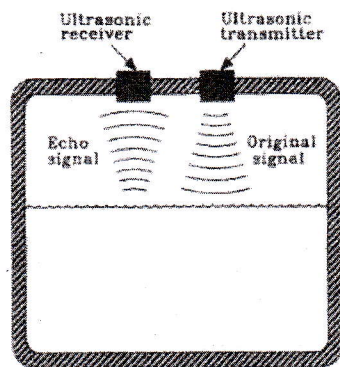


Fig.(5)

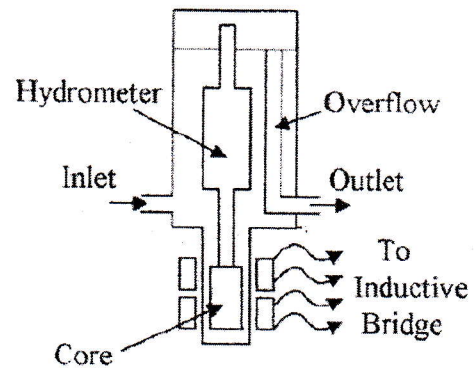
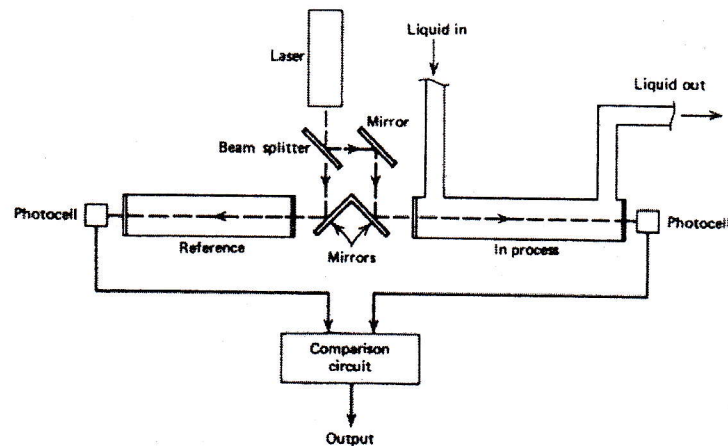


Fig.(6)

d. Explain the operation principles of the process shown below. State a practical application of this process.



Assiut University	Second Semester	June 2022
Faculty of Science	Analytical Chemistry (1) (C-342)	Time: 2 hour
Chemistry Department	Third Level (Credit Hours)	

Answer the Following Questions: (60 Marks)

Q.1: Choose the Correct Answer: (30 Marks)

- The specific conductance of conductor is reciprocal of
 (A) Equivalent conductance (B) Specific resistance
 (C) Molar conductance (D) All of them
- Which of the following solutions has the least value of conductivity?
 (A) 0.01M Na₂SO₄ (B) 0.01M NaCl
 (C) 0.01M CH₃COOH (D) 0.01M HCl
- The conductivity (k) of drinking water is
 (A) 0.055 $\mu\text{S}/\text{cm}$ (B) 1.0 $\mu\text{S}/\text{cm}$ (C) 50-500 $\mu\text{S}/\text{cm}$ (D) None
- The Λ_m when the concentration approaches zero is called
 (A) Molar conductivity at finite dilution (Λ^0)
 (B) Limiting molar conductivity (Λ^0) (C) A & B (D) None
- Which of the following equations is (are) correct?
 (A) $G = \frac{1}{R}$ (B) $R = \frac{\rho L}{A}$ (C) $G = \frac{k A}{L}$ (D) All of them
- Which of the following equations is (are) true for molar conductivity (Λ_m)?
 (A) $\Lambda_m (\text{S} \cdot \text{cm}^2 \text{mol}^{-1}) = \frac{\text{S} \cdot \text{cm}^{-1}}{\text{mol} \cdot \text{L}^{-1}} \times \frac{1000 \text{ cm}^3}{1 \text{ L}}$
 (B) $\Lambda_m (\text{S} \cdot \text{m}^2 \text{mol}^{-1}) = \frac{\text{S} \cdot \text{m}^{-1}}{\text{mol} \cdot \text{L}^{-1}} \times \frac{1 \text{ m}^3}{1000 \text{ L}}$
 (C) A & B (D) None
- For strong electrolytes molar conductivity increase slowly with dilution and can be represented by
 (A) Debye Huckel Onsager equation (B) Nernst equation
 (C) Kohlrausch's equation (D) None
- The conductivity of 0.001028 mol L⁻¹ acetic acid (HAc) is $4.95 \times 10^{-5} \text{ S cm}^{-1}$. The degree of dissociation and its dissociation constant are : ($\Lambda_{\text{HAc}}^0 = 390.5 \text{ S cm}^2 \text{mol}^{-1}$)
 (A) 10.33% , $K_{\text{HAc}} = 1.8 \times 10^{-3}$
 (B) 12.33% , $K_{\text{HAc}} = 1.8 \times 10^{-5}$
 (C) 11.33% , $K_{\text{HAc}} = 1.8 \times 10^5$
 (D) None
- Which of the following is (are) correct for sparingly soluble salt?
 (A) $\Lambda_{\text{salt}} = \Lambda_{\text{salt}}^0 = \Lambda_{\text{cation}}^0 + \Lambda_{\text{anion}}^0$
 (B) $\Lambda_{\text{salt}} = \Lambda_{\text{salt}}^0 = \Lambda_{\text{cation}}^0 - \Lambda_{\text{anion}}^0$
 (C) $k_{\text{salt}} = k_{\text{solution}} - k_{\text{solvent}}$
 (D) A & C

- 10- Two electrolytes X and Y are diluted. " Λ_m " of Y increases 1.5 times and for X it increases 25 times. Predict the strong electrolyte among X and Y.
- (A) X (B) Y
(C) Both A & B (D) There is no effect of dilution on nature of electrolyte

- 11- The number of ions in increases with dilution due to an increase in dissociation.

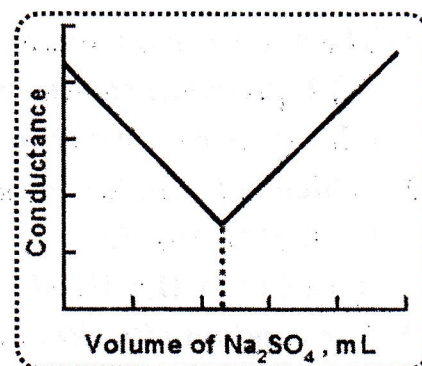
- (A) a strong electrolyte (B) a weak electrolyte
(C) non-electrolyte (D) None of them

* In answering questions 12-15, consider the following conductometric titration curve for BaCl_2 with Na_2SO_4

- 12- Before titration, which of the following statements is correct?

- (A) The presence of Na^+ with a high ionic conductivity results in a high conductance.
(B) The presence of Ba^{2+} with a high ionic conductivity results in a high conductance.

- (C) A & B (D) None of them



- 13- During titration till equivalence point, which of the following statements is correct?

- (A) Ba^{2+} with high ionic conductivity is replaced by Na^+ with low ionic conductivity (Low Conductance)
(B) Na^+ with low ionic conductivity is replaced by Ba^{2+} with high ionic conductivity (Low Conductance)
(C) Ba^{2+} with low ionic conductivity is replaced by Na^+ with high ionic conductivity (Low Conductance)
(D) None of them

- 14- At equivalence point, which of the following statements is (are) correct?

- (A) All BaCl_2 has reacted with Na_2SO_4 (B) BaSO_4 and NaCl are present
(C) A & B (D) None of them

- 15- After equivalence point, which of the following statements is (are) correct?

- (A) Excess Na_2SO_4 is added which can dissociate to Na^+ and SO_4^{2-}
(B) Excess Na^+ and SO_4^{2-} will decrease conductance of solution
(C) A & B (D) None of them

- 16- The problem with data detection in is that current varies over lifetime of drop, giving variation on current over curve.

- (A) Tast polarography (B) DC polarography
(C) Normal pulse polarography (D) Cyclic voltammetry

- 17- In polarography voltage is applied between

- (A) Working and reference electrodes (B) Working and counter electrodes
(C) Reference and counter electrodes (D) None of them

- 18- 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) $I_d = 607 n D^{1/2} C m^{1/2} t^{1/6}$
(C) $I_d = 607 n D^{1/2} C m^{1/6} t^{2/3}$ (D) $I_d = 607 n D^{1/2} C m^{2/3} t^{1/6}$

- 19- The pulse waveforms are designed to enhance the relative to the, leading to significantly improved detection limits
 (A) Faradaic current , charging current (B) Diffusion current , Faradaic current
 (C) Capacitive current , Faradaic current (D) Non-Faradaic current , limiting current
- 20- Which of the following groups is (are) reduced in the polarography?
 (A) $-\text{NO}_2$ (B) $\text{C}=\text{O}$ (C) $-\text{OH}$ (D) A & B
- 21- Convection current in polarography is eliminated by.....
 (A) Addition of KCl (B) Unstirred solution
 (C) Supporting electrolyte (D) Buffer solution
- 22- In cyclic voltammetry, the describes the effect of scan rate on the peak current (I_p).
 (A) Randles-Sevcik equation (B) Ilkovic equation
 (C) Boltzmann equation (D) Heyrovsky-Ilkovic Equation
- 23- The reversible oxidation of Rutin (RU) is a $2e^-$ process. A cyclic voltammetric anodic peak current (I_{Pa}) of $2.2 \mu\text{A}$ is observed for 0.4 mM solution of RU in acetate buffer at a carbon rod electrode of 2.6 mm^2 with a scan rate of 25 mV/s . What will I_{Pa} be for $v = 100 \text{ mV/s}$ and 1.2 mM RU?
 (A) $13.2 \mu\text{A}$
 (B) $26.4 \mu\text{A}$
 (C) 13.2 mA
 (D) 26.4 mA
- 24- involves the measurements of currents at constant voltage applied at the dropping mercury electrode.
 (A) Pulsed polarography (B) Differential pulsed polarography
 (C) Amperometry (D) Square wave voltammetry
- 25- Auxiliary electrode is used in polarography to
 (A) Prevent the residual current
 (B) Prevent the current passing through reference electrode
 (C) Eliminate the migration current
 (D) Decrease diffusion current
- 26- Diffusion current is directly proportional to
 (A) Molecular weight
 (B) Volume of supporting electrolyte solution
 (C) Volume of sample solution
 (D) Concentration of electroactive material
- 27- Half wave potential is dependent of
 (A) Volume of electroactive species
 (B) Concentration of supporting electrolyte
 (C) Dissolved oxygen
 (D) Nature of electroactive species
- 28- The main instrumental parameter in the is the scan rate.
 (A) Differential pulse voltammetry (B) Cyclic voltammetry
 (C) Normal pulse (D) None

29- At the dropping mercury electrode, the dissolved oxygen is reduced, resulting in polarographic waves.

- (A) One (B) Two (C) Three (D) None

30- All the following are advantages of solid electrodes based on carbon, except

- (A) Broad potential window (B) Low background current
(C) Low cost (D) A fast electron transfer rate

Q.2: Mark (✓) for the correct statement and (X) for the wrong statement: (20 Marks)

31- Reference electrodes should possess a high signal-to-noise ratio characteristic.

32- Hg is oxidized; it restricts the use of electrode as anode.

33- In cathodic stripping methods, the working electrode behaves as a cathode during the deposition step.

34- Convection is the movement of ions from a region of lower concentration to a region of higher concentration.

35- Linear sweep voltammetry is performed by applying a linear potential ramp in the same manner as D.C polarography.

36- For a fast one electron transfer, the peak separation (ΔE_P) = 59 mV.

37- Heyrovsky-Illkovic equation determines the number of electrons from the slope.

38- In normal pulse voltammetry, the output of the current response is a symmetric Peak.

39- For reversible systems E_{pa} and E_{pc} are dependent on the scan rate.

40- Polarizable electrode such as Ag/AgCl can take up any potential applied to it.

41- For weak electrolyte we can't obtain molar conductivity at infinite dilution (Λ°) by extrapolation of Λ_m versus $\sqrt{C}$ plots.

42- On diluting the solution, the concentration of ions per cm^3 increases, hence the specific conductance decreases.

43- Upon carrying out the conductometric titration; the titrant used must be at least 10 times concentrated as the solution to be determined.

44- An increase of temperature by 1 °C is accompanied by 20.0% increase in conductance.

45- The conductivity of metal is due to mobility of protons and electrons.

46- The number of ions in a weak electrolyte decreases with dilution due to an increase in dissociation.

47- The conductance (G) is directly proportional to the surface area.

48- Conductivity is customarily reported in smaller units as mS/m or $\mu\text{S}/\text{cm}$.

49- Higher the degree of dissociation of weak electrolyte, larger is the molar conductivity.

50- The conductance of an electrolytic solution is unaffected by ion velocity.

Q.3: Oral Exam (10 Marks)

Mark (✓) for the correct statement and (X) for the wrong statement:

- 51- In a conductance cell, the Pt electrodes must be covered by Pt black this will give low surface area.
- 52- Dilution decreases specific conductivity while decreasing equivalent and molar Conductance.
- 53- " Λ_m " of strong electrolyte remains almost constant upon dilution.
- 54- The hydrogen ion has highest conductance due to high mobility and small size.
- 55- Conductivity is defined as the ability to carry current.
- 56- Microelectrodes reach the state of polarization very rapidly.
- 57- Supporting electrolyte is reactive electrolyte used in electrochemical cells.
- 58- In differential pulse voltammetry small pulses of constant amplitude are superimposed on a staircase wave applied to the working electrode.
- 59- One important application of voltammetry is in the construction of electrochemical biosensors.
- 60- The migration current in polarography is expressed by the Ilkovic equation.

♣♣♣ GOOD LUCK ♣♣♣

Examiner: Prof. Dr. Hossieny Ibrahim

Physical Chemistry III Examination (C-332) for Third Level Students

Note: The Examination is in Four pages. Shade the correct answer in the bubble sheet as shown ● and do not shade more than one circle for each statement:

Section I: Final Examination: (50 Marks, 25 points, 2 Marks for each point)

Q1: Choose and shade the correct answer among (A), (B) or (C) for each statement of the following statements: (24 Marks, 12 points, 2 Marks for each point)

I- Quantum Chemistry Section

- 1 - The energy of degenerate states for a particle moves in a cube with length L with one of the three quantum numbers (n_x , n_y and n_z) equals one, the second equals two and the third equal three, is

(A) $E = \frac{2h^2}{8mL^2}$

(B) $E = \frac{14h^2}{8mL^2}$

(C) $E = \frac{5h^2}{8mL^2}$

- 2 - Schrödinger equation as a function of the spherical polar coordinates is

(A) $\frac{1}{r} \frac{\partial}{\partial r} r^2 \frac{\partial \psi}{\partial r} + \frac{1}{r^2 \sin \theta} \frac{\partial}{\partial \theta} \sin \theta \frac{\partial \psi}{\partial \theta} + \frac{1}{r^2 \sin^2 \theta} \frac{\partial^2 \psi}{\partial \phi^2} + \frac{8\pi^2 m^2}{h^2} (E - u) \psi = 0$

(B) $\frac{1}{r^2} \frac{\partial}{\partial r} r^2 \frac{\partial \psi}{\partial r} + \frac{1}{r^2 \sin \theta} \frac{\partial}{\partial \theta} \sin \theta \frac{\partial \psi}{\partial \theta} + \frac{1}{r^2 \sin^2 \theta} \frac{\partial^2 \psi}{\partial \phi^2} + \frac{8\pi^2 m}{h^2} (E - u) \psi = 0$

(C) $\frac{1}{r^2} \frac{\partial}{\partial r} r^2 \frac{\partial \psi}{\partial r} + \frac{1}{r^2 \sin \theta} \frac{\partial}{\partial \theta} \sin \theta \frac{\partial \psi}{\partial \theta} + \frac{1}{r^2 \sin^2 \theta} \frac{\partial^2 \psi}{\partial \phi^2} + \frac{8\pi^2 m}{h^2} (E - u) \psi = 0$

- 3 - The rotational motion energy for two microscopic particles rotating around their mass center is

(A) $\frac{h^2}{2I} \ell(\ell + 1)$

(B) $\hbar^2 \ell(\ell + 1)$

(C) $\frac{\hbar}{2I} \sqrt{\ell(\ell + 1)}$

where ℓ is angular momentum quantum number.

- 4 - The number of degenerate states for a particle moves in a square with length L with one of the two quantum numbers (n_x and n_y) equals one and the second equals two is

(A) Four states

(B) six states

(C) two states

II- Molecular Spectroscopy Section:

- 5 - The ESR frequency for a free electron is 9000 MHz. Calculate the magnetic field at which the ESR spectrometer is working, (Bohr magneton $\beta = 9.273 \times 10^{-24} \text{ JT}^{-1}$, g value = 2).

(A) 321.5 MHz

(B) 321.5 mT

(C) 0.3215 mT

6 - Find the frequency at which a proton NMR spectrometer should be operating under a magnetic field 1.8 T ($g_N = 2 \times 2.7245$, $\mu_N = 5.0504 \times 10^{-27} \text{ JT}^{-1}$).

- (A) 74.8 MHz (B) 44.7 MHz (C) 67.7 MHz

7 - The equilibrium frequency of $^{12}\text{C}^{16}\text{O}$ corresponds to 2143 cm^{-1} . Calculate the frequency of $^{13}\text{C}^{16}\text{O}$ using integer mass numbers.

- (A) 2000 cm^{-1} (B) 3095 cm^{-1} (C) 2095 cm^{-1}

8- Assuming equilibrium frequency of ^{35}HCl molecule to correspond to 2886 cm^{-1} .

Calculate the force constant of ^{35}HCl molecule.

- (A) 477 Nm^{-1} (B) 400 Nm^{-1} (C) 2000 Nm^{-1}

III- Kinetic Theory of Gases Section:

9 - Calculate the probability density for v_x of O_2 molecules at 300 K at 600 ms^{-1} .

- (A) $8.022 \times 10^{-4} \text{ s} \cdot \text{m}^{-1}$ (B) $1.429 \times 10^{-3} \text{ s} \cdot \text{m}^{-1}$ (C) $1.419 \times 10^{-4} \text{ s} \cdot \text{m}^{-1}$

10 - The vapor pressure of solid beryllium was measured by using a Knudsen cell. The effusion hole was 0.318 cm in diameter, and they found a mass loss of 9.54 mg in 60.1 min at a temperature of 1457 K. What is the vapor pressure?

- (A) 0.669 Pa (B) 0.68 Pa (C) 0.968 Pa

11 - For molecular oxygen at 25°C , calculate the collision frequency z_{11} at a pressure of 1 bar. The collision diameter of oxygen is 0.361 nm.

- (A) $0.26 \times 10^{-8} \text{ s}^{-1}$ (B) $6.24 \times 10^9 \text{ s}^{-1}$ (C) $1.16 \times 10^7 \text{ s}^{-1}$

12- Calculate the viscosity of molecular oxygen at 273.2 K and 1 bar. The molecular diameter is 0.36 nm.

- (A) $0.26 \times 10^{-5} \text{ kg m}^{-1} \text{ s}^{-1}$ (B) $1.926 \times 10^5 \text{ kg m}^{-1} \text{ s}^{-1}$ (C) $1.926 \times 10^{-5} \text{ kg m}^{-1} \text{ s}^{-1}$

Q2: Choose and shade True (T) for the correct statements or False (F) for the wrong ones for each statement of the following statements:

(26 Marks, 13 points, 2 Marks for each point)

I- Quantum Chemistry Section

13 - From black body radiation phenomenon, according to Stefan-Boltzmann law, the emittance (M) is inversely proportional to fourth power of absolute temperature. (T) (F)

14 - The normalization factor of a wavefunctions $\psi_n = A \sin \frac{n\pi x}{a}$ is $\sqrt{\frac{a}{2}}$. (T) (F)

15 - From black body radiation phenomenon, according to Wien's displacement law, v_{max}

(the frequency at which maximum emittance takes place) is directly proportional to absolute temperature. (T) (F)

16 - While according to classical mechanics, the ejection of the electron from metal surface depends on frequency of the photons in the incident light, its ejection according to quantum mechanics depends on the intensity of the incident light. (T) (F)

17 - In rotational motion for a microscopic particle, each level is doubly degenerate. (T) (F)

II- Molecular Spectroscopy Section:

18 - The relative energy levels of the three transition processes are in the order electronic > vibrational > rotational. (T) (F)

19- In asymmetric top molecule, two moments of inertia are equal and the third is not equal to both or zero. (T) (F)

20 - Shifting the absorption maximum to longer wavelength means hypsochromic shift. (T) (F)

21 - Symmetric stretching in CO₂ is Raman active. (T) (F)

III- Kinetic Theory of Gases Section:

22 - At constant temperature, a gas with higher molecular mass shows a narrow distribution of speeds compared to that shown by a low-molecular weight gas. (T) (F)

23 -The collision frequency of a gas is inversely proportional with the mean speed. (T) (F)

24 - The distribution of energy among molecules depends on temperature. (T) (F)

25 - Gases transfer heat by direct collisions between molecules, and their thermal conductivity is low compared to most solids. (T) (F)

Section II: Oral Examination

Q3: Choose and shade the correct answer among (A), (B) or (C) for each statement of the following statements: (10 Marks, 5 points, 2 Marks for each point)

I- Quantum Chemistry Section:

26 - In rotational motion, the relation between kinetic energy operator ($\hat{T}$) and angular momentum operator ($\hat{L}$) is

(A) $\hat{T} = \frac{\hat{L}^2}{2}$

(B) $\hat{T} = \frac{\hat{L}^2}{2I}$

(C) $\hat{T} = \hat{L}^2$

II- Molecular Spectroscopy Section:

27- The absorption of 5.4×10^{-4} M solution of Fe^{3+} at 530 nm was 0.54, when measured in a cell with 1 cm path length. Calculate molar absorption coefficient.

- (A) $10^4 \text{ M}^{-1} \text{ m}^{-1}$ (B) $10^5 \text{ M}^{-1} \text{ m}^{-1}$ (C) $10^3 \text{ M}^{-1} \text{ m}^{-1}$

28- An irradiated sample of MgO has a strong ESR line at 0.163 T, when the spectrometer is operating at 9.4 GHz. What is the g-value of the line, (Bohr magneton $\beta = 9.273 \times 10^{-24} \text{ JT}^{-1}$).

- (A) 4.13 (B) 2.002 (C) 2.005

III- Kinetic Theory of Gases Section:

29- Calculate the most probable speed for hydrogen molecules at 0°C .

- (A) $1.5 \times 10^3 \text{ ms}^{-1}$ (B) $1.84 \times 10^3 \text{ ms}^{-1}$ (C) $1.69 \times 10^3 \text{ ms}^{-1}$

30- What is the mean relative speed of hydrogen molecules with respect to oxygen molecules at 298 K?

- (A) 1824 m s^{-1} (B) 2824 m s^{-1} (C) 8.26 m s^{-1}

($R = 0.082 \text{ L atm K}^{-1} \text{ mol}^{-1}$, $8.314 \text{ J K}^{-1} \text{ mol}^{-1}$, $1.987 \text{ cal K}^{-1} \text{ mol}^{-1}$, Avogadro's number = 6.022×10^{23} , $h = 6.626 \times 10^{-34} \text{ JT}^{-1}$, $K = 1.381 \times 10^{-23} \text{ JK}^{-1}$, speed of light $3.0 \times 10^{10} \text{ cm s}^{-1}$, $\pi = 3.141$, atomic weight of Cl = 35, H = 1, O = 16, Be = 9.012).

With Our Best Wishes

Examiners:- 1- Prof. Dr. AbdelRahman A. Dahy 2- Dr. Mostafa Farrag

Answer only Five from the following questions

Q1: State (✓) or (×) for only 10 of the following (10 marks)

- 1- Atmospheric corrosion is considered as a uniform corrosion.
- 2- Dust particles enhance the protection of the metal surface.
- 3- Dry chlorine gas attacks the silver metal surface and form porous non-protective layer of AgCl.
- 4- The acidic solutions are more corrosive than the neutral ones.
- 5- Wet corrosion occurs on both homogenous and heterogeneous surfaces.
- 6- Wet corrosion is faster than dry corrosion.
- 7- The attack of chlorine gas as above in point no.3 is a dry corrosion.
- 8- Dry corrosion is an electrochemical in nature.
- 9- High corrosion resistance materials with corrosion rate ≤ 1.0 mm/y.
- 10- The effect of pH on corrosion current of each metal has been constructed by Pourbaix diagram.
- 11- Immunity domain represents the state in which corrosion is thermodynamically impossible in a particular environment.

Q2: Choose the correct answer for only 10 of the following (10 marks)

- 1- A direct cost of corrosion is
a) protection cost b) occurrence of disaster
c) stop of production d) decrease the cost of materials
- 2-The metal that form a stable surface oxide which prevents further corrosion is ..
a) Zn b) Mg c) Fe d) Al
- 3-The metal that forms an unstable surface oxide which undergoes back to metal
a) Fe b) Mn c) Pt d) Cr
- 4- The cathodic reaction during corrosion of iron in neutral aqueous solution is
a) $\text{Fe}^{2+} + 2 \text{e}^- \rightarrow \text{Fe}$ b) $\text{O}_2 + 4 \text{H}^+ + 4 \text{e}^- \rightarrow 2 \text{H}_2\text{O}$
c) $\text{O}_2 + 2 \text{H}_2\text{O} + 4 \text{e}^- \rightarrow 2 \text{H}_2\text{O}$ d) $2 \text{H}_2\text{O} \rightarrow \text{O}_2 + 2 \text{H}_2\text{O} + 4 \text{e}^-$
- 5- One factor is not necessary for the corrosion process.
a) corroded metal b) electrolyte solution.
c) Oxygen d) cathodic sites
- 6- Caustic embrittlement of boilers is due to hydrolysis of
a) CaSO_4 b) $\text{Mg}(\text{NO}_3)_2$ c) $\text{Ca}(\text{OH})_2$ d) Na_2CO_3
- 7-The corrosion rate unit of the SI system is
a) mdd b) mm/y c) mpy d) other
- 8- A direct reaction of oxygen with the metal surface in absence of moisture is consider as
a) dry corrosion b) wet corrosion c) atmospheric corrosion d) general corrosion
- 9-Pitting occurs under conditions.
a) stirring b) hot c) stagnant d) de-aerated
- 10-The corrosion rate unit mdd is
a) milligrams per square centimeter per day b) milligrams per square meter per day
c) milligrams per square millimeter per day d) milligrams per square decimeter per day
- 11- For protection of a steel tank which metal is used as a sacrificial anode
a) Al b) Mg c) Ni d) Cu

(مستمر)

Q3: Complete only 20 of the following statements (10 marks)

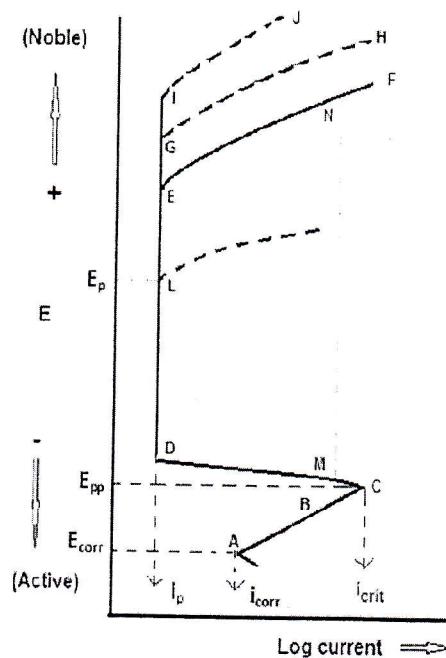
- 1-.....corrosion occurs when dissimilar metals are physically joined in the presence of an electrolyte.
- 2- is a localized form of corrosive attack.
- 3-Some inorganic compounds work as cathodic inhibitors like
- 4- Corrosion along grain boundaries leads to form corrosion.
- 5- Graphitization is an example of..... corrosion.
- 6-Bio-corrosion is corrosion of metals promoted by
- 7-..... is caused by relative motion between the metal surface and the corrosive fluid.
- 8-There are compounds which react with dissolved oxygen and remove it from the neutral or alkaline corrosive environment, these oxygen scavengers such as
- 9- Passivators react to form passive oxide films on the anodic sites of corroded metal, such as
- 10- For materials selection of nitric acid storage tank is
- 11- For materials selection of distilled water storage tank is
- 12- Increasing anodic or cathodic polarization leads to corrosion rate.
- 13- The storage containers of liquids and solutions should be designed in such a manner that they can be completely.
- 14-is one of the principal cause of corrosion problems
- 15- Organic inhibitor molecules attach to metal surfaces by
- 16- corrosion occurs within confined spaces formed by certain mechanical configurations.
- 17- The area of the metal in contact with the more diluted solution is to the more concentration ones.
- 18-SCC is the cracking induced from the combined influence of..... and
- 19- The scratched or abraded area is and the rest of metal is
- 20- Dust particles absorb moisture from the air due to their nature
- 21- The metals and alloys in service are thermodynamically

Q4: Define the corrosion inhibitors; indicate their work mechanisms and their types with examples. (10 marks)

Q5: From the following anodic polarization diagram for a metal in a given corrosive medium:

i) Define the potentials and currents indicated (E_{pp} , E_p , I_p ,...) in the diagram. (4 marks)

ii) Explain the points and lines represented by characters A, B, C,.... (6 marks)



(مستمر)

Q6: What is the forms of corrosion, explain one form of corrosion, its definition, causes, examples and how can avoid or protect the metal from this type of corrosion? (10 marks)

مع اطيب التمنيات بالتوفيق..
الاستاذ الدكتور / أبو الحجاج عبدالعزيز هرماس



المادة: ع.ت. ١٣٠٨١ كيمياء و تحليل الاغذية والالبان

القسم: علوم وتكنولوجيا الأغذية

الزمن : ساعتان

الفرقة: الثالثة- كلية العلوم

لجنة الممتحنين: أ.د. سامي ابراهيم الصياد

(٦٠ درجة)

أجب عن الاسئلة التالية :

ضع علامة (√) أو (x) أمام العبارات الاتية :

- ١- () Sample procedure يراد بها تحديد تتابع خطوات معينة تضمن سحب عينة ذات الصفات التي يتصف بها الكم الكلي Bulk موضع التحليل.
- ٢- () Consignments يقصد بها الأجزاء المتماثلة من المادة الغذائية الكلية ويتم سحبها بطريقة عشوائية تضمن تمثيل الغذاء الكلي تمثيلاً واقعياً.
- ٣- () Micro heterogeneity ويقصد به الاختلاف الموجود داخل الأجزاء المختلفة للوحدات التي يتكون منها الغذاء.
- ٤- () البروتينات والدهون والعناصر المعدنية والألياف تتواجد بتركيزات أقل في الطبقات الخارجية للحبوب مقارنة بتركيزاتها في الإندوسبرم.
- ٥- () لضمان اخذ عينة ممثلة ضرورة سحب العينة بطريقة عشوائية Random بلا أي تحيز.
- ٦- () أنواع العينات الغذائية Types of samples هي Semi-processed Materials Raw Materials, Processed Materials.
- ٧- () من أغراض فحص الأغذية هو تحديد مدى القبول أو الرفض ، تقييم الجودة ، تحديد درجة التجانس.
- ٨- () يستخدم السارق في سحب العينات السائلة بينما أنبوبة سحب العينات تستخدم في أخذ عينات الحبوب والبقوليات.
- ٩- () من أهم طرق الحفظ للعينات لحين تحليلها التبريد عند ٤٠ م° (في الثلجة) في حالة إجراء التحليل في غضون ساعات محدودة من سحب العينة والتجميد عند ٢ م° أو أقل إذا كان التحليل سيتم بعد فترة طويلة.
- ١٠- () أهم المواد الحافظة شائعة الاستخدام في حفظ الاغذية حامض البنزويك وبنزوات الصوديوم و حامض السوربيك وسوربات الصوديوم.
- ١١- () Phenoxetol-٢-phenoxy ethanol تستخدم في حالة حفظ المستحضرات الإنزيمية وهي مادة تعتبر مضادة للبكتيريا والفطريات في آن واحد.
- ١٢- () Precision يقصد به مدى تطابق النتائج لذات العينة أو مكرراتها داخل نفس المعمل تحت نفس الظروف.
- ١٣- () Sensitivity يقصد بها الطريقة التحليلية المستخدمة في تقدير مكون ما بأنها أقل كمية يمكن قياسها من المكون بهذه الطريقة (أقل فرق يمكن قياسه بين عينتين).

سامي الصياد

- ١٤- () الماء الموجود في الأغذية كوسط اذابة يطلق عليه الماء الحر Chemical Water.
- ١٥- () يتم الكشف عن غش الأغذية Food Adulteration من خلال تقدير الرطوبة بطرق مباشرة كما في حالة غش اللبن بالماء والذي يؤدي إلى خفض نسبة (TSS) والمواد الصلبة الكلية Total Soluble Solids والتي يمكن قياسها بطرق مختلفة مثل استخدام اللاكثوميتر Lactometer.
- ١٦- () تعد الكربوهيدرات من المصادر الرئيسية للطاقة التي يحصل عليها الإنسان من غذائه (حوالي ٧٠%) ، ولها صفاتها الطبيعية ودورها الوظيفي الهام في المنتجات الغذائية.
- ١٧- () ينصح تغذوياً أن يكون النشا هو المصدر الرئيسي للطاقة التي يحصل عليها الإنسان من الكربوهيدرات.
- ١٨- () عند تقدير الرطوبة باستخدام الحرارة المرتفعة في حالة المنتجات المرتفعة في محتواها من السكر - قد يحدث عنها تكرمل Caramelization أو هدم Decomposition للسكر مع فقد الماء.
- ١٩- () يعتبر الجليكوجين الصورة المخزنة من الكربوهيدرات في الكبد بينما الجلوكوز بمثابة السكر الرئيسي في الدم.
- ٢٠- () Oligosaccharides وهي تتكون من إرتباط ٢- ١٠ وحدات من السكريات الأحادية مع بعضها بواسطة مجموعة OH- من سكر مع مجموعة مختزلة من سكر آخر حيث ترتبط الجزيئات برابطة جليكوسيدية glycosidic bond مثل سكر ثنائي كالكروز ، المالتوز.
- ٢١- () Clarification تجري علي المستخلص السكري لمعظم الأغذية قبل إجراء عملية التقدير الكمي- حيث أن المستخلص يحتوي علي بعض الشوائب والتي تعيق عملية التقدير للسكريات بها- فمثلاً العكارة الناتجة عن البروتينات والنشا الذائب تؤثر علي القياسات البولاريمترية.
- ٢٢- () من أهم المواد المروقة المستخدمة لترويق المستخلصات السكرية هي خلات الرصاص المتعادلة $(CH_3-COO)_2Pb$ وخلات الرصاص القاعدية $(CH_3-COO)_2Pb \cdot Pb(OH)_2$.
- ٢٣- () تضاف كربونات الكالسيوم عند استخلاص السكريات من عينه غذائية.
- ٢٤- () الفورمالدهيد (الفورمالين) يستخدم لحفظ البذور الزيتية والفاكهة واللبن- ولايستخدم الفورمالدهيد لحفظ العينات المراد تقدير الكربوهيدرات بها.
- ٢٥- () يستخدم التولوين كأحد المذيبات العضويه عند تقدير الرطوبة بطريقه بديويل.
- ٢٦- () لا يفضل تقدير الرطوبة بفرن التجفيف العادي خاصه في العينات المرتفعه في محتواها من السكر او الدهن.
- ٢٧- () سكر القصب من السكريات البسيطه المختزله بينما سكر اللبن من السكريات المركبه غير المختزله
- ٢٨- () Hydrophilic balance هي توزيع جزيئات المكون الليبيدي ما بين الوسطين الدهنى والمائى.
- ٢٩- () الأحماض الدهنية الضرورية (الأساسية) وتشمل أحماض اللينوليك - اللينولينك وهي لا يستطيع الجسم تكوينها لابد من الحصول عليها من مصادر خارجيه في الغذاء.
- ٣٠- () تعتبر الليبيدات مصدر للفيتامينات الذائبة فى الماء مثل A, K, E, D.
- ٣١- () Wet Extraction يعتمد على استخلاص الزيت أوالدهن من المواد الغذائية كما هى بدون تجفيفها قبل الاستخلاص مثل طريقه فولش.
- ٣٢- () كلما احتوي الدهن علي كمية مرتفعة من الأحماض الدهنية غير المشبعة كلما إنخفضت نقطة إنصهاره نسبياً ، وكان سائلاً علي درجة حرارة الغرفة مثل الزيوت النباتية.
- ٣٣- () رقم الحموضة Acid value هو عبارة عن عدد ملليجرامات البوتاسا الكاوية اللازمة لمعادلة كافة الأحماض الدهنية المنفردة (الحررة) الموجودة في ١ جم زيت أو دهن.
- ٣٤- () يفضل الترميد الجاف للعينة عند تقدير العناصر المعدنية الصغري.
- ٣٥- () يستخدم إختبار الـ TBA للتعرف علي محتوى العينة من السكريات.

- ٣٦- () تقدير الرماد له أهميته في تقييم جودة السكر، الدقيق والمربي.
- ٣٧- () المستخلص المتحصل عليه بطريقه فولش يعطي الـ total fat ، يصلح استخدامه لدراسة خواص الليبيدات.
- ٣٨- () يقاس معامل الانكسار للزيت عند درجة ٢٠ م° ولدهون عند ٤٠ م°.
- ٣٩- () يفضل استخدام عامل الترويق للمستخلص السكري في صورة محلول مخفف.
- ٤٠- () من المهم استخلاص الليبيدات من العينة قبل استخلاص الكربوهيدرات وتقديرها.
- ٤١- () رماد المادة الغذائية هو عبارة عن المتبقي غير العضوي بعد حرق المادة العضوية وتعرف هذه العملية بالترميز Ashing.
- ٤٢- () قلوية الرماد هي عبارة عن عدد مليلترات حمض الهيدروكلوريك (١ ع) والتي تتفاعل مع الرماد الذائب في الماء والناتج من ١٠٠ جم من المادة الغذائية ويفيد هذا التقدير في الكشف عن غش بعض الاغذية.
- ٤٣- () النشا والجليكوجين من السكريات العديدة والتي تدخل في البناء الهيكلي الصلب لجدر الخلايا.
- ٤٤- () من اهم الخواص الطبيعية للزيوت والدهون Physical Properties of Fats الكثافة والوزن النوعي ونقطه الانصهار.
- ٤٥- () يفضل استخلاص السكريات من العينة بالكحول الساخن ١٠٠%.
- ٤٦- () ينتج من احتراق ١ جم بروتين يعطى ٤.٣ كالورى.
- ٤٧- () Deleading تجري بهدف التخلص من الرصاص الزائد بعد عملية الترويق - حيث أن الرصاص يتداخل في التفاعلات التي تعتمد علي الإختزال.
- ٤٨- () Maltose هو سكر ثنائي يتكون من جزئين جلوكوز مرتبطين برابطة جليكوسيدية ألفا ١-٤ وينتج من التحلل المائي للنشا، ويشابهه السليبولوز وينتج من تحلل السليلولز ولكن الرابطة بيتا ١-٤.
- ٤٩- () السكريات العديدة التغذوية Nutritional polysaccharides وهي مركبات يتم تخزينها ميتابولزمياً في النبات والحيوان في صورة النشا والجليكوجين علي التوالي.
- ٥٠- () تلعب الكربوهيدرات دوراً حيوياً في العمليات الفسيولوجية في جسم الإنسان.
- ٥١- () تستخدم Calcium Carbide (Gas production) method في تقدير الرطوبة في منتجات الفانيليا ، الدقيق ، الزيت ، عصير الفاكهة.
- ٥٢- () عادةً تتناسب قيمة المادة الغذائية طردياً مع مقدار ما تحتويه من رطوبة.
- ٥٣- () Sample unit وهي الحد الأدنى من مقاطع وحدة العينة التي يجب أخذها من الغذاء موضع التحليل.
- ٥٤- () Macro heterogeneity ويقصد به الاختلاف بين وحدات الغذاء الكلي Bulk أو Lot نفسه.
- ٥٥- () فكلما كانت نسبة الرطوبة منخفضة كانت المادة سريعة التلف More Perishable .
- ٥٦- () Fructose وهو مشتق من أبسط السكريات الكيتونية Dihydroxyacetone ، فيوجد في عصائر الفاكهة وعسل النحل ، وهو أحلي السكريات.
- ٥٧- () يجب ارتفاع درجه حرارة العينة الغذائية عند تجهيزها للتحليل.
- ٥٨- () تقل درجة الذوبان لليبيدات بزيادة درجة عدم التشبع.
- ٥٩- () يفضل حفظ عينات المحاليل السكرية والعصائر حمض الكبريتيك عندما يراد تقدير السكريات بها.
- ٦٠- () يجب عدم المحافظة علي ثبات حجم محلول الهضم مع الغليان للمدة المحددة عن تقدير الألياف الغذائية في العينة.

مع تمنياتنا بالتوفيق ،،،،

انتهت الأسئلة،،،،

إلى الأبد

Final Exam: Chem 334 (Corrosion chemistry)

Answer only Five questions from the following

Q1: State (✓) or (×) for the following (10 marks)

- 1- SCC is considered as a uniform corrosion.
- 2- The acidic solutions are less corrosive than the neutral ones.
- 3- The effect of pH on potential of each metal has been constructed by Pourbaix diagram.
- 4- Immunity represents a state of metal in which corrosion is thermodynamically impossible in a particular environment.
- 5- Oxidation corrosion is considered as wet corrosion.
- 6- Electrochemical standard potential series is an arrangement of metals and alloys potentials.
- 7- According to Tafel's equation, overvoltage (at greater than ± 50 mV) is a linear function of current (rate of oxidation or reduction).
- 8- Development of non-porous and uniform oxide film on a metal surface decreases the corrosion.
- 9- In differential aeration condition the area more accessible to air is work as anode.
- 10- The corrosion current can be calculated by intersection of the cathodic and anodic polarization lines at corrosion potential.
- 11- Dust particles enhance the corrosion of the metal surface.
- 12- The metals and alloys in service are thermodynamically stable.
- 13- Wet corrosion occurs on heterogeneous surfaces.
- 14- Dry corrosion is faster than wet corrosion.
- 15- The attack of gases of surface metals is a dry corrosion.
- 16- Corrosion inhibitor works as a catalyst for the chemical reaction.
- 17- High corrosion resistance materials with corrosion rate ≤ 1.0 mm/y.
- 18- Anodizing of aluminium is carried out by electrolysis in acidic electrolyte bath.
- 19- Phosphating is generally applied to the metal surface before finishing.
- 20- Dry chlorine gas attacks the silver metal surface and form protective layer of AgCl.

Q2: Choose the correct answer for the following (10 marks)

- 1- In anodizing of the aluminum the corrosion protection is due to
a) passive oxide layer b) phosphate layer c) chromate layer d) other
- 2- Coating used for iron containers for food package made from
a) Zn b) Tin c) Fe d) Al
- 3- In corrosion, the gas which is produced in the acidic medium is
a) nitrogen b) oxygen c) hydrogen d) other
- 4- The cathodic reaction during corrosion of iron in neutral aqueous solution is
a) $\text{Fe}^{2+} + 2\text{e}^- \rightarrow \text{Fe}$ b) $\text{O}_2 + 4\text{H}^+ + 4\text{e}^- \rightarrow 2\text{H}_2\text{O}$
c) $2\text{H}_2\text{O} \rightarrow \text{O}_2 + 2\text{H}_2\text{O} + 4\text{e}^-$ d) $\text{O}_2 + 2\text{H}_2\text{O} + 4\text{e}^- \rightarrow 4\text{OH}^-$
- 5- One factor is not necessary for the corrosion process.
a) corroded metal b) electrolyte solution c) Oxygen d) cathodic sites
- 6- Caustic embrittlement of boilers is due to hydrolysis of
a) CaSO_4 b) $\text{Mg}(\text{NO}_3)_2$ c) $\text{Ca}(\text{OH})_2$ d) Na_2CO_3

- 7-The corrosion rate unit of the SI system is
 a) mdd b) mm/y c) mpy d) all above
- 8- The metal which is more susceptible to pitting corrosion is
 a) aluminium b) zinc c) magnesium d) other
- 9-Pitting occurs under conditions.
 a) stirring b) hot c) stagnant d) all above
- 10-The corrosion rate unit mdd is
 a) milligrams per square centimeter per day b) milligrams per square meter per day
 c) milligrams per square millimeter per day d) milligrams per square decimeter per day
- 11- For protection of a steel tank which metal is used as a sacrificial anode
 a) aluminum b) magnesium c) nickel d) copper
- 12- Nernst Equation can be used to calculate:
 a) electrode potential in a given condition b) emf of an electrochemical cell
 c) tendency of a metal to corrode d) all above
- 13- Not acceptable high corrosion rate for the general engineering work is
 a) > 80 mpy b) > 60 mpy c) > 40 mpy d) other
- 14- In passive state of metal, the metal
 a) form protective oxide film. b) has very low corrosion rate.
 c) is thermodynamically possible to corrode. d) all correct.
- 15- To keep steel structure safe from corrosion damage, the corrosion rate (in corrosion current) should not exceed
 a) $20 \mu\text{A}/\text{cm}^2$ b) $10 \mu\text{A}/\text{cm}^2$ c) $5 \mu\text{A}/\text{cm}^2$ d) $0.5 \mu\text{A}/\text{cm}^2$
- 16-) Hydrogen embrittlement may be occurred by using protection method like
 a) anodic protection b) using inhibitors c) cathodic protection d) all correct
- 17- Susceptibility to SCC is affected by.....
 a) chemical composition of metal b) environmental temperature
 c) stress level d) all correct
- 18- Metal iron is coated with zinc metal to prevent corrosion, the process is
 a) anodic coating b) cathodic coating c) inorganic coating d) all above
- 19- At high hydrogen overvoltage the rate of corrosion is
 a) increase b) decrease c) increase initially then decrease d) remain constant
- 20- The flux used in galvanizing process is
 a) ZnCl_2 b) NH_4Cl c) NaCl d) Palm oil

Q3: Complete the following sentences (10 marks)

- 1-To overcome some of the limitations of the standard potential series the can be used.
- 2- is a localized form of corrosive attack.
- 3-Some inorganic compounds work as cathodic inhibitors like
- 4- Corrosion along grain leads to form corrosion.
- 5- Graphitization is an example of.....
- 6-Cathodic protection can be applied by using
- 7-Erosion-corrosion is caused by relative motion between the and the.....
- 8-There are compounds which react with and remove it from the neutral or alkaline corrosive environment, these oxygen scavengers such as
- 9- Compounds such as form passive oxide films on the surface of corroded metal, called
- 10- For materials selection of concentrated sulfuric acid storage tank is
- 11- For materials selection of dilute sulfuric acid storage tank is
- 12- Increasing anodic or cathodic polarization leads to rate.

- 13- The storage containers of liquids and solutions should be designed in such a manner that they can be completely.
- 14-is one of the principal causes of corrosion problems
- 15- Organic inhibitor molecules attach to surfaces by
- 16- corrosion occurs within confined spaces formed by certain mechanical configurations.
- 17- The area of the metal in contact with the more diluted solution is to the more concentrated ones.
- 18- SCC is the cracking induced from the combined influence of..... and
- 19- The scratched or abraded area is and the rest of metal is
- 20- Dust particles absorb from the air due to their nature

Q4: a) discuss the effect of following factors on the corrosion rate.

(6 marks)

- (i) nature oxide film
- (ii) anodic and cathodic area
- (iii) polarization

(b) Explain galvanization process

(4 marks)

Q5: Explain in detail the inorganic and organic coatings

(10 marks)

Q6: What are the forms of corrosion; explain one form of corrosion, its definition, causes, examples and how can avoid or protect the metal from this type of corrosion?

(10 marks)

مع اطيب التمنيات بالتوفيق..

الاستاذ الدكتور / أبو الحجاج عبدالعزيز هرماس

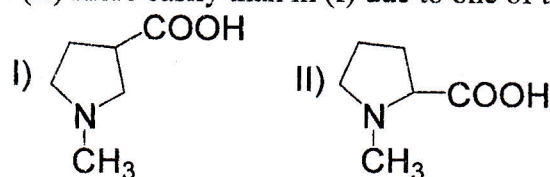
Final Examination of Natural Products and Biochemistry for 312C Students

Section A: Natural Products Chemistry:

Q1: Choose the correct answer A, B, C or D (One Mark each) (Final): (25 Marks)

1. Which is the following reaction when isomerization of linalool into geraniol in the presence of acid:
 - A. Conversion
 - B. Isomerization
 - C. Allylic rearrangement
 - D. All the previous
2. Reaction of Citral with K_2CO_3 gave one of the following compounds:
 - A. Laevulic acid, acetone and acetic acid
 - B. Acetaldehyde and methyl-2-heptenone.
 - C. Acetaldehyde, acetone and laevulaldehyde
 - D. All the pervious.
3. Prove that the second double bond in Carvone at position 1(7) one the following compounds:
 - A. Forming formaldehyde and pyruvic acid
 - B. Forming formic acid and not pyruvic acid
 - C. Forming formic acid only.
 - D. All the pervious.
4. Presence of limonene or dipentene in:
 - A. Terpintene oil
 - B. Limone and orange oil
 - C. Peppermint oil
 - D. All the previous
5. The acyclic momoterpenes containing an oxygen atom are connected to each other by means of:
 - A. Addition of hydrogen
 - B. Elimination of hydrogen
 - C. Elimination of water
 - D. Oxidation and reduction
6. Terpene (A) is a pleasant-smelling liquid optically active formula $C_{10}H_{14}O$. Its 1H NMR spectrum shows two methyl resonance peaks near δ 1.8 ppm gives oxime and hydrogenation ($2H_2 + Pt$) of (A) gives optically inactive a $C_{10}H_{18}O$. Ozonolysis of (A) produces a ketodiacid product $CH_3COCH(CH_2COCH_3)_2$. Other products may be formed but are not identified.
 - A. Carvone
 - B. Camphor
 - C. α -Terpineol
 - D. None of above
7. Oxidation of Cholesterol produce 1,5-dicarboxylic acid when heating with Ac_2O forming:
 - A. Cyclic ketone
 - B. Cyclic ether
 - C. Cyclic anhydride
 - D. Cyclic ester
8. The location of the side chain in cholesterol is determined by reactions:
 - A. Oxidation

- B. Reduction
 - C. Acylation
 - D. Elimination of hydrogen
9. Barbier-Wieland degradation method proves one of the following:
- A. Formation of 3',7- dimethyl-1,2-cyclopentenophenanthrene.
 - B. Ring © is five membered ring
 - C. Formation 1,2-dimehylphenanthrene
 - D. b. and c.
10. Reaction of N, N-dimethyl quinolinium iodide with Hoffman then Emde reactions gave one of the following compounds:
- A. N, N-Dimethyl styrene.
 - B. N, N-Dimethyl styrene and trimethylamine.
 - C. N, N-Dimethyl styrene only.
 - D. All the pervious.
11. Heating of Adrenaline with KOH fusion gives one of the following compounds:
- A. Veratric acid.
 - B. Protocatechuic acid.
 - C. Protocatechuic acid and dimethylamine.
 - D. All the pervious.
12. Methylation of Adrenaline followed by KOH fusion gave one of the following compounds:
- A. Protocatechuic acid and dimethylamine.
 - B. Veratric acidand dimethylamine.
 - C. Veratric acidonly.
 - D. All the pervious.
13. Decarboxylation of (II) more easily than in (I) due to one of the following reasons:



- A. Removal of COOH in α -position to N-atom easily than that of β -position.
 - B. Presence of lone-pair in N-atom make resonance α -position more easily than that of in β -position.
 - C. Formation of CO₂ in (II) more easily than in (I).
 - D. All the pervious.
14. Distillation of nicotine in ZnCl₂gave one of the following compounds:
- A. Pyridine, pyrrole and HCl
 - B. Pyridine, N-methylpyridine and methylamine.
 - C. Pyrrole, pyrrole and methylamine.
 - D. All the pervious.
15. Heating of Nicotine with HI proved one of the following compounds:
- A. Formation of methyl iodide.
 - B. Containing N-methyl group.
 - C. Formation of pyrrole and N-methyl iodide
 - D. All the pervious.
16. Oxidation of nicotine with K₃Fe(CN)₆ and Na₂CrO₇ gave one of the following compounds:
- A. Formation of N-methyl pyrrolidine
 - B. Formation of N-methyl pyrrolidine-2-carboxylic acid only
 - C. Prove that pyridine moiety attached at C-3
 - D. All the pervious.
17. Oxidation of nicotine with KMnO₄ gave one of the following compounds:
- A. Formation of nicotinic acid.
 - B. Prove that the side chain (C₅H₁₀N) attached to position-3 in pyridine moiety.

- C. Containing pyridine moiety.
D. All the pervious.
18. Oxidation of papaverine with cold and dilute KMnO_4 gave one of the following compounds:
A. Papaverinol only.
B. Papaverinol and papaveraldinone.
C. Papaveraldinone, papaverinic acid and H_2O .
D. All the pervious.
19. Conversion of p-hydroxybenzoic acid to 3,4-dimethoxybenzoic acid proved one of the following compounds:
A. Presence of COOH group relative to two OCH_3 groups.
B. Presence of benzene moiety.
C. Formation of veratric acid.
D. All the pervious.
20. Oxidation of 4-methylquinoline with KMnO_4 to 2,3,4-tricarboxylic pyridine proved one of the following compounds:
A. The positions of COOH groups are 2,3,4- relative to N-atom.
B. The positions of COOH groups in 2,3,4-pyridine.
C. Presence of 2,3,4- tri- COOH pyridine in papaverine
D. All the pervious.
21. Removing of COOH group in isoquinoline 6,7-dimethoxy-1-carboxylic acid and ultimately oxidation yields metahemapinic acid proved one of the following compounds:
A. Presence of COOH group
B. Presence of COOH group and pyridine moiety.
C. Presence of two methoxy group in ortho position
D. All the pervious.
22. Distillation of coniine then oxidation gave of one of the following compounds:
A. Conyryne and α -picolinic acid
B. α -picolinic acid and acetic acid
C. Conyryne and HCl
D. All the pervious.
23. Reaction of α -picoline with phenyl lithium then ethyl bromide followed by reduction gave one of the following compounds:
A. Coniine and 3H_2
B. Coniine and HCl
C. Coniine, conyryne and 3H_2
D. All the pervious.
24. Heating of oestriol with KHSO_4 forming one of the following:
A. Oestrone is produced with H_2O_2
B. Oestrone is produced with H_2O
C. Formation of oestradiol
D. All the pervious.
25. Conversion of oestrone into oestriol by Leed et al. pass through one of the following:
A. Acetylation, PhCO_3H followed LiAlH_4 .
B. Acetylation, PhCO_3H followed $\text{Zn}/\text{CH}_3\text{COOH}$
C. Acetylation, PhCO_3H followed $\text{Na}/\text{ethanol}$.
D. All the previous

Section B: Biochemistry:

Q2: Choose the correct answer A, B, C or D: (One Mark each) (10 Marks):

26. Lactose is a disaccharide, formed from.....
A. 2 Glucose
B. 2 Fructose
C. Glucose, Galactose
D. All of above

27. Glycine is a simple one of acids.
- Halogen
 - Carboxyl
 - Amino
 - Hydroxyl
28. Reaction of glucose with Fehling solutions produces.....
- Glyconic acid
 - Acetic acid
 - formic acid
 - Not react
29. Fructose is an optically active compound which contains.....chiral carbon atoms.
- 4
 - 5
 - 6
 - 3
30. Alanine is an amino acids.
- Neutral
 - Acidic
 - More acidic
 - Basic
31. is a polysaccharide formed from poly glucose monomers in plants.
- Ammonia
 - Lactose
 - Starch
 - Fructose
32. Maltose is a Sugars.
- Reducing
 - Oxidizing
 - Basic
 - All of above.
33. Glucose has Isomers.
- 17
 - 16
 - 12
 - 10
34. Monosaccharide can be oxidized by
- Fehling solutions
 - Tollen's reagent
 - HNO₃
 - All of above
35. Sucrose is a disaccharide produces from binding glucose and fructose monomer by bond.
- Ionic
 - Covalent
 - Glycosidic
 - Chelating

Q3: Choose (T) for True sentence or (F) for False sentence: (One Mark each) (15 Marks)

36. All carbohydrates are polyhydroxy aldehydes or ketones or compounds that hydrolyze to produce them.
- True
 - False
37. Glucose provides energy for the brain and ½ of energy for muscles and tissues.
- True
 - False

38. Monosaccharides contain chiral carbon atoms.
A. True
B. False
39. Diastereomers are stereoisomers that are not enantiomers.
A. True
B. False
40. Epimers, two sugars that different only in the configuration around one carbon atom.
A. True
B. False
41. Chiral centers are carbon atoms which have 5 different atoms bonded to it.
A. True
B. False
42. A reducing sugar is a sugar with an aldehyde group that reduces a metallic oxidizing agent.
A. True
B. False
43. A strong oxidizing agent such as HNO_3 can oxidize the aldehyde and the alcohol groups.
A. True
B. False
44. Cellulose is a polymer of glucose that forms plant cell walls.
A. True
B. False
45. Maltose is a disaccharide with an $\alpha(1, 4)$ glycosidic link between (C_1 , C_4) OH of 2 glucoses.
A. True
B. False
46. Amino acids bind with each other by glycosidic bond to produce proteins.
A. True
B. False
47. Reduction of glucose by Tollen's reagent produces glyconic acid.
A. True
B. False
48. Glucose is a non-optically active compound.
A. True
B. False
49. Monosaccharide has 2^{n-1} stereoisomers.
A. True
B. False
50. The different in the rearrangement of the amino acid in any protein causes problems in genetic formula and diseases.
A. True
B. False

Q4: Others (Oral Exam): Choose the correct answer (one Mark for each) (10 Marks)

1. Of the hormones that cause femininity:
A. Oestrone
B. Oestradiol
C. Oestriol
D. All the pervious
2. Oxidation of Cholesterol produce 1,6-dicarboxylic acid when heating with Ac_2O forming:
A. Cyclic ketone
B. Cyclic ether
C. Cyclic anhydride

- D. Cyclic ester
3. Reaction of protochutic acid with methyl diiodide gave one of the following compounds:
 - A. Piperonal and HI.
 - B. Piperonylic acid, piperonal and HI.
 - C. Piperonylic acid and 2HI.
 - D. All the pervious.
 4. The location of the side chain in cholesterol is determined by reactions:
 - A. Oxidation
 - B. Reduction
 - C. Acylation
 - D. Elimination of hydrogen
 5. The relation between the bile acid and the sterols found in one of the following:
 - A. Conversion of ergosterol into cholesterol
 - B. Conversion of cholesterol into cholinic acid
 - C. Conversion of ergosterol into allocholonic acid
 - D. All the pervious.
 6. Monosaccharaides have as general formula
 - A. C_nH_{2n-2}
 - B. $C_nH_{2n}O_n$
 - C. C_nH_{2n}
 - D. $C_nH_{2n}N_2$
 7. Amino acids have as function groups.
 - A. Carboxylic, Amino
 - B. Only Amino
 - C. Carboxylic, Amide
 - D. Only Carboxylic
 8. Reduction of glucose converts the function group (CHO) to
 - A. Carbonyl
 - B. Aldehyde
 - C. Alcohol
 - D. Amino
 9. Reaction of two molecules of monosaccharide produced disaccharide by losing of molecule.
 - A. Acetic acid
 - B. Methanol
 - C. H_2O
 - D. Carbonyl
 10. are reducing sugars because they contain an aldehyde group in their open-chain form.
 - A. Acetic acid
 - B. Aldoses
 - C. Ketoses
 - D. Carbonyl

Best wishes

أ.د. عبدالعال جابر
د. أماني عبدالرحمن



Final Exam of Photochemistry (313 C) for the 3rd level students

1]- Choose the correct answer for all of the following? (35 Marks)

(Final answers must be depicted in the answer sheet not here)

يتم طمس (تسويد) الأجوبة المختارة من قبل الطالب باستخدام القلم الجاف فقط في نموذج الأجوبة الخاص بالطالب

The answer chosen by the student is blurred (blackened) with the ballpoint pen only in the bubble sheet

1- Which of the following would be the most stable carbocation?

- a) $^+\text{CH}_3$
- b) $(\text{CH}_3)_3\text{C}^+$
- c) $^+\text{CHCH}_3$
- d) $^+\text{CH}(\text{CH}_3)_2$

3- Treatments of vic-diols with acids give aldehydes or ketones under ---- reaction.

- a) semipinacol rearrangements
- b) nucleophilic acyl substitution
- c) nucleophilic aliphatic substitution
- d) pinacol rearrangement

5- When thermal energy is given to the molecules, molecules move more rapidly that is --- energy increases.

- a) vibrational
- b) rotational
- c) translational
- d) electronic

7- What is the multiplicity of free radical having a net spin $S = \frac{1}{2}$?

- a) triplet state
- b) singlet state
- c) quartet state
- d) doublet state

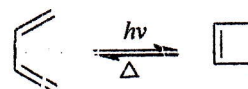
9- Migratory aptitudes of migrating group undergoes 1,2-nucleophilic shift decreases in the order ----.

- a) alkyl > aryl > hydrogen
- b) hydrogen > alkyl > aryl
- c) aryl > alkyl > hydrogen
- d) aryl > hydrogen > alkyl

2- Auxochrome is defined as ---.

- a) the shift to longer wavelengths
- b) a substituent on a chromophore that causes a blue shift
- c) a substituent on a chromophore that causes a red shift
- d) the functional group that absorbing a UV-Visible

4- Categorize the following photochemical reaction?



- a) The di- π methane rearrangement
- b) Electrocyclic rearrangements
- c) Photoreduction
- d) Sigmatropic Rearrangements

6- Name the process estimated from the showing equation? $S_1 \rightarrow S_0 + h\nu$

- a) Fluorescence
- b) Vibrational relaxation
- c) Internal conversion
- d) Phosphorescence

8- Quantum yield is the number of moles of the substance undergoing photochemical change per emission of ----.

- a) vibrational states
- b) radiation absorbed
- c) photons emitted
- d) excited states

10- In Wanger-Meerwein rule, an alkyl group migrates to electron deficient center, this changes in the carbon skeleton in order to make a ---- more stable.

- a) persistent carbon radical
- b) carbanions
- c) carbocation
- d) carbene

11- In Norrish type II cleavages involve ---- abstraction of ---- followed by cleavage of the resulting ---- to give the enol which can tautomerize to aldehyde or ketone.

- a) Intermolecular, β -hydrogen, diradical
- b) Intramolecular, γ -hydrogen, radical
- c) Intramolecular, α -hydrogen, diradical
- d) Intramolecular, γ -hydrogen, diradical

13- The transition of electron from a singlet state to a triplet state is called ----.

- a) intersystem crossing
- b) internal conversion
- c) absorption process
- d) phosphorescence

15- Choose the general way for generation of carbanions?

- a) A group attached to a carbon leaves without its electron pair as in acid-base reaction.
- b) A negative ion adds to a carbon-carbon double or triple bond
- c) Nucleophilic aliphatic substitution S_N1
- d) Both a & b

17- Claisen condensation is the reaction of esters that have α -hydrogens in basic solution to produce ----.

- a) β -hydroxycarbonyl product
- b) α,β -unsaturated carbonyl
- c) β -keto esters
- d) α -halo ester

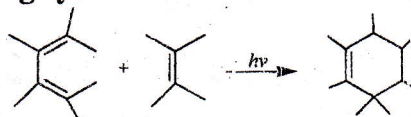
19- Emitting photon in the case of fluorescence is ----, while with phosphorescence are ----.

- a) singlet states, triplet states
- b) doublet states, singlet states
- c) triplet states, singlet states
- d) sextet states, triplet states

21- All the molecule energies are quantized that is they can change only by discrete ($E = h\nu$) except ---- energy.

- a) electronic
- b) vibrational
- c) translational
- d) rotational

12- Choose the product name of the following cycloaddition reaction?

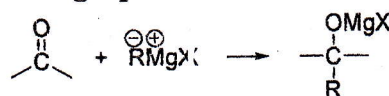


- a) 1,1,2,3,4,5,6-heptamethylcyclohexane
- b) 1,2,3,3,4,5,6-heptamethylcyclohex-1-ene
- c) 1,2,3,4,4,5,6-heptamethylcyclohex-1-ene
- d) 1,2,3,4,5,6-hexamethylcyclohex-1-ene

14- Some of radicals are long-lived or persistent by the effect of ---- and ----.

- a) inductive effect, delocalization
- b) delocalization, steric effect
- c) polar solvent, delocalization
- d) tautomerism, delocalization

16- What is the reaction type represented in the following equation?



- a) Nucleophilic substitutions
- b) Wagner-Meerwein rearrangements
- c) Nucleophilic additions
- d) Electrophilic additions

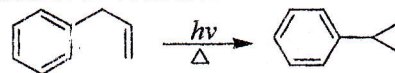
18- An S_N1 -reaction is commonly occurs for tertiary and resonance-stabilized alkyl halides in ----.

- a) nonpolar solvents
- b) polar solvents
- c) Lewis bases
- d) Lewis acids

20- What is the rupture process in which each bonding electron remains with two fragments?

- a) homolytic bond breaking
- b) heterolytic bond breaking
- c) cation formation
- d) radical formation

22- Choose the name for the following photochemical reaction?



- a) Photoisomerizaion
- b) The di- π methane rearrangement
- c) Photoreduction
- d) Sigmatropic rearrangements

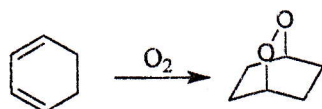
23- Reactions of an aldehyde or ketone with dilute base or acid are showing to form ----.

- a) β -keto esters
- b) β -hydroxycarbonyl
- c) α -halo ketone
- d) α - keto esters

25- An example of photochemically induced *cis-trans* (Z-E) systems is simplifying by interconversions of --- as in ----.

- a) double-bonded, azo-compounds
- b) double-bonded, carbonyl compounds
- c) Triple-bonded, cyanide compounds
- d) double-bonded, nitro-compounds

27- Give the name for the following photochemical reaction?



- a) Dimerization of cyclohexadiene
- b) Photochemical aromatic substitution
- c) Electrocyclic rearrangements
- d) Peroxy-compounds formation

29- Butter and other fats become rancid partly by reaction of ---- with ----.

- a) carbocation, nitrogen
- b) free-radical, oxygen
- c) cation, oxygen
- d) anions, nitrogen

31- The triplet excited state generates another triplet and a singlet generates ----.

- a) singlet
- b) singlet & singlet
- c) triplet
- d) singlet & triplet

33- Irradiation can be converted carbonyl compounds into 1,2-diols, through the ---- of -- -- that's abstract hydrogen atom from ---- producing free radicals.

- a) excited triplet states, aldehydes or ketone, reactive substrates
- b) aldehydes or ketone, excited triplet states, reactive substrates
- c) aldehydes or ketone, reactive substrates, excited triplet states
- d) excited triplet states, aldehydes or ketone, uncreative substrates

24- Calculate the multiplicity of the following spin configuration for the five 3d electrons?

- a) Quartet
- b) Doublet
- c) Singlet
- d) Triplet



26- Zimmerman and Zweig found that ---- derivatives rearrange to give more stable 1,2-diphenyl-2- propyllithium.

- a) 2,2-diphenyl-1-butyllithium
- b) 1,2-diphenyl-1-propyllithium
- c) 2,2-diphenyl-1-propyllithium
- d) 1,1-diphenyl-3-propyllithium

28- What is the Transmission?

- a) Is the fraction of light that reaches a detector after passing through a sample
- b) Is the intensity of a reference beam when no sample present
- c) Is a graph shows a peak at the absorption frequency
- d) Is a logarithmic scale that increases as the transmission decreases

30- Select the suitable preparation method for diazo-compounds that's act as a precursor of carbenes?

- a) Through diazo-group transfer from tosyl azide
- b) Via dehydrogenation of the hydrazones
- c) Both a & b
- d) None of the above

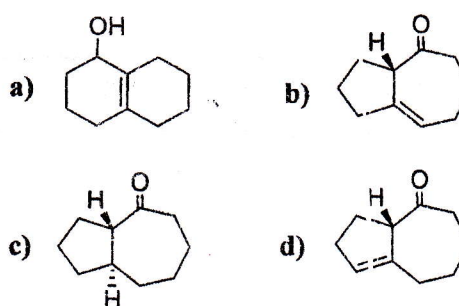
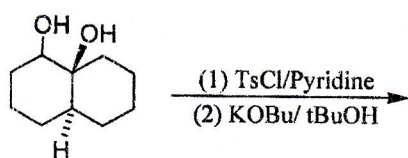
32- If an aldehyde without α -hydrogens reacts with ---- that does will undergo the Cannizzaro reaction.

- a) conc. base
- b) aldehydes
- c) strong acid
- d) ketone

34- In the Favorskii rearrangement, when an ---- is treated with a ---- and the resulting ---- can cyclize to yield a ---- derivative.

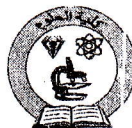
- a) cyclopropanone, α -halo-ketone, base, enolate
- b) enolate, α -halo-ketone, base, cyclopropanone
- c) α -halo-ketone, enolate, cyclopropanone, base
- d) α -halo-ketone, base, enolate, cyclopropanone

35- Choose the reaction product of the following equation?



2]- Answer all of the following with either (yes or T) or (no or F)? (15 Marks)

36. Alkenes without allylic hydrogen undergo cycloadditions with singlet oxygen to form 1,2- dioxetane.
37. Carbanions are the conjugate bases of weak acids and excellent nucleophiles.
38. Absorbance is defined as the fraction of light that reaches a detector after passing through a sample.
39. Carbonyl compounds can be converted into 1,2-diols and alcohols by irradiation in the presence of a hydrogen-donating compound.
40. Phenyl migrations (phenide migration) of carbanion intermediates are an intramolecular example of electrophilic aromatic substitution.
41. Carbanion has a planar sp²-hybridized configuration.
42. Quantum yield defined as the wavelength number of the substance undergoing photochemical change per emission of radiation absorbed.
43. Radical configurations are described as *p*-type orbital (π radical) or a σ -hybrid orbital (σ radical).
44. The irradiation of *cis*- or *trans*-stilbene in the absence of oxygen gives phenanthrene.
45. Hypsochromic shift is shift of wavelength to greater absorbance.
46. Biological organisms utilize atmospheric O₂ in a sequence of reactions that begins with oxidation-reduction reactions with a free-radical.
47. Reaction by an S_N2 mechanism commonly occurs for tertiary and resonance-stabilized alkyl halides and esters in polar solvents.
48. The transition from a singlet state to a triplet state is called Intersystem crossing.
49. Photosensitization process describes the molecule that absorbs light may transfer its excess energy to another molecule which in turn may undergo a reaction.
50. In semipinacol rearrangements the tosylates alkoxide undergoes a 1,2-alkyl shift with concomitant elimination of the tosylates in a stereoselective manner.



Final Oral Exam of Photochemistry (313 C) for the 3rd level students

Answer all of the following with either (yes or T) or (no or F)? (10 Marks)

(Final answers must be depicted in the answer sheet not here)

يتم طمس (تسويد) الأجوبة المختارة من قبل الطالب باستخدام القلم الجاف فقط في نموذج الأجوبة الخاص بالطالب

The answer chosen by the student is blurred (blackened) with the ballpoint pen only in the bubble sheet

- Answer all of the following with either (yes or T) or (no or F)?

51. Sigmatropic reaction involves the migration of δ -bond across an adjacent π -system to a new site with a consequent switching of the double bond arrangement in the molecule.
52. The reaction of aldehyde or ketone with dilute base or acid to form a β -hydroxycarbonyl product is called Perkin condensation.
53. Phosphorescence occurs when the molecule undergoes an unusual intersystem crossing into an energy state of higher spin multiplicity with lifetime ~ 10 sec and timescale of (10^{-3} -100).
54. If electron spins in the ground and excited electronic states are not paired. Therefore, the spin multiplicity = 2.
55. An electronic transition takes place very much slower than the nuclei can respond.
56. Phosphonium ylides react with the C=O group of an aldehyde or ketone to give an alkene.
57. The conjugate bases of weak acids are excellent electrophiles.
58. The shift of a hydrogen atom from one carbon in a carbocation to a neighboring carbon atom is often quite rapid when a more stable carbanion can be formed.
59. Photochromism can be defined as reversible transformation of a single chemical species between two states of different absorption spectra.
60. The Favorskii rearrangement involves the conversion of an α -haloketones into the corresponding esters by treatment with alcoholic base.



امتحان طلاب المستوى الثالث (كيمياء و جيولوجيا)
مقرر (٣٤٥ ج) مبادئ الجيولوجيا التركيبية

الزمن : ٢ ساعة

٢٠٢٢/٦/١٢ م

PRINCIPALS OF STRUCTURAL GEOLOGY

(Total Marks 50)

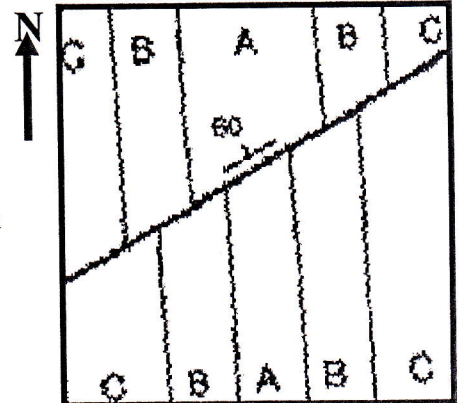
Select the letter (a, b, c or d) of the choice that **BEST** answers the question.

Each question has **ONLY one** correct answer.

(**Two Marks for each question**)

ANSWER THE FOLLOWING QUESTIONS:

I- In the geologic map below, units **A**, **B**, and **C** are sedimentary rocks; unit **A** is the oldest and unit **C** is the youngest. The sedimentary rocks are cut by a fault, indicated by the dark line that dips **60** degrees to the northwest.



1. What type of structure is shown on the map?

- a. a faulted syncline
- b. a faulted anticline
- c. a folded strike-slip fault
- d. the structure cannot be determined from the information given

2. What type of fault is depicted on the geologic map?

- a. a reverse fault
- b. a normal fault
- c. a right-lateral fault
- d. a left-lateral fault

3. Which way do the sedimentary layers dip - assuming the structure is not overturned?

- a. toward the east
- b. toward the west
- c. toward the center of the map
- d. east and west

4. Assume that dip of the fault is toward the southeast, what kind of Fault is there?

- a. a reverse fault
- b. a normal fault
- c. a right-lateral fault
- d. a left-lateral fault

5. Why is unit A wider north of the fault than it is south of the fault?

- a. deeper levels of the structure are exposed on the north side of the fault
- b. faulting has thinned unit A south of the fault.
- c. unit A had a variable thickness prior to faulting
- d. erosion has removed most of unit A south of the fault.

II- Choose the correct answer for the following statements

6. Compared to a fault, the rocks along a joint

- a. Have experienced no appreciable displacement.
- b. Are intensely deformed.
- c. Are older on the upthrow side.
- d. Are metamorphosed

7- The line of maximum curvature in a fold is known as:

- a. Crest.
- b. Axis.
- c. Hinge.
- d. Trough.

8- A recumbent-syncline fold may be determined by observing:

- a. Its concave upwards.
- b. Its limbs dip towards the axial plane.
- c. Younger beds in the center of the fold.
- d. Cannot be determined.

9- Drag folds:

- a. Occur within the competent beds.
- b. Within the competent beds.
- c. Within the incompetent beds are overlain by competent beds.
- d. When vertical stresses act on horizontal beds.

10. If a body of rock changes shape as a result of an applied stress, and then when the stress is removed or falls to some lower value, it regains its initial shape and volume, then it is behaving

- a. Plastically
- b. As a Newtonian fluid
- c. Elastically
- d. None of the above

11. Non-tectonic dislocations are those

- a. caused by deep seated forces.
- b. related to primary structures.
- c. caused by superficial forces.
- d. due to Magmatic intrusions.

12. Expansion joints is generally

- a. parallel to compressive force.
- b. related to primary structures.
- c. parallel to fold axes.
- d. None of the above.

13. Folding occurs when rocks behave as

- a. Brittle substances.
- b. Fluids.
- c. Ductile material.
- d. Dilatation strain.

14. Release joints is generally

- a. parallel to compressive force.
- b. related to igneous activity.
- c. parallel to fold axes.
- d. None of the above.

15. The term "intrusion" is basically associated with which type of rock?

- a. Igneous rocks.
- b. Sedimentary rock
- c. Metamorphic rock
- d. Not associated with any type of rock

16. Laccoliths and Lopoliths are a primary structure characterizing the..

- a. Igneous rock
- b. Sedimentary rock
- c. Metamorphic rock
- d. None of the above

17. Cross bedding is a primary structure of which type of rock?

- a. Igneous rock
- b. Sedimentary rock
- c. Metamorphic rock
- d. None of the above

18. In which type of the fault the hanging wall is moving up with respect to foot wall?

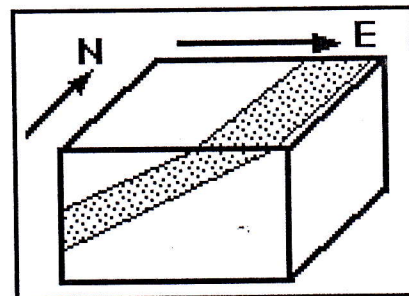
- a. Normal fault
- b. Strike slip fault
- c. Reverse fault
- d. None of these

19. When the rocks cool, they contract, and the hexagonal shape is a result of this contraction

- a. Mud cracks.
- b. Columnar joints.
- c. Dykes
- d. Phacoliths.

20. In the block diagram in front of you.

- a. the strike of the bed is E-W and the dip is N
- b. the strike of the bed is E-W and the dip is S
- c. the strike of the bed is N-S and the dip is E
- d. the strike of the bed is N-S and the dip is W



III- True or False? (Circle the correct answer).

- 21. Rocks in which plastic deformation occurs remain in their deformed shape when the stress is released. True or False?
- 22. In a normal fault, the hanging wall is displaced downward relative to the footwall. True or False?
- 23. In an anticline, the hanging wall moves upward relative to the footwall. True or False?
- 24. In translational movement, the movement is parallel to planes of weakness and occasionally parallel to slope. True or False?
- 25. The ability of the material to deform without breaking is called Elasticity. True or False?

GOOD LUCK

Pro. Dr. Ahmed R. El Younsy

12/6/2022

Assiut University

Date: 23-6-2022

Faculty of Science

Time: 2h

Chemistry Department

**Final Fertilizer Industry Chemistry Examination (Chem300) Third
Level Industrial Students.**

Answer the following questions:

Question No.1

- 1) Write four methods for determination of reactivity of rock phosphate.
- 2) Explain the two methods for production of the urea fertilizer.

Question No.2

- 1) Write the structure of pure fluorapatite .
- 2) There are two methods for production of phosphoric acid explain one of these methods with equation.

Question No.3

- 1) Write the equation for production of these fertilizers:
Di-ammonium phosphate(DAP)-Mono-ammoniumphosphate(MAP)-Single superphosphate(SSP)-Potassium sulfate.
- 2) Write the conditions Process operating variables in urea production.

Question No.4

- 1) What is the purpose of Primary and Secondary reforming for ammonia production.
- 2) What is the advantage of direct granulation of TSP.

Question No.5

- 1) Write the basic chemical reaction involved in production of triple superphosphate(TSP).
- 2) Write the reaction mechanism of V_2O_5 catalyst using in production of H_2SO_4 by contact process.

Good luck Dr. Atef .H.Ali

Final and oral exams of course 310C (glass industry) for the third level students of the industrial, program.

ملحوظة: الامتحان يقع في ثلاث صفحات

Part I final exam (50 Mark)

1. **Answer the following (10 Marks)**
 - a. "The system used for the manufacture of glass fiber consists of three parts". Draw these **three basic parts** and comment on each.
 - b. Draw the basic components of the **float process** and then comment.
2. **Complete FIVE of the following (5 Marks)**
 - a. Lead oxide glass (crystal glass) contains lead oxid of%
 - b. S-glass is a glass that posses a high
 - c. Pultrusion process for fiberglass application is a manufacturing process for producing.....
 - d. Fingerprints, glue or adhesives on the surface of clean glass may cause.....
 - e. The cucibles of pot furnace are made ofor.....
 - f. Glass container factories consist of three-part operations, the batch hous, the.....end and theend
3. **Give reasons for the following (20 Marks)**
 - a. Importance of Al_2O_3 (one of the feldspar constituents) in glass manufacture
 - b. Use of sodium sulphate in glass industry including its contribution in chemical reactions in the tank furnace.
 - c. Use of waste glass (cullet) as a raw material in glass industry.

- e. Sodium nitrate is applied in tank furnace toand to.....
- f. Polyester resin is preferred for wetting the chopped strand mat (CSM).
- g. Toughend glass shatters into small fragments when broken.
- h. Glass reinforced plastic (GRP) resists compressive and tensile forces.
- i. Application of sizing (coating) to glass fibers.
- j. Beveled glass provides a spectrum of colors in sunlight.

4. Choose the correct answer (5 Marks)

- a. E-glass is a type of glass fibers that can be regarded as
 - i) alkali-lime glass with high boron oxide content
 - ii) alumino-silicate glass with high MgO content
 - iii) alumino-borosilicate glass with less than 1% alkali oxide
 - iv) alumino-borosilicate glass with more than 2% calcium oxide.
- b. C-glass is a type of glass that is
 - i) electrical resistant ii) with high tensile strength iii) resistant to chemical attack
 - iv) non of them
- c. From the health point of view, are glas fibers safe?
 - i) not safe ii) safe iii) it is not known till now
 - iv) research work on this subject is ongoing.
- d. Devitrification of glass occurs
 - i) above 700°C ii) below 700°C iii) at 580°C
 - iv) below 580°C
- e. Which of the following raw materials is the major component?
 - i) soda ash ii) alumina iii) borax iv) feldspar.

5. Mark right answer with (✓) and the wrong one with(X)
(10 Marks)

- a. The sequence of producing fiberglass mold by hand or spray lay-up is to apply
 - i) first, the mold release agent ii) second, application of glass fiber layers and resin iii) third, application of gelcoat.
- b. Gelcoat used in fiberglass molds gives the mold a shiny appearance.
- c. The pot furnace in glass manufacture possesses higher capacity than tank furnaces.
- d. Number of glass fibers as well as their direction affect the durability

- of glass fiber cloth.
- e. Glass fibers are not moisture resistant.
 - f. Every 10% of cullet (recycled glass) used as a raw material in glass manufacture results in 7% reduction in carbon emission.
 - g. Devit of glass does not occur when glass has been fired more than once (refiring glass).
 - h. The strength of fiberglass is the same as cast iron.
 - i. Sodalime glass is resistant to water but not to acids.
 - j. Because of its low density lead oxide glass (crystal glass) has a low refractive index making the look of glassware more brilliant.

Part II oral exam (10 Marks)

1. complete the following

- a. Potash lime glass (hard glass) composition formula is
- b. Neutral glasses are highly resistant toattack.
- c. Beveled glass is made by creating a on one side around the entire periphery of clear glass.

2. Mark the correct sentence with (✓) and the false one with (X)

- a. Borosilicate glass is called also pyrex or Jena glass.
- b. 96% silica glass is translucent and has very low thermal expansion coefficient.
- c. When 99.5% silica glass is heated above its melting point, it becomes transparent (clear silica glass).
- d. Wired glass does not fall apart into splinters when breaks.
- e. Glass does not has the crystal structure and hence it breaks.
- f. Fracture of glass is caused by small imperfections, flows and irregularity on the surface of glass.
- g. Alkali-silicate glass is manufactured from only two components, i.e sand and soda ash.

Good Luck

Examiner: Prof. Dr. Aref A. M. Aly