Assiut University
Faculty of Science
Chemistry Department

Sep. 2023
Time:3 hrs

Physical Chemistry Examination (C-230) for Second Level Students

---

Answer the following questions:

1) Answer Only Five from the following: **(33 Marks)**

a) Discuss the temperature dependence of entropy.

b) The density of ice at 0°C is 0.9g cm^{-3} and has entropy of 38 cal mol^{-1} deg^{-1}. The density of liquid water at this temperature is 1 g cm^{-3} and has entropy of 60 cal mol^{-1} deg^{-1}. Given the date, calculate ΔS, ΔH and ΔE for the conversion of 36 gm of ice to liquid water at the normal melting point. (M.wt. of H_2O=18 g $mole^{-1}$)

c) Calculate the enthalpy change when 540 g of water freezes at constant pressure and a temperature of -30°C. At 0°C , ΔH is -1435 cal $mole^{-1}$, and C_p is 18 and 8.8 cal mol^{-1} deg^{-1} for water and ice , respectively.

d) Given , for acetic acid that ΔE_{fus}=2600 cal mol^{-1} at its melting point 17°C and ΔH_{vap}=6000 cal mol^{-1} at its boiling point 120°C. Calculate the change in entropy that takes place when 120 gm of solid acetic acid is melted at its melting point and vaporized at its boiling point , all under constant pressure taken as 1 atm. Assume that molar heat capacity of acetic acid is 27.6 cal deg^{-1} mol^{-1}.(M.wt of acetic acid=60g/mole)

e) Derive an expression for the efficiency of Carnot´s engine working between two temperature T_1 and T_2.

f) Prove that under adiabatic conditions for the expansion of an ideal gas: PV^{γ} = constant

2) Answer Only Two from the following: **(17Marks)**

a) Discuss the kinetics for the following:

I)First order reaction.

II)Opposing reaction.

III)Consecutive reaction.

b) Derive the relation between reaction rate and temperature.

c)Discuss the half-life method for determination of reaction order.

Examiners: Prof. Dr. R.M Gabr and Prof. Dr A. El-Awad

Assiut University
Faculty of Science
Department of Chemistry

28th August 2023
Time: 3 h
Summer Semester

Physical Chemistry II Examination (C-232) For 2nd Level Students

The exam in 4 pages

Answer ALL the following questions: *(50 Marks)*

Q1: Shade (T) for True or (F) for False statements. *(25 Marks; 1 Mark each)*

1. Eutectic mixture increases the strength of alloy.
2. Sulphur phase diagram at metastable condition is identical to that of water at normal condition.
3. The solubility of KI increases with an increasing temperature.
4. There are two solid phases (*Zn and $MgZn_2$*) in equilibrium with liquid melt at eutectic point E (345 °C) in *Zn-Mg* phase diagram system.
5. The dome shaped areas represent the regions of two phases. The system therefore is bivariant.
6. The transition temperature is below the hypothetical congruent melting point.
7. A solution of KI is in equilibrium with solid phase along curves AC and BC, in *KI-water* phase diagram system.
8. At metastable peritectic point H (24.2 °C) in *Na_2SO_4-water* phase diagram system, the heptahydrate *$Na_2SO_4.7H_2O$* decomposes into anhydrous monoclinic form.
9. *Na_2SO_4-NaCl-water* phase diagram system at 25 °C has only one isothermal invariant triple point.
10. According to Hardy-Schulze Law, the higher the valency of the active ion, the greater is its precipitating action.
11. The number of milligrams of protective colloid which prevents the coagulation of 100 c.c. of a given gold sol is known as gold number.
12. The standard calomel electrode is used as primary reference electrode for the measurement of the single electrode potential.
13. The precipitating action of the cations Na^+, Mg^{++}, Al^{+++} on As_2S_3 sol has been found to be in the order: $Al^{3+} > Mg^{+2+} > Na^+$.
14. It has been found that hydrophilic sols are less stable than hydrophobic sols towards coagulation.
15. The concentration of Ni^{2+} in the following cell $(Co \mid Co^{2+}(0.1M) \parallel Ni^{2+}(xM) \mid Ni)$ is $5.5 \times 10^{-3} M$ ($E_{cell} = 0.69\ V$; $E^{\circ}_{Ni^{2+}/Ni} = -0.25\ V$ and $E^{\circ}_{Co^{2+}/Co}$ = - 0.28 V).

16. The following reaction is spontaneous:

$$2Al(s) + 3Zn^{2+}_{(aq)} \rightarrow 2Al^{3+}_{(aq)} + 3Zn(s); \quad (E^{\circ}_{Al^{3+}/Al} = -1.676V, E^{\circ}_{Zn^{2+}/Zn} = -0.76V)$$

17. The technique of separating colloidal particles from the solvent and soluble solutes presents in the colloidal solution using specially constructed filters that are permeable to all substances save the colloidal particles is known as ultrafiltration.

18. Adsorption of certain ions from solution results in the charges on colloidal particles.

19. Multimolecular colloids include starch, portions, and gelatin.

20. The process of breaking up of colloidal solution resulting in the precipitation of the particles of a dispersed phase is known as stabilization.

21. Alkaline fuel cells are powered by pure hydrogen and employ an alkaline electrolyte such as KOH in H_2O.

22. When a powerful light beam is focused on a colloidal solution, the path of the beam is illuminated by bluish light and becomes apparent when viewed from the side.

23. Emulsion is a type of solid-liquid dispersion consisting of tiny drops of one liquid spread in another.

24. Electrons are supplied to the electrolytic cells from an external battery.

25. Cataphoresis is the movement of the dispersion medium caused by an electrical field.

Q2: Shade the correct answer A, B, C or D. *(25 Mark; 1 Mark each)*

26. Curve CF in sulphur system is known as .....
    A) Fusion curve of S_M B) Melting curve of S_M
    C) Both A and B D) None of these
27. Which of the following points are invariant as two phases can co-exist in equilibrium?
    A) Melting B) Cryohydric C) Transition D) All of these
28. The process in which *Ag* content in argentiferrous lead is raised, is called ..... process.
    A) Gibbs B) Pattinson's C) Roozeboom's D) None of these
29. The term eutectic means easy.....
    A) Transition B) Cooling C) Freezing D) None of these
30. The maximum number of degree of freedom for a three component system is .....
    A) Two B) Three C) Four D) None of these
31. At *cryohydric* point D in *$FeCl_3$-water* phase diagram system, the two solid phases co-exist in equilibrium with solution are .....
    A) $Fe_2Cl_6.5H_2O$ and $Fe_2Cl_6.4H_2O$ B) $Fe_2Cl_6.7H_2O$ and $Fe_2Cl_6.5H_2O$
    C) $Fe_2Cl_6.12H_2O$ and $Fe_2Cl_6.7H_2O$ D) $Fe_2Cl_6.4H_2O$ and Fe_2Cl_6
32. Liquidus curve corresponds to the beginning of ..... on cooling the system.
    A) Freezing B) Melting C) Both A and B D) None of these

33. Which of the following systems form one pair of partially miscible liquid?

A) *Acetone-phenol-water* B) *Aniline-phenol-water*

C) *Succinic nitrile-ethanol-water* D) *All of these*

34. In some types of cells, the chemical reaction can be reversed by applying an external current, which type of cell can this occur in?

A) Rechargeable batteries B) Alkaline batteries

C) Fuel cells D) All of the previous

35. What is the molar mass of a substance that plates 5 g of itself in 10 minutes with a current of 10 A and requires 2 electrons per mole of that substance?

A) 80.4 g/mol B) 321.6 g/mol C) 32.2 g/mol D) 160.8 g/mol

36. Which of the following properties of colloids doesn't depend on the charge on articles?

(A) Coagulation (B) Electro-osmosis (C) Electrophoresis (D) Tyndall effect

37. The diameter of particles in colloidal system is

(A) 10^{-9} m to 10^{-6} m (B) 10^{-10} m to 10^{-4} m (C) 10^{-12} m to 10^{-9} m (D) 10^{-7} m to 10^{-5} m

38. A gel is a colloidal system in which a ..... is dispersed in a ..... medium.

A) solid, gas B) liquid , solid C) liquid, liquid D) liquid, gas

39. The balanced chemical equation for the following reaction:

$$MnO_{4(aq)}^{-} + Cl_{(aq)}^{-} \rightarrow Mn_{(aq)}^{2+} + Cl_{2(g)}$$

A) $6MnO_{4(aq)}^{-} + 2Cl_{(aq)}^{-} + 20H_{(aq)}^{+} \rightarrow 6Mn_{(aq)}^{2+} + Cl_{2(g)} + 10H_2O_{(g)} + 7O_{2(g)}$

B) $MnO_{4(aq)}^{-} + 6Cl_{(aq)}^{-} + 9H_{(aq)}^{+} \rightarrow Mn_{(aq)}^{2+} + 2.5Cl_{2(g)} + 4H_2O_{(g)} + HCl_{(g)}$

C) $2MnO_{4(aq)}^{-} + 10Cl_{(aq)}^{-} + 16H_{(aq)}^{+} \rightarrow 2Mn_{(aq)}^{2+} + 5Cl_{2(g)} + 8H_2O_{(g)}$

D) $MnO_{4(aq)}^{-} + 10Cl_{(aq)}^{-} + 8H_{(aq)}^{+} \rightarrow Mn_{(aq)}^{2+} + 5Cl_{2(g)} + 4H_2O_{(g)} + 5e^{-}$

40. The pH of electrolyte of a hydrogen electrode with potential $-0.5\ V$ is .....

A) -4.24 B) -8.48 C) $+8.48$ D) $+4.24$

41. Consider the following: $Sn + NO_3^- \rightarrow Sn^{2+} + NO$; the balanced reaction is:

A) $Sn + NO_3^- \rightarrow Sn^{2+} + NO + O_2 + 2e^-$

B) $Sn + NO_3^- + 2H^+ \rightarrow Sn^{2+} + NO + 2OH^-$

C) $2Sn + 2NO_3^- + 8H^+ \rightarrow 2Sn^{4+} + 2NO + 4H_2O + 2e^-$

D) $3Sn + 2NO_3^- + 8H^+ \rightarrow 3Sn^{2+} + 2NO + 4H_2O$

42. If you have 375 mL of a 0.35 M solution of $Cr_{(aq)}^{3+}$, how long would it take to reduce the Cr^{3+} to Cr using a 0.67 A current? (Cr = 52 g/mol)?

A) 15.75 hour B) 5.25 hour C) 10.5 hour D) 3.94 hour

43. What species must chrome metal be oxidized to if the cell potential for one of its redox reactions is 0.744 V and the free energy of the reaction is −215.35 kJ/mole?

A) Cr^+ B) Cr^{2+} C) Cr^{6+} D) Cr^{3+}

44. Which of the following preparation method does not belong to the condensation methods of colloids preparation?

A) Reduction method (B) Ionic equilibrium method (C) Hydrolysis method

(D) Peptization method

45. Fog is an example of which type of colloidal system?

A) Solid in liquid B) Gas in gas C) Liquid in gas D) None of these

46. The term used to determine the protecting power of a lyophilic colloid is.....

(A) Oxidation number (B) Coagulation value (C) Gold number (D) Iodine value

47. Which of the following is an associated colloid?

(A) Soap (B) Sol of gold (C) Proteins (D) Starch

48. Which of the following expressions correctly shows the calculation of $\Delta G°$ in kJ/mol for a Voltaic cell with the half reactions shown below?

$$Ag^{+}(aq) + e^{-} \rightarrow Ag(s), E^{\circ} = +0.80V; Zn^{2+}(aq) + 2e^{-} \rightarrow Zn(s), E^{\circ} = -0.76V$$

A) 2.69×10^{-4} B) -232.21 C) -301.03 D) 3.86

49. When a high number of atoms or smaller molecules of a substance collect together, they form species with colloidal sizes of ..... nm known as multimolecular colloids.

A) $50 - 100$ B) $1 - 1000$ C) $200 - 500$ D) Non of these

50. ..... of colloidal solution refers to the process of lowering the amount of contaminants to a required minimum.

A) Purification B) Coagulation C) Stabilization D) None of these

---

Good Luck

Prof. Maher M. A. Hamed and Dr. Mohamed Nady Abd El-Hameed

Assiut University
Faculty of Science
Department of Chemistry

Inorganic Chemistry 2 (C-321)
Summer Semester
Final Examination

Time : 3 Hours
September 2023

Question 1: Give reasons for THREE Only from the following: (15 Marks)

1. Nickel(II) prefer to exhibit the square planar geometry in its compounds.
2. Titanium occurs naturally in oxide ores, but copper occurs in sulfide ores.
3. Silver chloride is white, but silver iodide is yellow.
4. Across the 3d elements, the change in atomic size from chromium to iron is practically insignificant.

Question 2: Answer SEVEN Only from the following: (35 Marks)

1. Explain valence bond description for the bonding in the complex $[Mn(CN)_6]^{3-}$. Tell what type of ligand is in this complex and calculate the complex magnetic moment.
2. Explain the meaning of alloys and the composition of white gold, brass and bronze.
3. What is meant by the metallic bond? Explain the relationship between this bond strength and the melting temperature of 3d-elements.
4. What is EDTA? What are its structure and denticity? Explain why EDTA is an important food additive.
5. Show detailed procedures to balance the following equation.

$$S_2O_3^{2-} + Cr_2O_7^{2-} \longrightarrow S_4O_6^{2-} + Cr^{3+} \quad (H^+)$$

6. Name the coordination compounds $[Cr(NH_3)_3(H_2O)_3]Cl_3$, $[Co(NH_2CH_2CH_2CH_2NH_2)_3]Cl_3$ and $[Ag(NH_3)_2][Ag(CN)_2]$.
7. Write the formula for the coordination compounds ammonium tetrahydroxozincate, diamminechloronitritoplatinum(II) and potassium trioxalatoaluminate(III).
8. Predict the oxidation state range for chromium.

Good Luck

Examiner: Ahmed B.M. Ibrahim

Associate professor of Inorganic Chemistry, Assiut University

Assiut University
Faculty of Science
Chemistry Department

September 2023
Time allowed: 3 hours
Summer Semester

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

Section I- Quantum Chemistry Section: *(17 Marks)*

Answer *Only One* from the following question:

1- A) Drive Schrödinger equation from the simple harmonic motion of a microscopic particle revolving around center in a circle with a radius r using ideal gas equation and de Broglie relation.

B) If the wavefunction $\Psi = A \sin kx + B \cos kx$, where A, B and k are constants, is a solution for the Schrödinger equation for a microscopic particle moving into a one dimensional box between x = 0 and x = a. Confirm that the energy is quantized and equals to

$$E = \frac{n^2 h^2}{8ma^2}$$

Answer the following two questions:

2- Using de Broglie relation, confirm that the energy for a rotating microscopic particle in a circle is quantized and equals to $E = \frac{m^2 \hbar^2}{2I}$ where m is a quantum number.

3- ii) Calculate the wavelength for each of the following;

1- Tennis ball has weight 65.0 g moving with velocity 45.0 ms^{-1}.

2- Electron with kinetic energy 205 eV.

What do you deduce from solution of this problem?

Section II- Molecular Spectroscopy Section: *(17 Marks)*

Answer Only Five of the following questions:

1- ^{39}K has spin, I = 3/2 and nuclear g-factor 0.2606.

a) Draw a diagram to show all possible orientations of magnetic momentum of ^{39}K nucleus in magnetic field.

b) Calculate the transition frequency from one of these orientations to an adjacent one in a field of 0.1 T ($\mu_N = 5.0504 \times 10^{-27}$ JT^{-1} and $h = 6.626 \times 10^{-34}$ Js).

Turn Over →

2- Explain, how the electron charge cloud around an atom or molecule is distorted, when UV-Vis light is absorbed or emitted by the atom or molecule.

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

4- Write the rule of mutual exclusion, and show when $ZnCl_2$ in alcoholic solution will be infrared active and Raman active.

5- 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.

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

Section III- Kinetic Theory of Gases Section: *(16 Marks)*

Answer Only Five of the following questions:

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

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

3- Drive the probability density equation ($F(\varepsilon)d\varepsilon$) and plot $F(\varepsilon)$ for the molecular translational energy of an ideal gas molecular at 300 K versus the energy (ε).

4- Calculate the viscosity of molecular oxygen at 273.2 K and 1 bar. The molecular diameter is 0.36 nm. (where, the mass weight of O_2 = 32).

5- Draw the Maxwell-Boltzmann distribution curve of molecular speeds at two temperatures (300 and 1200 K) and mention the important features of the distribution curve.

6- Calculate the most probably speed, the mean speed and the root-mean-square speed for hydrogen molecules at 0 °C.

(Constants: $h = 6.626 \times 10^{-34}$ Js, $m_e = 9.11 \times 10^{-31}$ kg, $e = 1.602 \times 10^{-19}$ C)

(R = 0.082 L atm K^{-1} mol^{-1}, 8.314 J K^{-1} mol^{-1}, 1.987 cal K^{-1} mol^{-1}, Avogadro's number = 6.022×10^{23}, $h = 6.626 \times 10^{-34}$ JT^{-1}, $K = 1.381 \times 10^{-23}$ JK^{-1}, speed of light 3.0×10^{10} cm s^{-1},).

With Our Best Wishes

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

Assiut University

Faculty of Science
Chemistry Department

Final Examination for 3rd (Industrial Program) Industrial Polymer Chemistry (304 Chem.)

Date: August , 2023 **Time: 2 hours**

Answer Eight only from the following Questions: **(50 points)**

1) What is a peptide linkage? Illustrate your answer with 2-amino-ethanoic acid ?
2) How does urea-methanal differ from nylon, Kevlar and Dacron, even though all of them are condensation polymers?
3) Explain the term "vulcanization of rubber". What are the differences between natural rubber and vulcanized rubber?
4) Why is the structure of DNA called a double helix? Name its component structure?
5) Why would a hole appear when a dilute alkali is spilt on a fabric made of Kevlar, discuss by mechanism equations ?
6) Compare between Thermosets and Thermoplastics Materials, showing examples of thermoplastics?
7) What are the three main types of degradable plastics? Why are they degradable?
8) Write short note about the Bakelite, its properties, and uses?
9) What are the two types of polyethene? What is the structural difference between them?

Good Luck

Examiner:

Prof. Dr. Kamal I Aly

Assiut University

Date: August 2023

Chemistry Department /Faculty of science

Time allowed: 3 hours

Final exam in the Biochemistry and Natural Products (312C) for 3rd year Chemistry students

---

Answer the following questions: .....(50 marks)

Part I (Biochemistry)

Question No. 1: What is you conclude from the following statement: .....(10 marks).

1. Mannose and Glucose gave the same product in the ozazone reaction.
2. Reduction of Glucose with HI gave n-hexane as a product.
3. Reduction of Glucose with $NaBH_4$ gave sorbitol which is a primary alcohol.
4. Reaction of glucose with mild oxidizing agent to give mono carboxylic aid.
5. Acylation of glucose with excess acetic anhydride produce glucose penta acetate.
6. Oxidative cleavage reaction of glucose with HIO_4 gave 5 formic acid and I formaldehyde molecules.
7. Maltose can be found in two anomers.
8. Sucrose doesn't oxidized by Fehling or Bendict's reagents.
9. Glucose has 16 stereo isomers.
10. The OH group attached with highest chiral carbon in any sugar directed to left.

Question No. 2: Choose the correct answer.....(10 marks).

1. Which reagents could be used to convert mannose to mannitol?
   a $NaBH_4$ / H_2O b) Tollen's solution c) Benedict's solution d) Ni / H_2
2. Which of the following sugars can't be existing in two anomers:
   a. Maltose b. Celluobiose c. Lactose d. Sucrose
3. Which of the following sugars presented in the germinated seeds:
   a. Galactose b. Mannose c. Lactulose d. Maltose
4. Which of the following sugars presented in milk:
   a. Galactose b. Mannose c. Lactulose d. Lactose
5. Which of the following sugars presented as stored sugar in mussels and liver.
   a. Hyaluronic acid b. Starch c. Glycogen d. Lactose
6. Celluobiose: a. considered as oligosaccharide, b. it can be found in two anomers.
   c. Can be hydrolyzed with □-glycosidase enzyme
7. Amylase is: a. enzyme used in hydrolysis of starch. b. is a part of starch
   c . Is a disaccharide d. Is an oligosaccharide
8. $NaBH_4$ converting fructose into: a. Glucose b. Sorbitol c. Manitol d. mixture of b and c.
9. Which of the following disaccharides non reducing sugar: a. Trehalose, b. Maltose c. Cellobiose
10. Which reagents could be used to convert glucose to glucaric acid?
    a. Bromine water b. Tollen's solution c. nitric acid

Question No. 3: Put (√) in the front of correct statement and (X) in the front of wrong one:(5 marks)

1. All disaccharides are reduced Tollen's reagent.
2. Oxidation of glucose using Ag_2O gave the dicarboxylic acid (glucaric acid)
3. Fructose containing four chiral centers
4. Tollens' reagent is very useful for distinguishing aldoses from ketoses.
5. The α and β-isomers are called anomers.
6. In isomaltose the linkage between anomeric carbon atoms is 1,4.
7. Lactose consists of molecule glucose and molecule galactose.
8. The Ruff procedure lengthens an aldose chain and gives a single product
9. The Kiliani-Fischer procedure shortens an aldose chain and gives a single product
10. The glycosidic bond can be formed between any hydroxyl group on the component monosaccharide.

(انظر خلفه)

Part II (Natural Products)

Answer the following questions :-

1) a) Starting with cholesterol how can you prepare 5β-cholanic acid and progesterone?

   b) Differentiate between α-Farnesene and β- Farnesene ?

2) a) Starting from Acetone how can you prepare the Citral ?

   b) Describe by chemical reactions, How can you convert Camphor to Bornane?

3) Discuss by chemical equations the synthesis of the following:

   i) Adrenalin ii) Nicotine

4) a) Discuss by equation the Diel's Alder reaction of Myrcene?

   b) Proof the function group in α-Terpinol ?

5) a) Mention the different types of alkaloids ?

   b) Explain by equation the elucidation of ring system and function group in Cholesterol ?

Good Luck

Prof. Dr. A. M Kamal & Prof. Dr. Kamal I. Aly

Assiut University
Faculty of Science
Chemistry Department

Sep. 2023
Time : 2 hours

Final Exam. for (211C)(Student not Chemistry , Summery Term)

Write the name of all compounds.

Answer for the following questions:

1) *A- What mining by* (give examples):- (**6 only**)---------- (**9** Marks):

1- Hydrazone 2- Pry. (1°) alchol 3- Quinone. 4- Amide / Emide
5- DMF 6- Elecrophilic addition / Elecrophilic Sub. 7- DMSO

B- Compound (A) its molecular formula (C_4H_8). Draw the All structural isomers of this compound.

2) *A-Give examples for the following reactions* (**Three only**)-(**12** Marks):
1- Re- arrangement reaction. 2- Cannizzaro's reaction.
3- Fridel – Crafts acylation. 4- Nuclophilic Sub. reaction (SN^2).

B- Write one method to prepare the following compounds (**Three only**):
Saccharin. * Formic anhydride * Iodoform * Benzanilide

3) *A- How do you convert* : (**Three only**)---------- (**9** Marks)
1- Acetaldhyde ⟶ Sec.(2°) alchol by Grinuard reagent.
2- Methanol ⟶ Formic acid. 3- Aniline ⟶ Phenol.
4- Acetylene ⟶ Di- vinyl acetylene.

B-Write on **Three only**:
1- Toutomerism 2-Ald-ol Condencation
3- Gabrile reaction. 4- Resonance.

********** أنظر خلفة **********

4)- *A- complete the following equations* (**Four only**)---------- (**20** Marks)

1)- $CH_3\text{-}C \equiv CH + NaNH_2 \longrightarrow$ a $+ CH_3CH_2I \longrightarrow$ b + c

2)- 2-Methyl propene $+ O_3 \longrightarrow$ a $+ H_2O \longrightarrow$ b + c

3)- Acetic acid $+ PCl_5 \longrightarrow$ a + b + c

4)- Benzen + 3. Cl_2 / light (hυ, ¤) $\longrightarrow$ a

5)- Aniline + $HNO_2(NaNO_2 / HCl) \longrightarrow$ a + H_2O (Δ) $\longrightarrow$ b + c + d

B- Write the name of the following compounds .

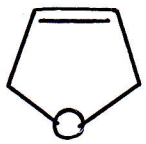
1) $Cl\text{–}CH_2\text{-}COOH$

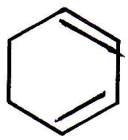
2) $CH_3CH_2\text{-}C \equiv C - C_6H_5$

3) $CH_3\text{-}CO\text{-}CO\text{–}CH_3$

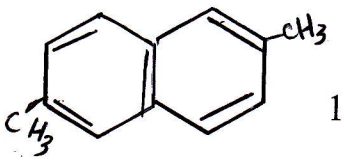
4) $CH_2 = C(OH) - C(Cl) = CH_2$

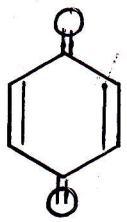
5) $(CH_2\text{-}CH\text{-}Cl)_n$

6) 

7) 

8) 

9) 

10) 

*C- Draw the structural formula of (**5 only**)from the following compounds:*

2,6 dichloro-cyclohexanone * Acetanilide * Ter(3°). Butyl alchol Ammonium salcylate* *p*– Xylene* 2,5-dihydro furane* Ethyloxalate

****

Good Luk e

Prof. Dr Osama Shehata Moustafa

Sep.2023

Assiut University
Faculty of Science
Chemistry Department

Final Examination in Petroleum & Petrochemicals (451C) for the 4th Level
(Summer Term)

Date: August, 2023 **Time: 2 hours.**

Answer the following questions: **(50 Mark)**

Question 1.

a) Explain the Doctor's sweetening process ?
b) Discuss the Isomerization mechanism (*n*-Alkanes into isoparaffins).
c) Write short notes on :-Non- Hydrocarbons in crude Petroleum.

Question 2.

a) What you mean by Octane number & Oxygenate additives.
b) Explain the Propane deasphalting.
c) Discuss the Catalytic hydrodesulfurization process.

Question 3.

a) Discuss the effect of sulfur compounds upon the Gasoline Product?
b) Describe the Solvent Extraction methods for Sulphur reaction.
c) Explain the Carbide Theory for origin of the Petroleum and its defects.

Question 4 (Answer Two only):

a) Discuss the following terms:
Aniline Point Additives Freezing Point of Aviation Fuels
b) Describe in details the thermal conversion processes (Visbreaking & Delayed coking) ?
c) Starting from the following building blocks , discuss what are the petrochemicals can be produced from it :
   a) Methane
   b) Propene.
   c) Butadiene

Good Luck
Examiner
Prof. Dr. Kamal Ibrahim Aly

Assiut University
Faculty of Science
Chemistry Department

June: 2023
Time: 2 hours

Summer Semester Examination for Biological Students
Subject: Analytical Chemistry (C- 460)

Answer Four only from the following questions: ..... (50 Marks)

Q_1) Answer the following: ..... (12.5 Marks)

a) Write on the following:
i. Polargraphic cell. ii. Mohr method iii. Half wave potential and factors affected on it.

b) Give the reason for the following:
The equivalent weight for $KMnO_4$ in basic medium is 1/3 its molecular weight while the equivalent weight for $K_2Cr_2O_7$ in acidic medium is 1/6 its molecular weight
ii. Mohr method is not applicable in basic solution.

Q_2) Answer the following: ..... (12.5 Marks)

a) If you are provided with 0.1M CH_3COOH (10 ml) and titrated with 0.1M NaOH. calculate the pH value: (k_a=5 x 10^{-5})
i. at the beginning of the titration, ii. Addition of 5 ml of NaOH.. iii. at the end point.

b) Define the Ilkovic equation. Calculate the diffusion current (i_d) for the reduction of 2x10^{-5}M Pb^{2+}, which has diffusion coefficient (D) = 0.25x$10^{-5}$$cm^{-2}$ sec. m =15mg/sec. and t = 4 sec/drop.
ii. Molar conductivity and equivalent conductivity.

Q_3) Answer the following: ..... (12.5 Marks)

a) Write on the following:
i. Two methods for the determination of equivalent point in potentiometric titration.
ii. Methyl orange is suitable for titration of NH_4OH solution with HCl solution.

b) Show how you can use polarographic technique in qualitative and quantitative analysis..

Q_4) Answer the following: ..... (12.5 Marks)

a) During the titration of 25 ml 0f NaCl (0.1N) using AgNO3 (0.1N), Calculate the pCl
i. before the titration. ii. Addition of 10 ml of AgNO3.
iii. at the end point. iv. Addition of 30 ml of AgNO3.
Ksp (AgCl) = $10^{\div 10}$

b) Write on the following :
i. Buffer solutions. ii. Nernst equation

Q_5) Answer the following: ..... (12.5 Marks)

a) Define the following :
i. Acid-base indicators. ii. Oxidizing agent and reducing agent iii. Glass electrode

b) Explain the Volhard method for the titration of chloride ions. This method must be used in acid solution. Why?

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

Examiner: *Dr. Gamal Abdel Wahab Ahmed*

Assiut University

Surface chemistry & Electrochemistry Examination for 4th Level Students (Chem.432)

Faculty of Science

Chemistry Department

Time :3 h Dat.: 6/9/2023

Section (I) Surface chemistry & Electrochemistry

Answer the Following Questions:

B-(A)Put (✔) or (×) for the following sentences: **(10 Marks)**

1. At low temperature, the carrier concentration is essentially constant and equal to [D] + [A]. ( )
2. The electrical conductivity of molecular crystal is generally very low. ( )
3. At very low temperature the electronic specific heat $C_v \alpha$ T. ( )
4. Sintering is an reversible process leading to a reduction of active area. ( )
5. For the industrial catalyst, a physical properties are not usually of major importance. ( )
6. The most important alumina for use as carrier is $\alpha - Al_2O_3$. ( )
7. In the catalytic reaction the adsorption must be chemical in nature. ( )
8. The heat of adsorption may vary considerably with surface coverage in both types of adsorption. ( )
9. With chemisorption a long time may be required for equilibrium. ( )
10. Physical adsorption monolayer at P/P° values above 0.3. ( )

A) Choose the correct answer of the following **(10 Marks)**

1. A semiconductor of Ge can be made -p-type by adding ..... impurity.

   (i) Trivalent (ii) Pentavalent (iii) Divalent (iv) Monovalent

2. The materials which are weakly repelled by the magnetic field are known as .....

   (i) Diamagnetic materials (ii) Paramagnetic materials (iii) Ferromagnetic materials

3. The n-type semiconductor is

   (i) [D] = [A] (ii) [A] > [D] (iii) [D] > [A] (iv) none

6. On which factor adsorption of gas on solid adsorption depend

   (i) On temperature (ii) On pressure of gas (iii) On nature of adsorbent (iv) All the given

7. According to Freunclich adsorption isotherm.

   (i) $\frac{x}{m} \alpha P^{\circ}$ (ii) $\frac{x}{m} \alpha P^{1}$ (iii) $\frac{x}{m} \alpha P^{1/n}$ (iv) All of the above

8. Due to adsorption.

(i) Surface energy increases (ii) Surface energy becomes zero

(iii) Surface energy decreases (iv) No change occurs in surface energy

9.Selective catalyst should .....

(i) Increase the reaction rate (ii) Change the reaction products

(iii) Increase the number of molecules adsorbed on the catalyst surface

(iv) Proceed the reaction to desired product

10.What is true for catalytic reaction

(i) Catalyst increases equally both the rate of forward and reverse reactions

(ii) Catalyst does not effect to equilibrium constant

(iii) Catalyst decreases activation energy (iv) Catalyst increases activation energy

11. According to the chemical approach, the desirable energy for decomposition the intermediate complex is:

(i) High energy (ii) Low energy (iii) Intermediate energy (iv) None

12. The disadvantage of a homogeneous catalysis is.

(i) Corrosion problems (ii) Poisonous (iii) Expensive (iv) All of them

Write short notes on three only of the following: **(12 Marks)**

a) The factors are responsible for deactivation of a catalyst.

b) The important characteristic properties of catalyst supports.

c) The factors are influence in the amount of gas adsorbed on solid materials.

d) Synthesis of ɤ-alumina from bauxite.

4-Answer two only from the following **(12 Marks)**

a- Mention the factors affecting thermal conductivity of solids and derive an equation that be used for calculation of specific heat of solids

b- From adsorption isotherm data, apply the BET equation for calculation of specific surface area of a catalyst.

c- Explain the precipitation method for manufacture of industrial catalyst and mention the forming operations.

5- Define the following terms **(6 Marks)**

(i) Turnover number (ii) Center of symmetry (iii) Schottky defect

(iv) Non-stoichiometric compound (v) Ionization energy of F-Center (vi) Catalyst selectivity

Section (II) Electrochemical

(17 marks)

oose the correct answer (5 marks)

1- The solid electrolyte is ..... conductor.

(i) ionic (ii) electronic

(iii) electronic and ionic (iv) non

2- The Saline water is .....

(i) Strong electrolyte (ii) weak electrolyte

(iii) non-electrolyte (iv) normal electrolyte

3- The salt activity mathematical form of $Al_2(SO_4)^3$ is

(i) 27 C4$\gamma\pm4$ (ii) 27C5$\gamma\pm5$ (iii) 27 C6$\gamma\pm6$ (iv) 108 C5$\gamma\pm5$

4- The ionic strength of 0.01 M $MgCl^{2+}$ 0.02 M sucrose is

(i)0.04M (ii) 0.02 M (iii) 0.06M (iv) none of these

5- The salt effect on the reaction: $[Co(NH_3)5Br]^{++} + OH^- \rightarrow [Co(NH_3)5OH]^{++} + Br^-$

(i) zero (ii) positive (iii) negative

6- "The electric double layer consists of a compact or a diffused layer of counter ions", this theory is called:

(i)Helmholtz (ii) Stern (iii) Gouy and Chapman (iv) none of these

7- The polarizable electrode is characteristic by:

(i) over surface area (ii) lower surface area (iii) Over current

(iv) Over potential

8- When an electrode has positive over potential (η), then the electrode reaction is

(i) reduction (ii) oxidation (iii) redox (iv) equilibrium

9- The over potential (η) of an electrode is may be related to

(i)activation polarization (ii) concentration polarization (iii) resistance polarization (iv) all correct

10- The Tafel's equation is applied to study the kinetic of (i) cell reaction (ii) electrode reaction (iii) redox reaction (iv) all

Q2 Answer only three from the following (4 marks for each one):

1) Explain the electrochemical polarization cell.

2) Indicate the steps of electrode reaction and how the potential of electrode ($\Delta\phi$) does affect the rate constant of the electrode reaction.

3) Using Debye – Huckel Limiting Law calculate the value of $\gamma \pm$ in 0.02 m solution of HCl at 25 °C, where A = 0.509 / $(\text{mol kg}^{-1})^{1/2}$ for an aqueous solution at 25 °C.

4) From the current vs. potential for reduction of Fe^{3+} to Fe^{2+}, determine Tafel constants (a and b), β coefficient and exchange current (Io). Where; T = 293 K , Erest = 0.75 V, R = 8.314 JK^{-1} mol^{-1}, F = 96485 C mol^{-1}.

E / V :	0.7	0.65	0.6	0.55	0.5
I / mA:	4.3	12.2	27.0	64.2	144

Use Tafel equation: $$\eta = \frac{2.303\, nRT}{\beta F} \log I_0 - \frac{2.303 n\, RT}{\beta F} \log I$$

Prof. Dr. Abd El-Aziz A. Said, Abu El-Hagag A. Hermas

Assiut University
Physics & chemistry Department (Credit Hours)
Course : Quqntum Mechanics

Faculty of Science
Time : 3 Hours
Date: 28 /8/2023

1. Choose the correct answer: Which field considers the dual behaviour of matter.

a. Classical physics b. Quantum physics

2. The momentum of a particle is equal to the product of _____ and _____.

a. Mass, weight b. Mass, velocity

c. Mass, acceleration d. Mass, force

3. According to the quantum mechanics, the photoelectric equation is given by _____

a. $K_{max} = hf + \Phi$ b. $K_{max} = hf - \Phi$

c. $K_{max} = hf \times \Phi$ d. $K_{max} = hf/\Phi$

4) Quantum Numbers are solutions of _____.

a) Schrodinger's Equationb) Hamiltonian Operator

c) Heisenberg's Uncertainty Principled) Einstein's Energy Relation

5) The shellnumber to which the electron belongs is given by which quantum number?

a) m b) s c) n d) l

6) The maximum number of electrons in a shell is?

a) 2n b) $2n^2$ c) $3n^2$ d) n^2

7) The shape of the atomic orbital of the subshell is given by :

a) m b) s c) n d) l

8) Which among the following is the range of Azimuthal Quantum Number, l?

a) 0 to n-1 b) 0 to s c) 0 to n d) 0 to s-1

9) What are the total values of the magnetic quantum number?

a) 3n b) 3l c) 3n + 1 d) 2l + 1

10) Principles of Quantum Mechanics can be used to derive the Schrodinger Wave equation.

a) True b) False

11) What does the principal quantum number describe?

a) The spin of the electron b) Spatial orientation of the orbital

c) The shape of the orbital d) Energy and size of the orbit

12) For the following set of quantum numbers, which one is not valid?

a) n = 5, l = 2, m = 0, s = ½ b) n = 5, l = 3, m = 2, s = ½

c) n = 1, l = 2, m = 0, s = ½ d) n = 5, l = 2, m = 0, s = -1/2

13) The motion of a wave packet is analogous to _____.

a) Photons b) Electrons

c) Classical Particle d) Quantum Particle

14. Choose the wrong statement of spin of electrons, according to quantum mechanics:

a) It is related to intrinsic angular momentum.

b) Spin is the rotation of an electron about its own axis.

c) Value of the spin quantum number must not be 1.

d) +1/2 value of spin quantum number represents up spin.

15. The Quantum Mechanical Model of the atom was proposed by:

a) Louis de Broglie b) Erwin Schrodinger

c) Neil Bohr d) Werner Heisenberg

16. The wavelength of the matter waves is independent of:

a) mass b) velocity c) charge d) momentum

17. Assuming the velocity to be the same, which particle is having longest wavelength

a) an electron b) a proton c) a neutron d) an α-particle

Uncertainty principle states that the error in measurement is due to-

a) dual nature of particles b) due to the small size of particles

c) due to large size of particles d) due to error in measuring instrument

19. If the uncertainty in velocity of a moving object is 1.0×10^{-6} ms^{-1} and in its positions is 58 m, itsis approximately equal to that of:

a) deuterium b) lithium c) electron d) helium

20. The equation of motion of matter-wave was derived by:

a) Heisenberg b) Bohr c) de-Broglie d) Schrodinger

21. If the momentum of a particle is increased to four times, then the de-Broglie wavelength will become:

a) two times b) four times c) half times d) one-fourth times

22)What is the total number of energy levels used by an atom of aluminum (Al^{27}) in the ground state?

a) 3 b) 7 c) 13 d) 0

23)This "rule" of Quantum Chemistry states that it is impossible to know both the position and velocity of an electron at the same time.

a) Hund's Rule b)Heisenberg Uncertainty Principle

c) Aufbau Principle d) Pauli Exclusion Principle

24)Identify the following element: $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10}$

a) Nickel b) copper c) zinc d) gallium

25)The second energy level (n=2) contains a total of 5 electrons...how many more electrons can fit in the 2nd energy level?

a) 0 b) 3 c) 5 d) 7

26)Which of the following statements is true about the 3s and the 4s sublevels?

a) These sublevels have the same energy

b) These sublevels are the same distance from the nucleus

c) These sublevels hold different amounts of electrons

d) These sublevels have the same shape

27)This "rule" of Quantum Chemistry states that no 2 electrons in an atom can b
the exact same state...each electron in an atom can be described by a unique set o
quantum numbers.

a) Hund's Rule b) Heisenberg Uncertainty Principle

c) Aufbau Principle d) Pauli Exclusion Principle

28)How many valence electrons are in an atom of sulfur?

a) 2 b) 4 c) 6 d) 8

29)How many unpaired electrons are in an atom of strontium? (atomic number 38)

a) 0 b) 1 c) 2 d) 3

30)What electron configuration matches an oxygen atom?

a) $1s^2 2s^2 2p^6 3s^2\ 3p^6 4s^2 3d^{10} 4p^5$ b) $1s^2 2s^2 2p^4$

c) $1s^2 2s^2 2p^6$ d) $1s^2 2s^2 2p^6 3s^2\ 3p^6 4s^2 3d^1$

31)How many electrons does a neutral atom of Si contain?

a) 14 b) 28 c)24 d)16

32)What is the number of valence electrons for Oxygen?

a) 8 b) 6 c) 2 d) 1

33)Nitrogen will _____ valence electrons when forming an ionic bond.

a) gain 1 b) lose 1 c) gain 3 d) lose3

34)The Lewis dot symbol for the noble gases will contain 8 dots except:

a) He b) Ne c) Ar d) Rn

35)How many electron can be found in a s orbital?

a) 2 b) 3 c) 4 d) 1

36)How many electrons can the d sublevel hold?

a) 14 b) 10 c) 26 d) 8

37)How many electrons can the p sublevel hold?

a) 14 b) 10 c) 26 d) 16

38) What is the noble gas configuration for Neon?

a) [Ne] $1s^2$ b) [Ne] $1s^2 2s^2 2p^6$ c) [F]$2p^6$ d) [F] $2s^2 2p^6$

39 The uncertainty principle proposed by:

a) Louis de Broglie b) Erwin Schrodinger

Neil Bohr d) Werner Heisenberg

10) The wavelength of light with an energy of 5.22×10^{-19} J where $h = 6.626 \times 10^{-34}$ joul/s equals :

a) 7.878×10^{12} sec^{-1} b) 7.878×10^{14} sec^{-1} c) 7.878×10^{16} sec^{-1}

Answer The following Questions (equal grades):

1. Find the uncertainty in the position of an electron when the mass of an electron is 9.1×10^{-28} g and the uncertainty in velocity is equal to 2×10^{-3} cm/sec.

2. State Heisenberg's uncertainty principle. Give its mathematical expression.

3. What is the wavelength associated with a photon of a light with the energy is 7.2×10^{-19} J where $h = 6.626 \times 10^{-34}$ joul/s

2. What is meant by the dual behaviour of particles, Why Is it a microscopic not a macroscopic property

***** The End ***** Best wishes ***** Prof. Galal S. Hassan *****

Assiut University
Faculty of Science
Chemistry Department

Summer 2023
Time: 3 hours

Final Examination of Organic Chemistry II (212C) for Credited Hours Students

يتم طمس (تسويد) الإجابة المختارة من قبل الطالب باستخدام القلم الجاف فقط

Answer the following questions: (50Marks)

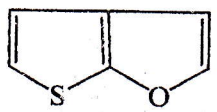
Q1: Choose the correct answer A, B, C, or D: (1 Mark/each)

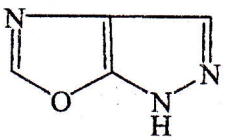
According to the following reactions answer the question from 1-5

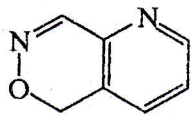
A) Pyrrole $\xrightarrow[H_2O]{POCl_3\ DMF}$ 1 B) Aniline $\xrightarrow[H_2SO_4\ Conc.]{NaNO_2}$ 2 $\xrightarrow[heat]{CuBr}$ 3

1. Reaction A is called: A- Paal-Knorr. B- Mannish. C- Vilsmeier.
2. Reaction A is type of: A- Electrophilic substitution. B-Nucleophilic substitution. C-Anion chemistry.
3. Compound1 is: A- 3-Acetyl pyrrole. B- 2-Formyl pyrrole. C- 3-Formyl pyrrole.
4. The reaction of compound 2 to give compound 3 is called:
A- Cannizaro. B- Wurtiz Reaction. C- SandMayer reaction.
5. Compound 2 is: A- 2,4,6-Tribromobenzene. B-*o*-Bromoaniline. C-*m*-Bromoaniline.

According to the following compounds answer the question from 6-8:

A- 

B- 

C- 

6. The IUPAC name of compound A is:

A) Thieno[2,3-*b*]furan. B) Thieno[3,2-*b*]furan. C) Furo[2,3-*b*]thiophene.

7. The IUPAC name of compound B is:

A) 1*H*-Pyrazolo[3,4-*d*]oxazole. B) 1*H*-Pyrazolo[4,3-*d*]oxazole. C) 1*H*-Oxazolo[4,5-*c*]pyrazole.

8. The IUPAC name of compound C is:

A) Pyrido[4,5-*b*]-*o*-oxazine. B) Pyrido[2,3-*b*]-*o*-oxazine. C) 5*H*-Pyrido[2,3-*d*]-*o*-oxazine.

9. Reaction of bromine with toluene in the presence of $AlBr_3$ gave:

A- Bromobenzene. B- *o*- and *p*-Bromotoluene. C- *m*-Bromotoluene.

10..... is the activating group and directing *o-p* in the monosubstituted benzene reactions:

A- Br B- NH_2. C- NO_2

11. Nomenclature of heterocyclic compounds having five membered ring suffixes is:

A- –ine B- –ole C- -olidin.

12. 1,4-Dicarbonyl compounds can be reacted with P_2S_5 to give:

A- Pyridine B- Indole C-Thiophene.

13.The electrophilic substitution reactions of indole occur mainly at: A- C_2 . B- NH. C- C

14. The Numbering of heterocycliccompounds generally start at:

A- Heteroatom. B- Carbon atom C- Fused face.

15.Which of the following wouldnot be expected an aromatic compound:

A- Indole B- 1,3,5-Hextriene C- Cyclohexene

16. Reaction of haloketone with thioamide gives: A-Thiazole. B-Thiophene. C-Pyrrole.

17.Pyridine is: A-Moderately acidic B-Moderately basic C-Acidic

18.The correct order of aromaticity (most aromatic first) of pyrrole, furan and thiophene is:

A- Pyrrole> furan >thiophene. B- Thiophene>pyrrole> furan. C- Furan >pyrrole>thiophene.

19. Reaction of aromatic amine with 1,3-dicarbonyl compound give:

A) Isoquinoline. B) Indole. C) Quinoline.

20. Quinoxaline and isoquinoxaline are two isomeric heterocyclic systems which have ------- pi electrons.

A) Twelve. B) Eight. C) Ten.

Q2: Choose (T) for true sentence or (F) for false sentence: (1 Mark/each)

21. Oxidation of methyl benzene or ethyl benzene gave the same product. (T / F)

22. Benzene oxidized by ozone to give maleic anhydride. (T / F)

23. Peroxymonosulfuric acid H_2SO_5 is called Caros acid. (T / F)

24. Reduction of acetophenone using Zn(Hg)/HCl gave ethylbenzoate. (T / F)

25. The deactivating group is groups that decreases electron density in the aromatic ring. (T / F)

26. TNT can be oxidized by $Na_2Cr_2O_7/H_2SO_4$ to give trinitrobenzoic acid. (T / F)

27. Picric acid can be reacted with PCl_5 to give picryl chloride. (T / F)

28. Catalytic hydrogenation of nitrobenzene gives aniline. (T / F)

29. *N*-Dimethyl amine is type of secondary amines. (T / F)

30. Nitrosation of tertiary aromatic amine gave electrophilic substitution at para position of aromatic ring. (T / F)

31. Bromination of aniline gives *p*-bromoaniline. (T / F)

32. Reaction of aniline with benzaldehyde to give Schif's base is c lled addition reaction. (T / F)

33. Decarboxylation of salicylic acid gives phenol. (T / F)

34. Acetyl nitrate can't be used for the nitration of pyrrole. (T / F)

35. The compound to be aromatic must apply 4n+4 rule. (T / F)

36. Ortho dinitrobenzene can be prepared by nitration of nitrobenzene. (T / F)

37. Pyrrole is one of 1,2-diazole compounds. (T / F)

ē system produces from fusion of benzene with furan. (T / F)

oxazole is 1,2-oxazole type where thiazole is 1,3-thiazole type. (T / F)

. Quinoline comes from fusion of pyridine with benzene ring at C3/C4. (T / F)

41. The nitrogen atom of isoquinoline can be protonated and does not disturb aromaticity. (T / F)

42. Oxadiazole is a six membered ring bearing three heteroatoms (O, N, and N). (T / F)

43. TNT is the product of oxidation of trinitrobenzoic acid. (T / F)

44. Nitrosation of phenol gives phenyl diazonium salt. (T / F)

45. Halogenation of nitrobenzene gives ortho and para products. (T / F)

46. 2,4,6-Trinitrophenol is the product of nitration of phenol. (T / F)

47. Saccharin is prepared from *o*-toluenesulfonic acid. (T / F)

48. Hydrazobenzene under basic condition rearranged to give benzidine. (T / F)

49. Nitration of benzenesulfonic acid yields the 3-nitrobenzenesulfonic acid. (T / F)

50. Ammonolysis of activated halobenzene give chloroaniline. (T / F)

Q3. Oral exam:Choose (T) for true sentence or (F) for false sentence: (1 Mark/each)

51. 2,4,6-Trinitrophenol reacted with PCl_5 to give picryl chloride. (T / F)

52. Oxidation of phenylhydroxyl amine gave nitrozobenzene.(T / F)

53. *N, N*-dimethylaniline is an example of tertiary amine. (T / F)

54. Hydrolysis of the benzenesulfonic acids with dilute HCl gives phenol. (T / F)

55. The sulfonic acid with PCl_5 affords the sulfonyl chlorides.(T / F)

56. Bromination of aniline gives 2,4,6-tribromoaniline. (T / F)

57. Chloramine T is prepared from *p*-toluenesulfonic acid. (T / F)

58. Reduction of nitrobenzene by Zn/NH_4Cl gives aniline. (T / F)

59. Sulfonation of phenol using sulfuric acid gives ortho and para products. (T / F)

60. 1,3-Dicarbonyl compound reacts with urea to give pyrimidine-2-thione. (T / F)

Good Luck

Dr. Ahmed Abdou Omar

Assiut University
Faculty of Science
Chemistry Department

Summer 2023
Time: 3 hours

Final Examination of Organic Chemistry II (212C) for Credited Hours Students

يتم طمس (تسويد) الإجابة المختارة من قبل الطالب باستخدام القلم الجاف فقط

Answer the following questions: (50Marks)

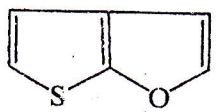
Q1: Choose the correct answer A, B, C, or D: (1 Mark/each)

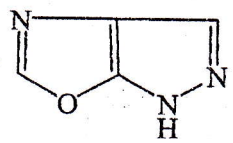
According to the following reactions answer the question from 1-5

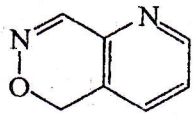
A) Pyrrole $\xrightarrow[H_2O]{POCl_3\ DMF}$ 1 B) Aniline $\xrightarrow[H_2SO_4\ Conc.]{NaNO_2}$ 2 $\xrightarrow[heat]{CuBr}$ 3

1. Reaction A is called: A- Paal-Knorr. B- Mannish. C- Vilsmeier.
2. Reaction A is type of: A- Electrophilic substitution. B-Nucleophilic substitution. C-Anion chemistry.
3. Compound1 is: A- 3-Acetyl pyrrole. B- 2-Formyl pyrrole. C- 3-Formyl pyrrole.
4. The reaction of compound 2 to give compound 3 is called:
A- Cannizaro. B- Wurtiz Reaction. C- SandMayer reaction.
5. Compound 2 is: A- 2,4,6-Tribromobenzene. B-*o*-Bromoaniline. C-*m*-Bromoaniline.

According to the following compounds answer the question from 6-8:

A- 

B- 

C- 

6. The IUPAC name of compound A is:

A) Thieno[2,3-*b*]furan. B) Thieno[3,2-*b*]furan. C) Furo[2,3-*b*]thiophene.

7. The IUPAC name of compound B is:

A) 1*H*-Pyrazolo[3,4-*d*]oxazole. B) 1*H*-Pyrazolo[4,3-*d*]oxazole. C) 1*H*-Oxazolo[4,5-*c*]pyrazole.

8. The IUPAC name of compound C is:

A) Pyrido[4,5-*b*]-*o*-oxazine. B) Pyrido[2,3-*b*]-*o*-oxazine. C) 5*H*-Pyrido[2,3-*d*]-*o*-oxazine.

9. Reaction of bromine with toluene in the presence of $AlBr_3$ gave:

A- Bromobenzene. B- *o*- and *p*-Bromotoluene. C- *m*-Bromotoluene.

10..... is the activating group and directing *o-p* in the monosubstituted benzene reactions:

A- Br B- NH_2. C- NO_2

11. Nomenclature of heterocyclic compounds having five membered ring suffixes is:

A- –ine B- –ole C- -olidin.

12. 1,4-Dicarbonyl compounds can be reacted with P_2S_5 to give:

A- Pyridine B- Indole C-Thiophene.

13.The electrophilic substitution reactions of indole occur mainly at: A- C_2 . B- NH. C- C

14. The Numbering of heterocycliccompounds generally start at:

A- Heteroatom. B- Carbon atom C- Fused face.

15.Which of the following wouldnot be expected an aromatic compound:

A- Indole B- 1,3,5-Hextriene C- Cyclohexene

16. Reaction of haloketone with thioamide gives: A-Thiazole. B-Thiophene. C-Pyrrole.

17.Pyridine is: A-Moderately acidic B-Moderately basic C-Acidic

18.The correct order of aromaticity (most aromatic first) of pyrrole, furan and thiophene is:

A- Pyrrole> furan >thiophene. B- Thiophene>pyrrole> furan. C- Furan >pyrrole>thiophene.

19. Reaction of aromatic amine with 1,3-dicarbonyl compound give:

A) Isoquinoline. B) Indole. C) Quinoline.

20. Quinoxaline and isoquinoxaline are two isomeric heterocyclic systems which have ------- pi electrons.

A) Twelve. B) Eight. C) Ten.

Q2: Choose (T) for true sentence or (F) for false sentence: (1 Mark/each)

21. Oxidation of methyl benzene or ethyl benzene gave the same product. (T / F)

22. Benzene oxidized by ozone to give maleic anhydride. (T / F)

23. Peroxymonosulfuric acid H_2SO_5 is called Caros acid. (T / F)

24. Reduction of acetophenone using Zn(Hg)/HCl gave ethylbenzoate. (T / F)

25. The deactivating group is groups that decreases electron density in the aromatic ring. (T / F)

26. TNT can be oxidized by $Na_2Cr_2O_7/H_2SO_4$ to give trinitrobenzoic acid. (T / F)

27. Picric acid can be reacted with PCl_5 to give picryl chloride. (T / F)

28. Catalytic hydrogenation of nitrobenzene gives aniline. (T / F)

29. *N*-Dimethyl amine is type of secondary amines. (T / F)

30. Nitrosation of tertiary aromatic amine gave electrophilic substitution at para position of aromatic ring. (T / F)

31. Bromination of aniline gives *p*-bromoaniline. (T / F)

32. Reaction of aniline with benzaldehyde to give Schif's base is c lled addition reaction. (T / F)

33. Decarboxylation of salicylic acid gives phenol. (T / F)

34. Acetyl nitrate can't be used for the nitration of pyrrole. (T / F)

35. The compound to be aromatic must apply 4n+4 rule. (T / F)

36. Ortho dinitrobenzene can be prepared by nitration of nitrobenzene. (T / F)

37. Pyrrole is one of 1,2-diazole compounds. (T / F)

e system produces from fusion of benzene with furan. (T / F)

. Isoxazole is 1,2-oxazole type where thiazole is 1,3-thiazole type. (T / F)

40. Quinoline comes from fusion of pyridine with benzene ring at ~~3C4~~ C_3/C_4. (T / F)

41. The nitrogen atom of isoquinoline can be protonated and does not disturb aromaticity. (T / F)

42. Oxadiazole is a six membered ring bearing three heteroatoms (O, N, and N). (T / F)

43. TNT is the product of oxidation of trinitrobenzoic acid. (T / F)

44. Nitrosation of phenol gives phenyl diazonium salt. (T / F)

45. Halogenation of nitrobenzene gives ortho and para products. (T / F)

46. 2,4,6-Trinitrophenol is the product of nitration of phenol. (T / F)

47. Saccharin is prepared from *o*-toluenesulfonic acid. (T / F)

48. Hydrazobenzene under basic condition rearranged to give benzidine. (T / F)

49. Nitration of benzenesulfonic acid yields the 3-nitrobenzenesulfonic acid. (T / F)

50. Ammonolysis of activated halobenzene give chloroaniline. (T / F)

Q3. Oral exam:Choose (T) for true sentence or (F) for false sentence: (1 Mark/each)

51. 2,4,6-Trinitrophenol reacted with PCl_5 to give picryl chloride. (T / F)

52. Oxidation of phenylhydroxyl amine gave nitrozobenzene.(T / F)

53. *N, N*-dimethylaniline is an example of tertiary amine. (T / F)

54. Hydrolysis of the benzenesulfonic acids with dilute HCl gives phenol. (T / F)

55. The sulfonic acid with PCl_5 affords the sulfonyl chlorides.(T / F)

56. Bromination of aniline gives 2,4,6-tribromoaniline. (T / F)

57. Chloramine T is prepared from *p*-toluenesulfonic acid. (T / F)

58. Reduction of nitrobenzene by Zn/NH_4Cl gives aniline. (T / F)

59. Sulfonation of phenol using sulfuric acid gives ortho and para products. (T / F)

60. 1,3-Dicarbonyl compound reacts with urea to give pyrimidine-2-thione. (T / F)

Good Luck

Dr. Ahmed Abdou Omar

Chemistry Department
Faculty of Science
Assiut University

Sept, 2023
Time: 3 hours
50 Marks

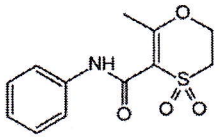
Final Exam of Green Chemistry (214C) for the 2nd Level Students

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

Final answers must be depicted in the TABLES below

1- Which is the type of aerosol distribution modes whose particles serve as nuclei and undergo coagulation followed by deposition of gas molecules?
- a) Nuclei mode
- b) Particle mode
- c) Accumulation mode
- d) Coarse particles

2- Select the name the following fungicide structure?
- a) Oxicarboxin
- b) Dimethomorph
- c) Triadimefon
- d) Difolpet



3- Which of the following is believed to be responsible for the hole in the ozone layer over Antarctic?
- a) Compounds containing chlorine
- b) Carbon dioxide
- c) Compounds containing sulfur
- d) Radioactive compounds

4- Choose the contamination type that created when chemicals are released by spill or underground storage tank leakage?
- a) Water pollution
- b) Thermal pollution
- c) Radioactive contamination
- d) Soil contamination

5- The chlorines of cyanuric chloride are very readily replaced by the alkyl amino-group to form
- a) Atrazine and Simazine
- b) Tebuthiuron and Prochloraz
- c) Fluometuron and Ethirimol
- d) MCPA and MCPB

6- Dimethirimol and Ethirimol appear to act by enzyme inhibition and belong to heterocyclic fungicides of
- a) benzimidazoles,
- b) pyrimidines
- c) morpholines
- d) imidazoles and triazoles

7- Which of the following species can initiate an aerobic troposphere CH_4-oxidation process?
- a) $CO^{\bullet}$
- b) $HO^{\bullet}$
- c) $NO^{\bullet}$
- d) $ClO^{\bullet}$

8- When traffic dies down, the nitrogen oxides and VOCs begin to react to form ------.
- a) NO
- b) O_3
- c) NO_2
- d) Aldehydes

9- Which of the following reactions represent the hydrogen removal by the hydroxyl radical from the troposphere layer?
- a) $NH_3 + HO^{\bullet} \rightarrow H_2N^{\bullet} + H_2O$
- b) $CO + HO^{\bullet} \rightarrow CO_2 + H$
- c) $CH_4 + HO^{\bullet} \rightarrow H_3C^{\bullet} + H_2O$
- d) a & c

10- Ozone in the upper atmosphere is produced from:
- a) Photochemical reactions
- b) Electrical appliances on Earth
- c) Model fractals
- d) Lightning

1	2	3	4	5	6	7	8	9	10

ملحوظة: الأختبار مكون من خمسة صفحات

11- The ----- gas is responsible for filtering most of the UV light (λ_{max} 120 - 220 nm) from sunlight radiation.

a) O_2
b) O_3
c) CO_2
d) CO

12- Dobson unit is the number of ozone molecules that would be required to create a pure O_3 layer with ------.

a) 0.01 mm thickness at 10 °C /1 atm
b) 0.01 mm thickness at 0 °C /10 atm
c) 0.10 mm thickness at 0 °C /1 atm
d) 0.01 mm thickness at 0 °C /1 atm

13- If the temperature in the synthesis reaction of 2,4,5-T, rises above ------, a side reaction between two molecules of sodium 2,4,5-trichlorophenate occurs to form ------.

a) 135°C & 1,3,6,8-tetrachlorodibenzo-p-dioxin
b) 140°C & 2,3,5,6-tetrachloro-1,4-dioxin
c) 160°C & 2,3,7,8-tetrachlorodibenzo-p-dioxin
d) 150°C & 1,2,3,4-tetrachlorodibenzo-p-dioxin

14- In the following equations, which of the following statements most accurately describe the process?

$$SO_2 + \cdot OH + M \rightarrow HOSO_2\cdot + M$$
$$HOSO_2\cdot + O_2 \rightarrow HO_2\cdot + SO_3$$
$$SO_3 + H_2O + M \rightarrow H_2SO_4 + M$$

a) Oxidation of SO_2 in coal-fired power plants
b) Injected into the atmosphere
c) Oxidation of SO_2 in gas and aqueous phase
d) Oxidation of SO_2 in rich fossil fuels

15- Which of the following herbicides is widely used as total herbicides to clear land prior to planting of crops?

a) Rimsulfuron
b) Diquat
c) glyphosate
d) Benomyl

16- Which of the following is incorrect to systemic fungicides?

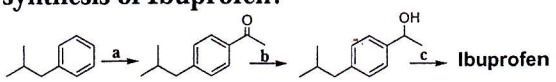
a) Enter the plant and are translocated throughout it
b) They will be more effective against spores which have already entered the plant.
c) Examples are Carboxin and Dimethirimol
d) Are applied prior to fungal attack

17- Consider the following reactions, which type of reaction best explains what has occurred?

$$Cl + CH_4 \longrightarrow HCl + CH_3$$
$$ClO + NO_2 \longrightarrow ClONO_2$$

a) Inactivation of chlorine atom
b) Chlorine reacts directly with ozone
c) Synthesis of carbon dioxide
d) Revolution of Chlorine

18- Choose the best reagents used in the synthesis of Ibuprofen?



a) **a**: Ac_2O/HF, **b**: CO/Pd-Cat., **c**: H_2/Cat.
b) **a**: H_2/Cat., **b**: CO/Pd-Cat., **c**: Ac_2O/HF
c) **a**: Ac_2O/HF, **b**: H_2/Cat., **c**: CO/Pd-Cat.
d) **a**: CO/Pd-Cat., **b**: Ac_2O/HF, **c**: H_2/Cat

19- Which of the following fungicides made by condensation reaction of Et-guanidine with ethyl *n*-butyl acetoacetate?

a) Acylalanines
b) Ethirimol
c) Dimethirimol
d) Triadimenol

20- Which one of the following is not amongst the components of photochemical smog?

a) O_3
b) RCHO
c) NO
d) SO_2

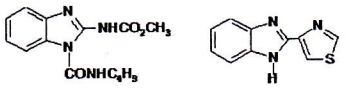
11	12	13	14	15	16	17	18	19	20

ملحوظة: الأختبار مكون من خمسة صفحات

21- What is the definition of aerosol radiative forcing effect?

a) Dark particles tend to scatter light led to warming earth s atmosphere.
b) Dark particles tend to react with light led to warming earth s atmosphere.
c) Dark particles tend to absorb light led to warming earth s atmosphere.
d) None of these

22- Which of the following is the correct name?



A B

a) **A**. Thiabendazole; **B**. Dimethirimol
b) **A**. Benomyl; **B**. Thiabendazole
c) **A**. Dimethirimol; **B**. Thiabendazole
d) **A**. Thiabendazole; **B**. Benomyl

23- Effective atrazine herbicide is produced when the 2-chlorine atom of an intermediate cyanuric chloride is replaced by ------.

a) methoxy-or thiomethyl-group
b) amino-or methyl-group
c) methyl-or phenyl-group
d) none of these

24- Which of the following is the source of secondary organic aerosols?

a) Volatile organic compounds
b) Sea spray & bubble bursting
c) Fuel combustion
d) Microbial activities

25- Amongst the given set of solvents, the most preferred solvent in synthesis of pharmaceutical drugs industry is -----.

a) Benzene
b) Ethanol
c) Cyclohexane
d) Dichloromethane

26- CNSL is obtained from roasting of cashew nuts which is riches source with ------ and ------.

a) carboxylic acids & glycines
b) amines & carbohydrates
c) phenolics & cardinols
d) unsaturated hydrocarbons & amides

27- The revolutions of inactive HCl&ClONO$_2$ to active chlorine occur at the surface of particles composed of ------.

a) H_2O, H_2SO_4 & HNO_3
b) H_2O, SO_3 & NO_2
c) H_2O, CO_2 & NO
d) None of these

28- Hydroxyl radical is the prominent oxidizing species in the atmosphere it can not be added to ------.

a) O-O bonds
b) O=S=O bonds
c) O=C=O bonds
d) a & c

29- The cloud condensation nuclei (CCN) represents are -----.

a) Particles that can become deactivated to fog or cloud droplets in the presence of a supersaturating of water vapor
b) Particles that can become activated to grow to fog or cloud droplets in the presence of a supersaturating of sulphur dioxide gas
c) Particles that can become activated to grow to fog or cloud droplets in the presence of a supersaturating of nitrogen dioxide gas
d) Particles that can become activated to grow to fog or cloud droplets in the presence of a supersaturating of water vapor

30- The following mechanism represents the catalytic processes contributing to ozone destruction by -----.

Mechanism I

$$X + O_3 \rightarrow XO + O_2$$
$$XO + O \rightarrow X + O_2$$
$$O_3 + O \rightarrow 2\,O_2$$

a) Hydroxyl Free Radical as a Catalyst
b) Nitric Oxide as a Catalyst
c) Inactive form of chlorine
d) Free radicals are readily converted into stable forms

21	22	23	24	25	26	27	28	29	30

ملحوظة: الأختبار مكون من خمسة صفحات

31- Which is the correct reaction sequence applied for synthesis of Dithiocarbamates?

a) a: oxidation, b: CS_2
b) a: reduction, b: CS_2
c) a: CS_2, b: oxidation
d) None of the above

32- Which is the final product in Pathway D for the microbial DDT degradation mechanism?

a) 4-Chlorophenyl acetate
b) 4-Chloroacetophenone
c) 4-Chlorobenzaldehyde
d) 4-Chlorobenzyl acetate

33- Benomyl can prepare from the reaction of ----- with ----- followed by addition of -----.

a) cyanamide & o-$C_6H_4(NH_2)_2$ & methyl chloroformate &
b) cyanamide & methyl chloroformate & o-$C_6H_4(NH_2)_2$
c) methyl chloroformate & o-$C_6H_4(NH_2)_2$ & cyanamide
d) o-$C_6H_4(NH_2)_2$ & cyanamide & methyl chloroformate

34- What is the definition of nuclei mode?

a) Small particles (0.02 µm) are formed by the condensation of liquids of pollutants
b) Small particles (0.01 µm) are formed by the cycloaddition of vapors of pollutants
c) Small particles (0.01 µm) are formed by the condensation of vapors of pollutants
d) Small particles (0.01 µm) are formed by the precipitation of vapors of pollutants

35- What is meant by Haze?

a) Are the particles whose diameter is higher than that of wavelength of visible light which are responsible for scattering light and increasing the visibility
b) Are the particles whose diameter is lower than that of wavelength of visible light which are responsible for scattering light and reducing the visibility
c) Are the particles whose diameter is about that of wavelength of infra red region which are responsible for scattering light and reducing the visibility
d) Are the particles whose diameter is about that of wavelength of visible light which are responsible for scattering light and reducing the visibility

31	32	33	34	35

2- Answer all of the following with either (T) or (F)? (15 Marks)

36. Inactive chlorine compounds are responsible for 75% of the ozone depletion over antartic. ( )

37. Selective herbicides tend to be used immediately after a crop has been harvested. ( )

38. Particulate matter (PM) described a very small diameter solids or liquids that remain suspended in the atmosphere. ( )

39. Elemental sulfur is the oldest effective fungicides to control mildew of fruit trees. ( )

40. The addition of CS_2 to ethylene diamine in the presence of NaOH gave Nabam. ( )

41. Ultraviolet light at the wavelength 220-320 nm range is filtered from sunlight ( )

ملحوظة: الأختبار مكون من خمسة صفحات

mainly by O_3 molecules.

42. Parasitic fungi live on decaying matter and largely responsible for the breakdown of animal and plant remains in soil. ( )

43. Thiram is used to control grey mould on lettuce and strawberries. ( )

44. Nitrogen oxides could be obtained when the temperature is sufficiently low. ( )

45. Bordeaux fungicide is a mixture contains copper, sulfur and lime mixture. ( )

46. Synthesis of 2,4-dichlorophenoxyacetic acid is carried out by following the Dow process. ( )

47. The biochemical β-oxidation process can be degraded MCPB into 2,4,5-T. ( )

48. Mushrooms and truffles are belonging to saprophytic fungi. ( )

49. Glyphosate is the trade name of *N*-(phosphonomethyl) glycine. ( )

50. Saprophytic fungi are responsible for the breakdown of animal and plant in soil. ( )

ملحوظة: الأختبار مكون من خمسة صفحات

Assiut University Faculty of Science Chemistry Department	Summer Semester Final Examination Instrumental Analysis (C-445) Credit Hours System	31-8-2023 Time: 2 hour

Section (A) (25 Marks)

Answer Only Four From the Following Questions:

Q.1: Write on the following:

(a) Advantages of solid electrodes based on carbon (Give examples) :

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(b) Ilkovic equation:

.....

.....

.....

.....

.....

.....

.....

.....

.....

Q.2: Mark (√) for the correct statement and (X) for the wrong statement

a) It is desirable to make electrochemical measurements without current flowing through the RE

b) Normal pulse is about 5-10 times more sensitive than differential pulse polarography

c) The half wave potential ($E_{½}$) can be used to identify the analyte concentration.

d) Current of polarizable electrode remains unchanged with changes in the electrode potential

e) Hg forms soluble amalgam with many metals hence lowers their reduction potentials

f) Non-faradaic currents exist in an electro- chemical cell are related to any redox reaction

g) In anodic stripping methods, the WE behaves as a cathode during the deposition step

a	b	c	d	e	f	g

Q.3: (a) A Pb^{2+} solution of unknown concentration yields a diffusion current of 1.00 µA. Then, to 10.00 mL of the unknown solution is added 0.50 mL of a standard solution of Pb^{2+} whose concentration is 0.04 M. The diffusion current with the spiked solution is 1.50 µA. Calculate the Pb^{2+} concentration of the unknown solution.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(b) Write on limitations of dropping mercury electrode:

.....

.....

.....

.....

.....

.....

.....

.....

Q.4: (a) Sketch the relation between current and time for differential pulse voltammetry.

(b) Write on the principle of electrochemical biosensor (Give an example).

Q.5:(a) The oxidation of rutin (RU) is a $2e^-$ process. A cyclic voltammetric anodic peak current (I_p) of 2.2 µA is observed for 0.4 mM solution of RU in acetate buffer at glassy carbon electrode of 2.6 mm^2 with a scan rate (v) of 25 mV/s. What will I_p be for v =100 mV/s and 1.2 mM RU?

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

(b) Write on amperometry:

.....

.....

.....

.....

.....

(c) Write on supporting electrolyte (Give examples):

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

Section (B) (25 Marks)

Answer the Following Questions:

Q.1: Choose the correct answer from a, b, c and d (6 Marks)

1. **……. is false about electromagnetic radiation.**

a) Radiation with short wavelengths have high energies
b) Energy does not depend on wavelength
c) Radiation with long wavenumbers have high energies
d) Radiation with high frequencies have high energies

2. **……. is the absorbance if the percent transmittance is 10 %.**

a) 1.0
b) 0.1
c) 0.05
d) 2.0

3. **The molar absorptivity values for compounds A and B are 1200 and 15,000 $M^{-1}cm^{-1}$, respectively. Which of the following statements is correct regarding them?**

a) Compound A can be detected at very low concentrations than compound B.
b) Compound B can be detected at very low concentrations than compound A.
c) Both compounds can be detected at very dilute concentrations.
d) Molar absorptivity does not influence the detection of compounds.

Q.2: Question 2: What are meant by chemiluminescence and bioluminescence (4 Marks)

……

……

……

……

……

……

……

……

……

……

Q.3: Answer <u>THREE ONLY</u> from the following (15 Marks)

(A) EDTA forms colored complexes with a variety of metal ions that may serve as the basis for a quantitative spectrophotometric method of analysis. The molar absorptivities of the EDTA complexes of Cu(II) and Co(II) at two wavelengths are summarized in the following table (all values of ε are in $M^{-1}cm^{-1}$)

Metal	ε462.9	ε732.0
Co(II)	15.8	2.11
Cu(II)	2.32	95.2

Using this information, determine the concentrations of Cu(II) and Co(II) in a solution that has an absorbance of 0.453 at a wavelength of 732.0 nm and 0.107 at a wavelength of 462.9 nm. The pathlength, b, is 1.00 cm.

(B) Derive the relationship between the concentration of an analyte and the measured absorbance.

(C) Show what are meant by absorption spectroscopy and emission spectroscopy, and give an example for each.

(D) The molar absorptivity is 8760 $M^{-1}cm^{-1}$ (λ = 238 nm) for a given substance in acetonitrile. What would be the absorbance if a 1-ml aliquot of this substance (2 M) was diluted to 1 liter?

Good Luck

Examiners: Prof. Dr. Hossieny Ibrahim & Dr. Ahmed Bayoumi

Assiut University
Faculty of Science
Chemistry department

27th August 2023
Time: 3 hours

Final examination for third level students in Inorganic Chemistry C-324
(Summer semester)

Section I (33 Marks)

Answer the following questions

1- Give the reason for the following: (10 Marks)

a) The decrease in basic strength of the oxides and hydroxides of lanthanides with the increase in the atomic number.
b) The extra stability shown by Ce^{4+}, Gd^{3+}, and Yb^{2+} ions. (Ce^{58}, Gd^{64} and Yb^{70})
c) The anhydrous chlorides of lanthanides are not easily obtained by heating.
d) Tetrahedral crystal field splitting energy is about half that of octahedral ones.
e) Splitting of d-orbitals in tetrahedral field is inverse that in octahedral field.

2- Calculate the spin only magnetic moment value for $[Mn(Br)_4]^{2-}$. Also predict the geometry of the complex ion. (5 Marks)

3- Calculate the crystal field stabilization energy for the high spin d^4 octahedral complexes. (4 Marks)

4- Explain the nature of bonding in $[Ni(CN)_4]^{2-}$ on the basis of valence bond theory, take in consideration that CN^- is a strong field ligand. (4 Marks)

5- Show the resemblances and differences between Sc and Ln elements. (5 Marks)

6- What are the main points of differences between the lanthanide and actinide elements? (5 Marks)

(At no. of Mn = 25 and Ni =28)

Section II (17 Marks)

Put (T) for the correct answer or (F) for the wrong statement

1. Compression Jahn-Teller distortions occur when the degeneracy is broken by the stabilization of the d orbitals with a z component.
2. The Jahn-Teller effect predicts which structures will distort, and the nature or extent of the distortion.
3. d^7 and d^8 octahedral complexes usually have 3 absorptions peaks in their spectra.
4. The UV/Vis spectra are used to determine the value of Δ_o for the complex.
5. According to Laporte selection rule, d-d transitions of octahedral complexes are forbidden, when the molecule does not have a center of symmetry.

6. **The orbitals which are left unchanged by the operation of inversion (are symmetric) are labelled with a subscript "u".**
7. **For any transition to take place, change in the value of total orbital angular momentum (ΔL) between the final and initial stage = 0.**
8. **MLCT transitions are common for coordination compounds having π-donor ligands.**
9. **LMCT transitions result in intense bands.**
10. **A charge transfer transition can be regarded as an internal oxidation-reduction process.**
11. **d-d transitions can occur only in the UV region.**
12. **In a tetrahedral crystal field, the electrons in d_{x2-y2} and d_{z2} orbitals are less repelled by the ligands.**
13. **O_h and T_d complexes have the same amount of d orbital splitting with different types of ligands.**
14. **π-bonding is the main determinant of Δ_o and the spectrochemical series for TM complexes.**
15. **Cyanide complex $[Fe(CN)_6]^{3-}$ is so much more stable than the water complex $[Fe(H_2O)_6]$.**
16. **The value of the pairing energy increases as volume of the orbitals decreases.**
17. **The larger a compound's HOMO-LUMO gap, the more stable the compound.**

.....

Best Wishes

Examiners: Dr. Mohamed Abdel megeed & Dr. Mohamed Abd El-Aal

Assiut University
Faculty of Science
Chemistry Department

Sep. 2023
Time : 2 hours

Final Exam. Of General Chemsitry(105 C) for 1 st Level Student
(Summery Term)

Section A :Organic Chemistry ***(25 Marks)***

Answer the following questions *: write the name of all compounds*

A- Write Mark (√) for the right statement and(×)for the wrong statement (8 Marks):- مع تصويب الاخطاء

1- The molecular weight of alkane less than the same cycloalkane. (....)
2- **Trans** compounds more active than **Cis** compounds. (....)
3- Convert cyclohexane to benzene through addition of $2H_2$. (....)
4- $NH_2-(CH_2-CH_2)_3-NH_2$ – called 1,5 – hexane-di amine. (....)
5- Addition of $(2H_2)$ to furane give 2,5 dihydrofurane. (....)
6- The CH_3-Cl bond is apolar covalent pond. (....)
7- Homolytic bond fission of a covalent bonds gave carbocatins and carboanions. (....)
8- Addition of (H_2O) to propene gave ethyl alchol. (....)

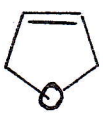
*2)- A- Write the **name** or **drow** of the following compounds (8 Marks):-*

1- $CH_3-CH=C=CH_2$

2-- $(CH_3)_2CH-CH=CH_2$

3- $CH_3-C(Cl_2)-CH_2-C(Br_2)-CH_3$

4- 

5- 

*B - Draw the structural formula of (**Three only**)from the following compounds*

1,1 -Dimethyl-2-cyclohexene*
1- Ethyl-3,5-dimethyl-cyclopentene*
Neo-pentylbromide*
Mezo-tartaric acid*

********** انظر خلفه **********

*3)- A- complete the following equations (**Three only**)---------- (9 Marks)*

1- $CH_2 = CH\text{-}CH = CH_2 + HBr \rightarrow$? + ?

2- $(CH_3)_2\ C = CH_2 + O_3 \rightarrow$? + $H_2/Zn \rightarrow$? + ?

3- $C_{10}H_{22}$ (Thermal cracking/Homolytic fission) $\rightarrow$? $\rightarrow$? + ?

4- $CH_3\text{-}CH_2\text{-}CH = CH_2 + H_2SO_4$ (conc.) $\rightarrow$? + H-OH $\rightarrow$? + H_2SO_4

*B-Write on **two** only: -*

Toutamerism* Anti Markownikoffs rule* Resonance of 1,3butadiene.

C)- Write the type of hybrization and number of(σ; π) in the following compounds.) ***Two only***

$CH_3 - C \equiv N$; $CH_3\text{-}CH = CH_2$; $CH_2 = CH - C \equiv CH$

****

Prof.Dr Osama Shehata Moustafa

2023

Assiut University Faculty of Science Chemistry Department	August 2023 Time allowed: 2 hours.
Summer Semester Final Examination (Inorganic part) Subject: General Chemistry II (105C) First Level "Faculty of Science"	

Answer the following questions:

Question 1: Put (T) for the correct answer or (F) for the wrong statement (Answer only 5 points) (5 Marks).

1. When a solute is dissolved in a pure solvent, the vapour pressure will lower.
2. The ion is completely precipitated if 99.8% of it is precipitated and only about 0.2% is left in solution.
3. For complete precipitation, the concentration of the common ion should be lower than that of the ion to be precipitated.
4. If $Q_{ip} < K_{sp}$, the precipitation occurs.
5. The solubility of a slightly soluble ionic compound is lowered in the presence of a second solute that gives a common ion.
6. Buffer solutions can resist changes in pH when an acid or a base is added to them.
7. The resulting solution form the hydrolysis of the salt derived from weak acid and weak base is neutral.
8. The interaction of ion of a salt and the ion of water is called oxidation.

Question 2: Answer only 5 points from the following (20 Marks).

1. What is the molarity of NH_4OH solution has a pH = 4? (K_b $NH_4OH = 1.8x10^{-5}$)
2. What is the pH value of a solution prepared by dissolving 0.0155 mole $Ba(OH)_2$ in water to give 900 ml aqueous solution? Assume that $Ba(OH)_2$ is completely dissociated.
3. What is the solubility of Ag_2SO_4 in 2 M aqueous Na_2SO_4 solution? ($K_{sp} = 1.4x10^{-5}$).
4. What is the molar solubility of $Mg(OH)_2$ in a solution containing 1M NH_3 and 2 M NH_4Cl? ($K_{sp} = 1.8x10^{-11}$, $K_b = 1.8x10^{-5}$).
5. A solution of 0.8 g of urea in 50 g of water gave a boiling point elevation of 0.17°C. What is the molal elevation constant of water. (M. Wt. of urea = 60 g/mol).
6. An aqueous solution containing 3 g of sorbitol in 300 g of water is found to have a freezing point of – 0.102 °C. What is the molar mass (molecular weight) of sorbitol ($K_f = 1.86$ °C /mol).

Assiut University
Faculty of Science
Chemistry Department

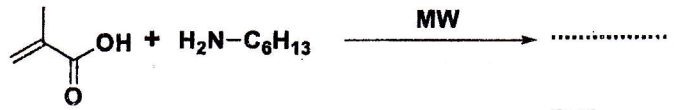
Date: 09-09-2023
Time: 3 h

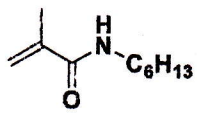
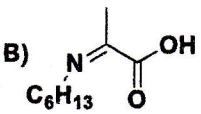
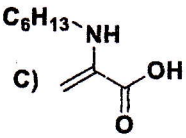
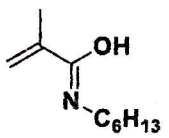
Final Exam in Photochemistry and Reactive Intermediates for 3rd Level Students (C-313)

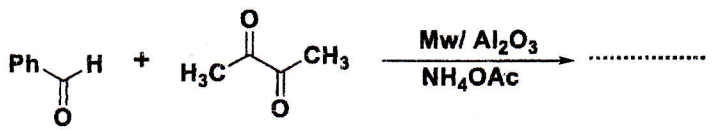
The questions on five pages

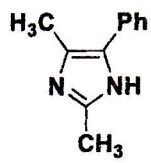
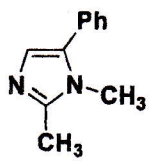
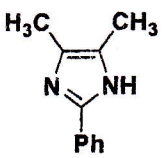
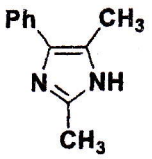
Section A: Photochemistry (25 Marks)

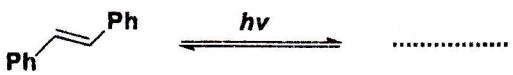
Q1: Choose the correct answer A, B, C, or D: (1 Mark/each)

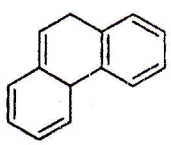
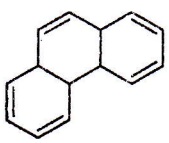
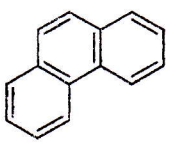
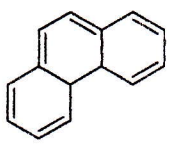
1. 

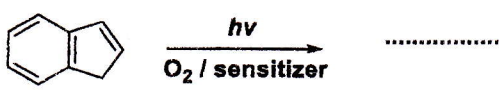
A) 
B) 
C) 
D) 

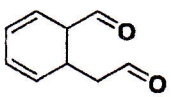
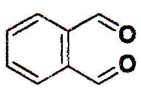
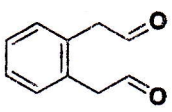
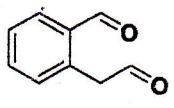
2. 

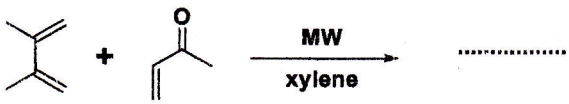
A) 
B) 
C) 
D) 

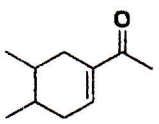
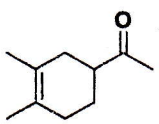
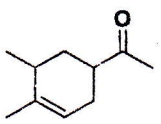
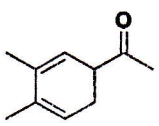
3. 

A) 
B) 
C) 
D) 

4. 

A) 
B) 
C) 
D) 

5. 

A) 
B) 
C) 
D) 

6- The irradiation of benzene itself brings about a low conversion into .....

A) fulvene and toluene.
B) Dibenzyl and benzvalene.
C) fulvene and benzvalene.
D) fulvalene and benzvalene.

7- 4,4'-bis (N-dimethylamino)benzophenone under ***hv*** and in the presence of isopropyl alcohol gives:

A) Dimer. **B)** diol. **C)** A & B **D)** No reaction.

8- Dimerization of butadiene at (> 400 nm) in the presence of acetophenone gives the major product .....

A) 3-Vinylcyclohexene.
B) Trans-1,2-divinyl cyclobutane.
C) 3-Vinylcyclohexane.
D) Cis-1,2-divinyl cyclobutane.

9- Reaction of benzophenone under the light in toluene gives .....

A) Benzhydrol. **B)** Benzyldiphenyl carbinol. **C)** Dibenzyl. **D)** All of them

10- In some reactions, Φ is more than 1 which indicates to .....

A) Chain product reaction
B) Our materials have a higher quantum yield
C) Our materials have lower quantum yield
D) Our materials haven't fluorescence

11- By increasing the solvent polarity, the ..... shift in $n \rightarrow \pi^*$ excitation was observed.

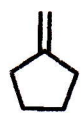
A) Blue. **B)** bathochromic. **C)** Hypochromic. **D)** Red.

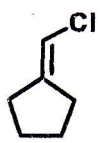
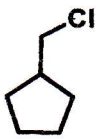
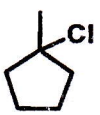
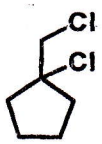
12- Ozone layer is existing in .....

A) Thermosphere. **B)** Mesosphere. **C)** Stratosphere **D)** Troposphere.

13- In the AIE materials, the main reason why the fluorescein color does not appear in the solution is .....

A) Rotation motion of aromatic rings.
B) π- π interactions of aromatic rings.
C) Vibrational motion of aromatic rings.
D) No rotation of aromatic rings.

14-  + HCl $\xrightarrow[\text{sensitizer}]{\text{Light}}$ .....

A) 
B) 
C) 
D) 

15- ..... Compounds are considered as AIE material.

A) Pyrene. **B)** HPS. **C)** Fluorescein **D)** A & C.

16- According to Beer's Lambert's law, the absorbance is directly proportional to .....

A) The concentration **B)** the solvent **C)** the length of the light path **D)** A & C

17- Photoisomerization reactions may exist in .....

A) Alkenes. **B)** Aromatic compounds. **C)** Cycloalkanes. **D)** A & C.

18- Usually, the maximum concentration used in the water fraction experimental is ……..

A) 500 μM B) 50 μM C) 50 mM D) 50 M

19- The four types of excitations are arranged according to the energy as the following: ……

A) $\sigma \rightarrow \sigma^* > \pi \rightarrow \pi^* > n \rightarrow \sigma^* > n \rightarrow \pi^*$

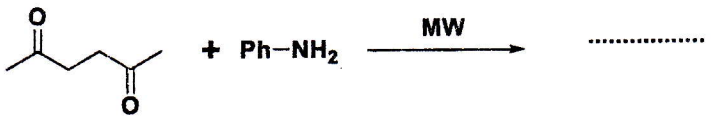
B) $\pi \rightarrow \pi^* > \sigma \rightarrow \sigma^* > n \rightarrow \sigma^* > n \rightarrow \pi^*$

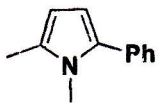
C) $\sigma \rightarrow \sigma^* > \pi \rightarrow \pi^* > n \rightarrow \pi^* > n \rightarrow \sigma^*$

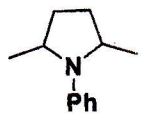
D) $\sigma \rightarrow \sigma^* > n \rightarrow \sigma^* > \pi \rightarrow \pi^* > n \rightarrow \pi^*$

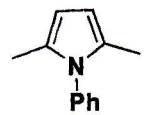
20- The microwave wavelength range between …….. and …….

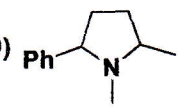
A) 1 cm / 30 mm B) 1 mm / 30 mm C) 1 mm / 30 cm D) 1 cm / 30 cm

21. 

A) 

B) 

C) 

D) 

22- Conversion of carbonyl compounds into 1,2-diols is an example of:

A) Photooxidation. B) Photoisomerization. C) Photoreduction. D) Sigmatropic Shift.

23- Why T → T transfer is important? Because ……

A) Easy to obtain triplet state by direct irradiation B) Have a longer lifetime.

C) Have a shorter lifetime. D) A & B.

24- The fluorescence spectrum can be represented graphically by ……

A) Intensity on Y-axis and Wavelength on X-axis B) Wavelength on Y-axis and Absorbance on X-axis

C) Absorbance on Y-axis and Wavelength on X-axis D) Wavelength on Y-axis and Intensity on X-axis

25- In most cases, the Fluorescence light has a …….. wavelength, and therefore …… photon energy than the absorbed radiation.

A) Longer/Lower. B) Longer/Longer C) Lower/Longer. D) Lower/Lower.

With best wishes

Dr. Abdelreheem A. Saddik.

oose (T) for true sentence or (F) for false sentence: (1 Mark/each)

ion (B) Reactive intermediates:

26- An example for active intermediates is the free radical and carboanion. (T / F)

27- Carbocations are not electron efficient. (T / F)

28- Wagner-Meerwein Rearrangement is migration of alkyl group. (T / F)

29- Due to short lifetimes, radicals cannot be observed directly by spectroscopic techniques (T/F)

30- Pinacol Rearrangement is an acid catalyzed 1,2-migration of a diol compound. (T/F)

31- The divalent carbocations take SP^3 and SP^2 hybridized forms. (T / F)

32- Transformation of camphenilol to santene is type of Wanger-Meerwein Rearrangement (T / F)

33- Molecule-molecule reactions is type of Radical Reactions. (T / F)

34- Disproportionation reaction is type of radical-molecule reactions. (T / F)

35- Olefin polymerization is one of the reactions of carbanions. (T/F)

36- Wanger-Meerwein rearrangement involves four membered ring intermediates. (T/F)

37- Carbenes are defined as divalent carbon intermediates. (T/F)

38- Photolysis of epoxides gives stable carbocation. (T/F)

39- The ethyl cation is more stable than methyl cation. (T/F)

40- Oxidation of phenol gives peroxide compound. (T/F)

41- The carboanions are electron rich. (T/F)

42- Fragmentation reaction is type of unimolecular radical reactions. (T/F)

43- Coupling process is type of electron transfer reactions. (T/F)

44- AIBN is called azo bis isobutyryl nitroabenzene. (T/F)

45- The propagation step is the first step in free radical reactions.

46- Photolysis of diazoalkanes gives carbene species. (T/F)

47- Photolysis of epoxide gives oxonium ion. (T/F)

48- Thermal decomposition of benzaldehyde tosyl hydrazone afforded the carbocation. (T/F)

49- The field effect in carbocation is observed in 1-adamantyl cation relative to the 3-cyano derivative. (T/F)

50- Photolysis of azide compound give carbine species. (T/F)

اقلب الصفحة

Q3. Oral: Choose (T) for true sentence or (F) for false sentence: (1 Mark/each)

51. The ozone layer exists in the Mesosphere layer. (T/F)
52. The photochemical reaction of benzophenone in the presence of isopropanol is an example of Dimerization and Hydrogen Abstraction. (T/F)
53. In the solvent fraction test to identify the ACQ and AIE materials, the two solvents should be immiscible together. (T/F)
54. ACQ materials showed fluorescein color in the solid state. (T/F)
55. Conventional Prism or Grating monochromator systems cannot provide sufficiently high-intensity monochromatic beams. (T/F)
56. Pinacol rearrangement proceeds in an acid or basic catalyzed. (T/F)
57. Carbanion can be generated as a group attached to a carbon leaves taking its electron pair. (T/F)
58. Carbenes can abstract hydrogen or other atoms to give free radicals. (T/F)
59. Nitrogen atom in nitrene species has six electrons. (T/F)
60. Decomposition of diazomethane in benezene leads to tropilidene and toluene. (T/F)

انتهت