

مكتبة جامعة القاهرة

الفرقة الثانية

2

Assuit University Faculty of Science Chemistry Department		Time: 2 hrs Course Code: C-210
Final Examination of Biochemistry (210 C) For Second Year Industrial Students		

Answer the following questions: (50 Marks)

Q1: Write True (T) or False (F) in front of the following statements in Table with correcting the wrong one.

(18 marks, 1.5 Mark for each)

- 1- The body begins to break down protein-rich tissues, such as muscles, leading to muscle wasting and eventually death if the deficiency is severe.
- 2- Enzymes catalyze the vast majority of chemical reactions that occur in the cell.
- 3- Lipids include fats, oils, terpenoids, phosphatides, waxes and related compounds.
- 4- Lipoproteins are important cellular constituents that are present both in the cellular and subcellular membranes.
- 5- Photosynthesis reaction occurs in the ribosomes of cells.
- 6- Cholesterol enters in membrane structure and is used for synthesis of adrenal cortical hormones, sex hormones vitamin D3 and bile acids.
- 7- Biological compounds such as enzymes, hormones, and antibodies are present in all living organisms.
- 8- When an animal consumes excess proteins, they are converted into fats and used to supply energy or build energy reserves.
- 9- In eukaryotic cells, ribosomes are found as free-floating particles within cells.
- 10- Minerals are embedded in the rough endoplasmic reticulum, a cell organelle.
- 11- Bioenergetics is the study of the energy changes accompanying biochemical reactions.
- 12- Micro-minerals control the activity of genes and regulate gene expression.

1		3		5		7		9		11	
2		4		6		8		10		12	

Q2: Write (Only Seven) in details the following items including the reaction mechanisms:

(21 Marks, 3 Mark for each)

- A- Biological importance of glycolysis.
- B- Krebs cycle.
- C- Difference between DNA – RNA.
- D- Glyoxylate cycle.

- E- Kinetics of enzyme reaction and its role.
- F- Types of inhibitors.
- G- Photosynthesis reaction.
- H- Difference between hypoglycemia and hyperglycemia.
- I- Factors affecting enzyme activity.

Q3: Choose the correct word of the following statements:

(11 Marks, 1 Mark for each)

- 1- If an enzyme produces too much of one substance in the organism, that substance may act as an for the enzyme at the beginning of the pathway that produces it.
a) Reducing b) Oxidizing c) Inhibitor d) All of above.
- 2- A protein is a naturally occurring, extremely complex substance that consists of amino acid residues joined by bonds.
a) Ionic b) Covalent c) Peptide d) Chelating
- 3- provide many of the structural elements of a cell, and they help to bind cells together into tissues.
a) Carbohydrates b) Enzymes c) Proteins d) Minerals
- 4- Glycine is a simple one of acids.
a) Halogen b) Carboxyl c) Amino d) Hydroxyl
- 5- Macro-minerals are required more greater than 100 mg/ day including.....
a) Calcium b) Magnesium c) Phosphorus d) All of above
- 6- Michaelis-Menten kinetics relies on the law of action, which is derived from the assumptions of free diffusion and thermodynamically driven random collision.
a) Volume b) Binding c) Mass d) All of above.
- 7- Alanine is an amino acids.
a) Neutral b) Acidic c) More acidic d) Basic
- 8- is a polysaccharide formed from poly glucose monomers in plants.
a) Ammonia b) Lactose c) Starch d) Fructose
- 9- To find the maximum speed of an enzymatic reaction, the substrate concentration is until a constant rate of product formation is seen.
a) Minimized b) Reduced c) Increased d) Decreased
- 10- Amino acids have as function groups.
a) Carboxylic, Amino b) Only Amino
b) Carboxylic, Amide d) Only Carboxylic
- 11- In Krebs cycle, the energy produced by catabolism of
a) Citrate b) Oxaloacetate c) Acetyl CoA d) All of above

انتهت الاسئلة بالتوفيق
الممتحن / د. أماني عبدالرحمن عثمان



**Final Examination for Applied Industrial Chemistry Students (Chem 202,
Organic Chemistry II)**

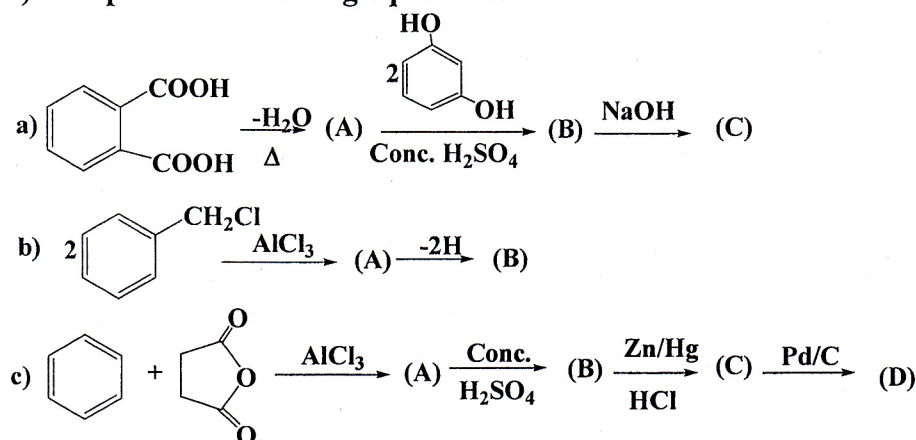
Section A (Aromatic Compounds)

(25 Marks)

Answer the following questions

1) Complete the following equations:

(9 Marks)



2) Write on the following by equations:

(9 Marks)

- Reaction of phenol with PCl_5 , LiAlH_4 , Cl_2 and Soda lime
- Oxidation of naphthalene with V_2O_5 , KMnO_4 and alkaline KMnO_4
- Claisen rearrangement of allyl phenyl ether with its mechanism

3) Discuss the following by equations:

(7 Marks)

- Pschorr synthesis of phenanthrene
- Arrange the acidity of the following compounds with ascending:
 - p-Nitrophenol
 - p-Methoxyphenol
 - m-Nitrophenol
 - Phenol
- Reaction of α - and β -naphthols with FeCl_3
- Gattermann-Koch reaction for aldehydes

بقية الأسئلة خلف الصفحة

Section B (Heterocyclic Chemistry)

(25 Marks)

Answer the following:

1) Draw the structure of the following compounds:

(5 Marks)

- (i) 1,4-Dimethylimidazole, (ii) Piperidine, (iii) Barbituric acid, (iv) Furfural, (v) 3-Methyl-5-pyrazolone.

2) Mark the following as ($\sqrt{}$) or (X) for the following sentences:

(8 Marks)

- i. α , γ -Aminopyridine are easily prepared by reducing of α , γ -nitroaniline.
- ii. Nicotinic acid like benzoic acid in chemical reaction.
- iii. Pyridine resist oxidation.
- iv. In isoquinoline, the benzene ring is fused β , γ - with pyridine ring.
- v. Coumarine is stable with acids.
- vi. The pyrone ring is more stable than benzene ring.
- vii. Chromon decomposes with alkali.
- viii. α and γ - pyrone have the same structural formula.

3) Complete the following equations

(4 Marks)

- i- Indole + Na -----
- ii- Furfural + AgO -----
- iii- Thiophene + N-bromosuccinamide -----
- iv- Pyridine + H₂SO₄ -----

4) Explain by equations the synthesis of the following:

(8 Marks)

- i- Reissert synthesis of indole. (3 Marks)
- ii- Fischer's synthesis of carbazole. (2 Marks)
- iii- Skraup synthesis of quinoline. (3 Marks)

Best Wishes
Prof. Ali Abdel-Hafez
Prof. Abdel-Aal Gaber

Assiut University Faculty of Science Chemistry Department	Final Examination Industrial Methods of Analysis for 2 nd Year Students (C-205) (Industrial Chemistry Programme)	Second Semester June 2023 Time: 2 hour
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Section(A) Answer the Following Questions: (25 Marks)

Q.1: Choose the Correct Answer: (15 Marks)

- Which of the following is the advantage of glass pH electrode?
 - Potential affected by the presence of oxidizing or reducing agents
 - Selective for polyvalent cations
 - Operates over a wide pH range
 - Slow response
- Glass ion selective electrode is a type of electrode.
 - Reference
 - Non-crystalline membrane
 - Crystalline Membrane
 - A & B
- At levels the glass membrane is more responsive to other cations, such as Na^+ and K^+
 - more basic pH
 - more acidic pH
 - Neutral pH
 - None
- Liquid-membrane electrode in which the is held in a polyvinyl chloride gel has been developed for Ca^{+2} .
 - Tridodecylmethylammonium chloride
 - Valinomycin
 - Tetradodecyl ammonium nitrate
 - di-(n-decyl) phosphate
- In which of the following systems inert metallic electrodes are used?
 - $\text{Fe}^{3+}/\text{Fe}^{2+}$
 - $\text{Hg}^{2+}/\text{Hg}^0$
 - A & B
 - None
- The potential of a glass indicator electrode (E_{ind}) is given by
 - $E_{\text{ind}} = E_b - E_{\text{ref}} - E_{\text{asy}}$
 - $E_{\text{ind}} = E_b - E_{\text{ref}} + E_{\text{asy}}$
 - $E_{\text{ind}} = E_b + E_{\text{ref}} - E_{\text{asy}}$
 - $E_{\text{ind}} = E_b + E_{\text{ref}} + E_{\text{asy}}$
- In fluoride ion selective electrode, the membrane consists of a slice of a single crystal of
 - lanthanum fluoride (LaF_3)
 - Europium(II) fluoride (EuF_2)
 - LaF_3 doped with EuF_2
 - None
- The first commercial glass electrodes were manufactured using Corning 015, a glass with a composition that is approximately
 - 18% Na_2O , 10% CaO and 72% SiO_2
 - 22% Na_2O , 6% CaO and 72% SiO_2
 - 24% Na_2O , 6% CaO and 70% SiO_2
 - None
- arises from difference in rate of migration of anion and cations of the bridge salt and the electrolytes in the electrodes solutions.
 - Cell Potential
 - Electrode potential
 - Liquid junction potential
 - None

- 10- Glass electrode is commonly used in reactions.
 (A) Neutralization (B) Redox (C) Precipitation (D) All of them
- 11- To eliminate the bias caused by....., calibration of the glass electrode in standard solutions covering the pH range in which measurements are desired.
 (A) The boundary potential (E_b) (B) Reference potential (E_{ref})
 (C) The asymmetry potential (E_{asy}) (D) None
- 12- Potentiometric titration is used when.....
 (A) Endpoints are very difficult to determine
 (B) Colored and turbid solution
 (C) Absence of a suitable indicator (D) All of them
- 13- The resulting difference in potential between the two surfaces of the glass is
 (A) The boundary potential (B) Reference electrode potential
 (C) Asymmetry Potentials (D) None
- 14- Ion selective electrode are unaffected by of the solution.
 (A) colour (B) turbidity (C) color or turbidity (D) None
- 15- Which of the following is (are) the advantage(s) of ion exchanger used liquid membrane electrode?
 (A) Low ion selectivity (B) Low-ion exchanger capacity
 (C) High solubility in sample solution (D) Availability in high purity

Answer

[illegible]

Q.2: Write on advantages of Glass pH electrode.

(3 Marks)

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Q.3: Drive the potential of a liquid-membrane electrode for Ca^{2+} .

(3 Marks)

Q.4: When a Pb ion-selective electrode and a SCE reference were immersed in 50.0 mL of the sample, the cell potential was found to be -0.118 volts. 5.00 mL of a 0.006 M solution of Pb^{2+} standard solution was added to the above sample and the measurement repeated; the cell potential was changed to -0.109 volts. What is the approximate concentration of Pb^{2+} in the wastewater in molar, in mg/L and in ppm? (Atomic mass of Pb = 207.2 g/mol)

(4 Marks)

Section(B) Answer the Following Questions: (25 Marks)

Part I: choose the correct answer:

(10 points)

1. Which of the following is not a type of chromatography based on physical state of the mobile phase?
 - a) Liquid chromatography.
 - b) Gas chromatography.
 - c) Supercritical fluid chromatography.
 - d) Ion-exchange chromatography.
2. The retention factor (k') is an important parameter that is widely used to describe the migration rates of solutes on columns. For a solute B, when k'_B is > 30 ,
 - a) The separation is poor.
 - b) The separation is slow.
 - c) The separation is optimum.
 - d) None of these.
3. The number of theoretical plates is used in the _____.
 - a) Determination of the thickness of the stationary phase.
 - b) Estimation of the column efficiency.
 - c) Measurement of analyte distribution between mobile and stationary phases.
 - d) All of these.
4. The partition coefficient, K_c , involved in chromatography is defined as,

a. $\frac{C_S}{C_M}$ c. $\frac{K_B}{K_A}$	b. $\frac{n_s/V_s}{n_M/V_M}$ d. a and b
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5. The column chromatography elutes two compounds, M and N. (adsorption of $N > M$). Which of the following is the correct statement?

a. N will elute first with high t_R value c. N will elute first with low t_R value	b. M will elute first with high t_R value d. M will elute first with low t_R value
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6. Real deviation of Beer's Law resulting from the presence of:
 - (a) Higher concentration of the analyte in the solution ($> 10\text{mM}$).
 - (b) Association, dissociation and interaction of the analyte with the solvent.
 - (c) Polychromatic radiation or stray radiation.
 - (d) None of these.
7. According to Beer's law for a colored solution, which one of the following statements is incorrect?
 - (a) The absorbance changes when the cell path length (cell thickness) increases.
 - (b) The cell path length is reversibly proportional to the concentration.
 - (c) The absorbance is reversibly proportional to the concentration and path length.
 - (d) None of these.

8. A device that splits the light source, after passing through the monochromator, into two separate beams-one for the sample and the other for the reference is
 - a) Single-beam UV-Vis spectrophotometer
 - b) Double-beam UV-Vis spectrophotometer
 - c) Photoelectric transducer
 - d) Both (a) and (b)
9. A sample has an absorbance of 0.20. What is its percent transmittance?
 - a) 80.3%
 - b) 50.2%
 - c) 63.1%
 - d) 20.0%
10. What is the light source used in UV/visible spectrophotometers?
 - (a) Deuterium Lamp.
 - (b) Tungsten Lamp.
 - (c) Hollow cathode lamp.
 - (d) Deuterium and tungsten lamps.

Part II: Enter in the appropriate box the expressions you would select to define each of the phenomena Labeled A-E inclusive. (5 points)

Expression	Phenomena
Elution Chromatography	A. is the time it takes after sample injection for the analyte to reach the detector in column chromatography.
Stationary phase	B. is defined as the degree of separation between successive peaks in column chromatography (generally called as critical pair).
Mobile phase	C. it involves transporting a species through a column by continuous addition of fresh mobile phase.
Retention time (t_R)	D. is a solid substance through which the mobile phase passes. The most common substance for column chromatography is silica gel, followed by alumina.
The selectivity factor (α)	E. is a solvent or a mixture of solvents that is used to move compounds through the column chromatography. Solvents used based on their polarity include ethanol, acetone, water, and others.

A	
B	
C	
D	
E	

Part III: Problems and Questions

(10 points)

1. The following data were obtained by liquid-chromatography on a 24.7 cm packed column and 0.313 mL/min flow rate. **(4 points)**

	t_R , min	W, min
Nonretained	3.1	—
A	5.4	0.41
B	13.3	1.07

Calculate (a) the plate height for the column.

(b) the capacity factor for A and B.

(c) the resolution, R_s .

(d) the selectivity factor, α .

2. A 2.83×10^{-4} M solution of KMnO_4 has an absorbance of 0.510 when measured in a 0.982 cm cell at 520 nm. Calculate **(2 points)**

(a) The molar absorptivity for KMnO_4 at this wavelength.

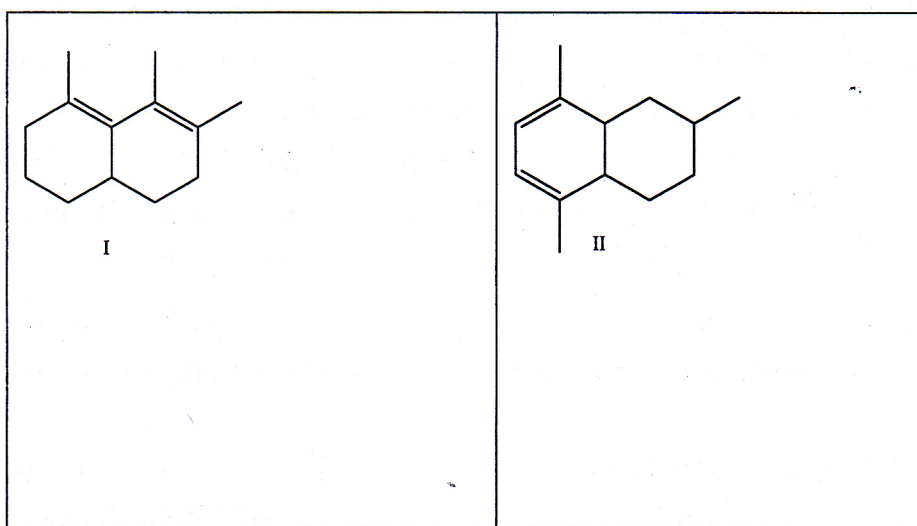
(b) The molar concentration of KMnO_4 in a solution that has an absorbance of 0.747 when measured in a 1.5 cm cell at 520 nm.

3. Describe the basic components of UV/visible spectrophotometers.

(2 points)

4. Using Woodward-Fieser rule, calculate the wavelength of absorption maximum of the following compounds:

(2 points)



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

Q1: Shade (T) for True statements or (F) for False statements: (1 Mark each)

No.	Phrase
1	Proteins above their isoelectric points move to the anode. .
2	The surface tension of lyophilic sols is frequently higher than that of the pure medium.
3	The dispersed phase in emulsions are generally positively charged.
4	Many elastic and non-elastic gels shrink in volume on standing, with an accompanying exudation of solvent. This process is called syneresis.
5	Water-insoluble soaps favor the formation of emulsions of water in oil.
6	If the sol particles in a given colloid move towards the anode, the dispersion medium carries negative charge.
7	An emulsifier at the water- oil interface decreases the surface tension on the side of one liquid more than does on the other one.
8	Lyophobic colloids are characterized by relatively weak Tendall effect.
9	The two phases S_R and S_L co-exist in equilibrium along fusion curve (FG) of S_R . Thus the system is monovariant.
10	According to water phase diagram, the solid ice will sublime if heated at one atmospheric pressure.
11	All triple points are eutectic points.
12	At transition point E (234°C) in phase diagram of Na_2SO_4 -water system, enantiotropic transformation of rhombic Na_2SO_4 to monoclinic form takes place and the system is univariant.
13	Cryohydrate can be regarded as a compound.
14	NaCl-water phase diagram system exhibits only two invariant triple points.
15	Ammonium chloride in equilibrium with its dissociation products is three phases and one component system.
16	The phase diagram of NH_4NO_3 - AgNO_3 - H_2O at 30°C showing the existence of one bivariant area, three univariant areas and two invariant areas.

17	At maximum (points C, E, G and I) in FeCl_3 -Water phase diagram, the system has two phases and one component.
18	At STP, an 835 mL of H_2 is evolved when 2 A is passed through a water electrolysis for one hour.
19	The standard calomel electrode is used as primary reference electrode for the measurement of the single electrode potential.
20	The reduction potential of Ni electrode in 0.023M NiSO_4 solution at 25°C is 0.28 V, where $E^\circ = -0.25\text{V}$.
21	The concentration of Cu^{2+} in the following cell ($\text{Ni} \mid \text{Ni}^{2+}(0.1\text{M}) \parallel \text{Cu}^{2+}(x\text{M}) \mid \text{Cu}$) is $4.4 \times 10^{-3}\text{M}$ ($E_{\text{cell}} = 0.55\text{V}$; $E_{\text{Ni}^{2+}/\text{Ni}}^\circ = -0.25\text{V}$ and $E_{\text{Cu}^{2+}/\text{Cu}}^\circ = 0.34\text{V}$)
22	The electrode potential of $\text{Pt} \mid \text{I}_2 / \text{I}^- (0.005\text{M})$ is 0.598V (note: $E^\circ = 0.53\text{V}$) ($F = 96485\text{ C mol}^{-1}$; $R = 0.0821\text{ atm L K}^{-1}\text{ mol}^{-1}$)
23	On the electrolysis of water hydrogen gas evolved on the cathode.
24	Primary batteries are disposable because their electrochemical reaction can be reversed.
25	Alkaline fuel cells use an alkaline electrolyte such as NaOH and are fueled with pure methanol and hydrogen. ($F = 96485\text{ C mol}^{-1}$; $R = 0.0821\text{ atm L K}^{-1}\text{ mol}^{-1}$)

Q 2: Shade the correct answer; A, B, C or D: (1 Mark each)

No.	Phrase
26	<u>The dispersal of freshly prepared aluminum hydroxide into colloidal solution can be performed by</u> A) peptization by dispersion medium C) A and B are correct B) peptization by dil. HCl solution D) none of these
27	<u>Some gels liquify readily when shaken to form a sol which on standing turns back into a gel. The sol-gel transformation is referred to as</u> A) metathesis B) syneresis C) thixotropy D) B and C are correct.
28	<u>A gel is a colloidal system in which a is dispersed in a medium.</u> A) solid, liquid B) liquid, solid C) liquid, liquid D) liquid, gas
29	<u>The effectiveness of SO_4^{2-}, Cl^- and $[\text{Fe}(\text{CN})_6]^{3-}$ ions for precipitating $\text{Fe}(\text{OH})_3$ positive sol decreases in the order.....</u> A) $[\text{Fe}(\text{CN})_6]^{3-} > \text{SO}_4^{2-} > \text{Cl}^-$ B) $\text{Cl}^- > \text{SO}_4^{2-} > [\text{Fe}(\text{CN})_6]^{3-}$ C) $\text{SO}_4^{2-} > \text{Cl}^- > [\text{Fe}(\text{CN})_6]^{3-}$ D) $[\text{Fe}(\text{CN})_6]^{3-} > \text{Cl}^- > \text{SO}_4^{2-}$
30	<u>The charge on hydrous ferric oxide sol is due to ions.</u> A) absorption of Cl^- B) adsorption of Cl^- C) adsorption of Fe^{+3} D) absorption of Fe^{+3}

31	The the gold number of a hydrophilic colloid, the greater is its protective power. A) higher B) lower C) constant D) none of these
32	Macromolecular colloids possess..... A) high viscosities B) high molecular weights C) weak Brownian motions D) all of these
33	Cheese is an example of A) solid in solid. B) liquid in solid. C) solid in liquid. D) none of these.
34	The movement of the dispersion medium under the influence of applied potential is known as A) osmosis B) diffusion C) electro-osmosis D) electrophoresis
35	For a two component system the maximum number of degree of freedom is A) Two ; B) Three ; C) Four ; D) None of these
36	Curve OC in water phase diagram is known as A) Freezing curve of water; B) Fusion curve of ice ; C) Melting curve of ice ; D) All of these
37	MgCl ₂ -CaCl ₂ -Water at 25°C gives the formation of A) Congruently saturating double salt; B) Incongruently saturating double salt; C) Congruently saturating ternary compound; D) Incongruently saturating ternary compound
38	The occurrence of the same substance in more than one crystalline form is known as A) Polymorphism; B) Phase reaction; C) Isomerism; D) None of these
39	Which of the following points are invariant as maximum three phases can co-exist in equilibrium ? A) Boiling; B) Freezing; C) Triple; D) All of these
40	A mixture of benzene and water has the number of phases and degrees of Freedom equal to ---- and ---- respectively. A) 1 and 2 ; B) 2 and 1 ; C) 2 and 2 ; D) 2 and 3
41	The ----- temperature is below the hypothetical congruently melting point. A) Transition ; B) Eutectic ; C) Critical ; D) None of these
42	A drop of water is placed in stoppered bottle. The number of phases in the system is A) One ; B) Two ; C) Three ; D) None of these
43	What mass of copper metal is deposited if a 5.12 A current is passed through a Cu(NO ₃) ₂ solution for 1.5 h? (Cu=63.546 g/mol) A) 9.1 g B) 18.2 g C) 5.4 g D) 0.143 g
44	The ΔG° for the following reaction is: $2Cu_{(aq)}^+ + Sn_{(aq)}^{4+} \rightarrow 2Cu_{(aq)}^{2+} + Sn_{(aq)}^{2+}$; ($E^\circ_{Sn^{4+}/Sn^{2+}} = 0.151 V$, $E^\circ_{Cu^{2+}/Cu^+} = 0.153 V$) A) 385.94 J B) -385.94 J C) -192.97 J D) 192.97 J

45	What is the concentration of Ag^+ in the following cell? ($E_{cell} = 1.536 V$) $Zn(s) Zn^{2+}(2.00 M) Ag^+(xM) Ag(s)$; ($E_{Ag^+/Ag}^\circ = 0.80 V, E_{Zn^{2+}/Zn}^\circ = -0.76 V$) A) 0.33 M B) 0.55 M C) 0.88 M D) 0.44 M
46	Consider the following: $Cl_2 \rightarrow ClO_3^-$ the balanced half reaction is: A) $Cl_2 + 3H_2O \rightarrow ClO_3^- + 6H^+ + 5e^-$ B) $Cl_2 + 3H_2O \rightarrow 2ClO_3^- + 6H^+ + 4e^-$ C) $Cl_2 + 4H_2O + 2e^- \rightarrow 2ClO_3^- + 6H_2$ D) $Cl_2 + 6H_2O \rightarrow 2ClO_3^- + 12H^+ + 10e^-$
47	Which of the following statements is incorrect about lead-acid batteries? A) The electrolyte is H_2SO_4 B) Produce of a total 12 V C) When fully charged both of the plates becomes Pb_2O_2 D) Used in automobiles
48	What volume of chlorine gas at standard temperature and pressure is evolved when a solution of $MgCl_2$ is electrolyzed using a current of 12.4 A for 1.0 h? A) 5.2 L B) 10.4 L C) 572 L D) 1144.6 L
49	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+}
50	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) 166.8 g/mol

Good Luck

Prof. Dr. Maher M. Girgis, Prof. Dr. Maher M. A. Hamed and Dr. Mohamed N. Abd El-Hamed.



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 answer sheet not here)

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

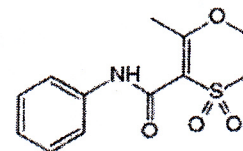
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1- Which insecticide is used in household as RAID as well as mosquito coils?

- a) Allethrins
- b) Paraquats
- c) Atrazines
- d) Dioxins

2- Select the name the following fungicide structure?

- a) Oxicarboxin
- b) Dimethomorph
- c) Triadimefon
- d) Difolpet



3- Which is the condition number over antarctic that involves a break down of Cl₂ gas by solar radiation?

- a) Fifth
- b) First
- c) Third
- d) Fourth

4- Choose the contamination type that created when chemicals are released by spill or underground storage tank leakage?

- a) Soil contamination
- b) Water pollution
- c) Thermal pollution
- d) Radioactive contamination

5- 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

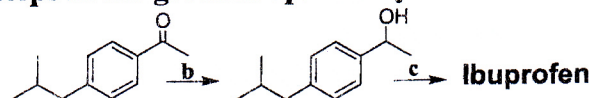
6- Which compound of the following is widely used as seed dressing?

- a) PhHgOH
- b) PhHgNO₃
- c) (CF₃CO₂)₂Hg
- d) MeCO₂HgPh

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

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

8- Select the best reagents used in the last two steps in the green Ibuprofen synthesis?



- a) b: Ac₂O/HF, c: CO/Pd-Cat.
- b) b: H₂/Cat., c: Ac₂O/HF
- c) b: H₂/Cat., c: CO/Pd-Cat.
- d) b: CO/Pd-Cat., c: H₂/Cat.

9- Which of the following species can initiate an aerobic troposphere CH₄-oxidation process?

- a) CO[•]
- b) HO[•]
- c) NO[•]
- d) ClO[•]

10- When traffic dies down, the nitrogen oxides and VOCs begin to react to form -----.

- a) NO
- b) O₃
- c) NO₂
- d) Aldehydes

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

13- Furans can be formed at temperature of ----- by strong heating of ----- having boiling point range ----- in the presence of oxygen.

- a) 325-366 °C & polychlorinated biphenyl (PCBs) & 300-310 °C
- b) 250-450 °C & polychlorinated biphenyl (PCBs) & 325-366 °C
- c) 310-360 °C & 2,4-dichlorophenoxyacetic acid (2,4-D) & 290-320 °C
- d) 300-350 °C & chlorinated cyclohexane and cyclopentadiene & 200-300 °C

15- 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) 150°C & 1,2,3,4-tetrachlorodibenzo-p-dioxin
- d) 160°C & 2,3,7,8-tetrachlorodibenzo-p-dioxin

17- Among the most common properties of HCB is/are -----.

- a) stability against decomposition in the environment
- b) very low solubility in water
- c) high toxicity to insects and low toxicity to humans
- d) all of the above

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

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

14- The first step in the synthesis of Captan included the reaction of maleic anhydride with butadiene under the -----.

- a) Diels-Alder thermally allowed [4+2] cycloaddition
- b) Diels-Alder thermally allowed [2+2] cycloaddition
- c) Diels-Alder thermally forbidden [4+2] cycloaddition
- d) Diels-Alder thermally forbidden [2+2] cycloaddition

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

18- Which purely organic fungicides were originally synthesized as accelerators for rubber vulcanization?

- a) Dithiocarbamates
- b) Captan
- c) Benomyl
- d) 1,4-Oxathiins

20- Among ureas herbicides, the ----- is effectively used for the control of herbaceous and woody plants.

- a) Atrazine
- b) Paraquat
- c) Tebuthiuron
- d) Chlorsulfuron

21- Which is the best condition used in the Dow process for 2,4-D synthesis in order to minimize formation of glycolic acid,?

- a) alkaline solution & 50% excess of 2,4-dichlorophenol
- b) alkaline solution & 50% excess of $\text{HOCH}_2\text{CO}_2\text{H}$
- c) alkaline solution & 50% excess of 2,5-dichlorophenol
- d) acidic solution & 50% excess of 2,4-dichlorophenol

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

25- Biodegradation steps of ----- herbicides are dechlorinated followed by removal of the other ring substituents by amidohydrolases to give cyanuric acid as the end product.

- a) Atrazine
- b) Glyphosate
- c) Paraquat
- d) Clopyralid

27- CNSL is obtained from roasting of cashew nuts which is rich source with ----- and -----.

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

29- Incineration method used for disposal of PCBs which involves burning PCBs at a temperature of -----.

- a) 1200°C for at least three seconds
- b) 1200°C for at least four seconds
- c) 1200°C for at least five seconds
- d) 1200°C for at least two seconds

31- 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

22- Benomyl can be prepared from the reaction of ----- with ----- followed by addition of -----.

- a) cyanamide & $\text{o-C}_6\text{H}_4(\text{NH}_2)_2$ & methyl chloroformate &
- b) cyanamide & methyl chloroformate & $\text{o-C}_6\text{H}_4(\text{NH}_2)_2$
- c) methyl chloroformate & $\text{o-C}_6\text{H}_4(\text{NH}_2)_2$ & cyanamide
- d) $\text{o-C}_6\text{H}_4(\text{NH}_2)_2$ & cyanamide & methyl chloroformate

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

26- Organophosphate ----- in fatty tissues and these chemicals ----- within days or weeks, thus are ----- found in food chains.

- a) decompose & concentrate & seldom
- b) seldom & concentrate & decompose
- c) decompose & seldom & concentrate
- d) concentrate & decompose & seldom

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

- a) O-O bonds
- b) $\text{O}=\text{S}=\text{O}$ bonds
- c) $\text{O}=\text{C}=\text{O}$ bonds
- d) a & c

30- Which is the final product at route D in the microbial DDT degradation mechanism?

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

32- Persistent organic pollutants (POPs) are resistant to environmental degradation through -----.

- a) chemical processes
- b) biological processes
- c) photolytic processes
- d) all of the above

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

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

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

- a) O_3
- b) SO_2
- c) $RCHO$
- d) NO_2

35- Dioxins and furans are created during industrial synthesis of ----- and from the ----- industry through a process that ----- the wood pulp.

- a) bleaches & paper & cleaning
- b) herbicides & paper & bleaches
- c) herbicides & paper & dying
- d) herbicide & bleaches & removes

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

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

- 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. Stratosphere extends from the earth's surface to an average of 12 km.
- 40. The addition of CS_2 to ethylene diamine in the presence of NaOH gave Nabam.
- 41. $HOO^\bullet$ radical initiated the troposphere oxidation of CH_4 .
- 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. Richard Stolarski & Ralph Cicerone had developed a highly sensitive electron capture detector for measuring extremely low organic gas contents in the atmosphere.
- 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. The CCN-particles are that can become deactivated to fog or cloud droplets in the presence of a supersaturating of water vapor.

Answer the following questions:

(50 Marks)

A- Mark with (x) for the wrong statement or (✓) for the correct statements of the following and explain why: **(10 Marks)**

- 1- Oxidation state of Carbone is limited to four.
- 2- Ozone acts as a powerful reducing and oxidizing agent.
- 3- Graphite conducts electricity.
- 4- Flourine is lower in reactivity than group (VII) elements.
- 5- Water gas is made by blowing air through red hot coke.

B- Compare between the following : (answer only two) (10 Marks)

- 1- Metallic character and solubility of (Si, N, S).
- 2- Reactivity and conductivity of (Diamond and Graphite).
- 3- Hardness and conductivity of (Lithium and Cesium).

C- How can you prepare the following : (answer five) (10 Marks)

- 1- Urea 2- Hydrazine
- 2- Diborane 4- Carbon monoxide
- 5- Hydrogen 6- thermite reaction

D- Give reason for the following : (answer four) (10 Marks)

- 1- HF has low melting point.
- 2- Pb (II) is more stable than Pb (IV).
- 3- Oxygen is never more than divalent.
- 4- Boric acid acts as strong monobasic acid in presence of glycerol.
- 5- Freon causes any damage to ozone layer.

E- Write the structure of the following: (answer four) (10 Marks)

- 1- Freon
- 2- Diborane
- 3- Hydrogen azide
- 4- Dithionic acid
- 5- Nitrogensesquioxide.

GOOD LUCK

**Examiner
Prof Dr Dina M Fouad**



Final Examination in Organic Chemistry II (C-212) for 2nd Level Students

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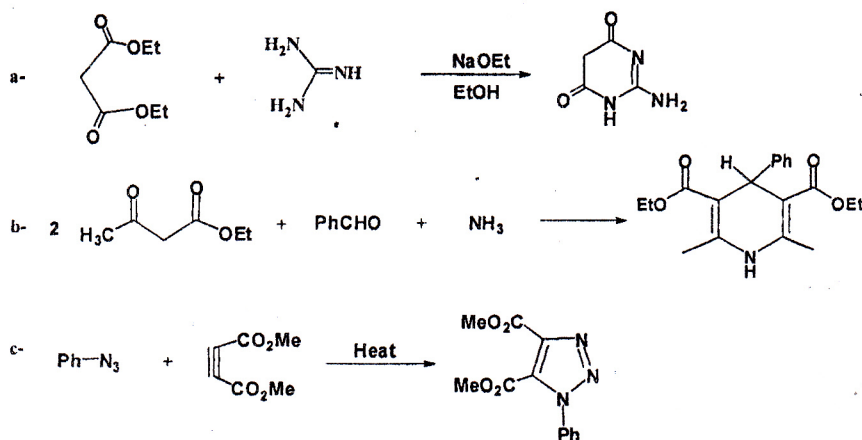
Answer on the two following sections (A & B)

Section (A): Heterocyclic Aromatic compounds (25 Marks).

Answer the following questions:

Question 1: (12 Marks)

A) Write in details a reaction mechanism of (Two only) from the following: (4 Marks)



B) Explain why? (Three only) from the following: (3 Marks)

- Pyrrole, Furan and thiophene do not contain any benzene ring still they are classed as aromatic compounds.
- Quinoline or pyridine does not give Friedel-Crafts reaction.
- Electrophilic substitution reactions in thiophene takes place at C2 whereas in pyridine at C3.
- Reaction of phenyl hydrazine with 2-butanone in presence of $ZnCl_2$ give two products.

C) Show by equations how will you synthesize (Five only) from the following: (5 Marks)

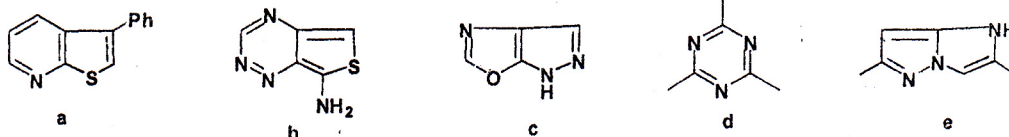
- | | | |
|-------------------------|----------------------------|------------------------------|
| (i) 2-Aminoquinoline. | (ii) 3,5-Dimethylpyrazole. | (iii) Imidazole. |
| (iv) 5-Methyltetrazole. | (v) 2-Methoxypyrimidine. | (vi) 2,4,5-Trimethyloxazole. |

Question 2: (13 Marks)

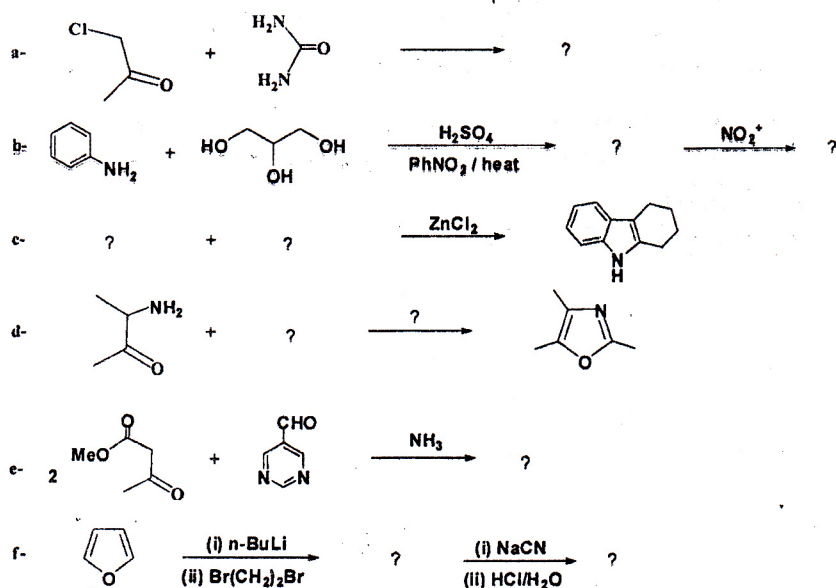
A) Write by equations what happen when (Three only) from the following: (3 Marks)

- Heating of 3-chloro-2-butanone with thioacetamide.
- Reaction of 4(5)-methylimidazole with CH_2O / $(CH_3)_2NH$ in acidic medium.
- Cycloaddition reaction between acetonitrile and sodium azide then followed by acidification.
- Nitration of 3-formylthiophene.

B) Write the systematic name for Three only from the following: (3 Marks)



C) Complete Five only from the following: (5 Marks)



D) Answer the two following questions: (2 Marks)

- How many electrons of nitrogen contribute to the π -system of furan and pyridine?
- In Retrosynthetic analysis, show the starting material required to synthesize 2,5-dimethylpyrrole.

Section (B): Aromatic compounds (25 Marks)

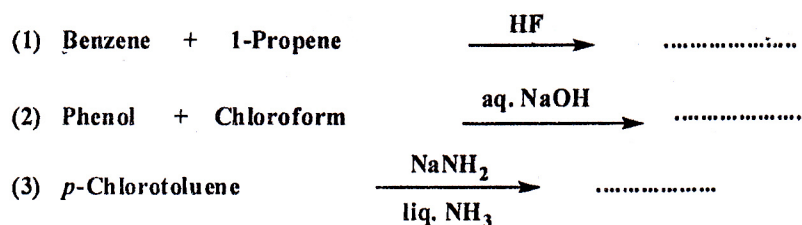
Answer the following questions:

Question 3: (13 Marks)

A) Indicate the product(s) that would be obtained when each of the following compounds is nitrated: (i) Phenol. (ii) *N*-Ethylaniline. (iii) *p*-Toluidine. (3 Marks)

B) Use resonance theory to explain why a sulfonic acid group of sulfonic acid is a deactivating group and *m*-director. (2 Marks)

C) Complete two only of the following equations giving the reaction mechanism: (8 Marks)



Question 4: (12 Marks)

A) Explain which is the more acidic in each of the following pairs: (2 Marks)

- 3-Cyanophenol and 4-cyanophenol.
- 4-Chlorophenol and 4-methoxyphenol.

B) Indicate by equations how you can synthesize three only of the following: (9 Marks)

- Saccharin from toluene
- Anisole from nitrobenzene
- o*-Hydroxyacetophenone from salicylic acid
- Chalcone from benzene.

C) Write a note on the Gattermann-Koch reaction. (1 Mark)

Examiners: Prof. Dr. Zienab A. Hozien, Dr. Ahmed Abdou and Dr. Fatma Kassem.

Good Luck

Physical and Inorganic Chemistry Examination (C-250) for Second Level Students

Section(I)

1. Answer the following:

(11 Marks)

- Reaction, $\text{H}_{2(g)} + \text{I}_{2(g)} \rightarrow 2\text{HI}_{(g)}$; $\Delta H = 12.4 \text{ kcal}$. Calculate the heat of formation of HI.
- The heat of formation of CO (g) and $\text{CO}_2 \text{ (g)}$ are -26.4 kcal and -94.0 kcal respectively. Calculate the heat of combustion of carbon monoxide.
- Heat of evaporation of benzene is $7350 \text{ cal K}^{-1} \text{ mol}^{-1}$. Calculate the change in entropy to convert 4 moles gaseous benzene to liquid at 77°C .
- When 2 moles of water are boiled at 100°C and converted to vapor at the same temperature. Calculate the change in entropy. $\Delta H_{\text{cond}} = -9590 \text{ cal/mole}$
- The latent heat of vaporization of a liquid at 500 K and 1 atm pressure is 10 kcal/mol . Calculate the change in internal energy (ΔE) of 3 moles of liquid at the same temperature.
- Calculate the work done in L. atm for an expansion of one mole of an ideal gas from a volume of 10 liters to 30 liters at 27°C .

2. Answer Only Four of the following:

(14 Marks)

- Discuss the temperature dependence of entropy.
- Write short note on the ideal gas calculation and explain how you can calculate w , ΔE , ΔH and q for the an isothermal expansion of gas.
- Prove that under adiabatic conditions for the expansion of an ideal gas: $PV^\gamma = \text{constant}$.
- Calculate the enthalpy change when 36 g of water freezes at constant pressure and a temperature of -30°C . At 0°C , ΔH is -1435 cal and C_p is 18 and $8.8 \text{ cal mol}^{-1} \text{ deg}^{-1}$ for water and ice, respectively.
- Given, for an acid that $\Delta H_{\text{fus}} = 2600 \text{ cal mol}^{-1}$ at its melting point -17°C and $\Delta H_{\text{vap}} = 6000 \text{ cal mol}^{-1}$ at its boiling point 120°C . Calculate the change in entropy that takes place when two moles of this acid in the gaseous state are condensed and further cooled to be a solid at -17°C , all under constant pressure taken as 1 atm . Assume that molar heat capacity of this acid is $27.6 \text{ cal deg}^{-1} \text{ mol}^{-1}$.

بقية الاسئلة بالخلف

Section (II)

Answer the following:

1- a- Explain the reason for **(Five only)** from the following: **(5 Marks)**

I) Concentrated solution of HF acid is not kept in glass bottle.

II) Graphite is a conductor of electricity but diamond is not.

III) NO_2 is an acidic oxide.

IV) Cesium ions conduct electricity more than lithium ions.

V) K_2CO_3 is soluble in water but CaCO_3 is not. VI) CO is a poisonous gas.

b- How you can prepare **(Three only)** from the following: **(4.5 Marks)**

Superphosphate , NH_3 , HI , CaCO_3

c- What are the differences between the green hydrogen, blue hydrogen and gray hydrogen? **(3 Marks)**

2- a- Choose the correct answer and comment: **(6 Marks)**

I) An isotope that is used as tracer in chemical reaction is (^1_1H , ^2_1H , ^3_1H)

II) Which one of the following species contains an odd number of electrons?

(CN^- , NH_4^+ , NO)

III) The element which has the maximum number of oxidation state (C, N, Cl)

IV) The compound which contains hydrogen bond (CH_4 , H_2S , HF)

b- In each pairs of acids, state which is stronger and why?

HCl and HI, H_3PO_4 and H_3PO_3 , HClO and HBrO. **(3 Marks)**

c- What the types of hardness of water? How we can remove this problem? **(3.5Marks)**

Good Luck

Examiners: prof. A.Elawaad and Prof. A.S.A. Zidan,



Assiut university
Faculty of science
Chemistry department

Date: 27/05/ 2023
Time allowed: 3 hours

Final exam in 210 C course for second level's students

Answer the following questions

Question No. 1. :

(25 marks)

Choose the correct answer for the following questions:

1- Carbon has 6 electrons, charged and sp^2 hybridized with vacant p orbital is:

- a. carbocation , b. carboanion , c. free radical

2- Heterolytic fission of organic molecule like CH_3Br form:

- a. Carbocation $CH_3^+ + Br^-$, c. Carbon radical $CH_3^\cdot + Br^\cdot$
b. Carbanion $CH_3^- + Br^+$, d. Carbon radical $CH_3^\cdot + Br^\cdot$

3- Which of the following is not true about S_N1 mechanism ?

- a. Multistep mechanism , b. has more than one transition state , c. kinetically second order

4- Vinyl chloride undergoes :

- a. S_N1 mechanism , b. S_N2 mechanism , c. neither S_N1 nor S_N2

5- What is the effect on the rate of the S_N2 reaction of CH_3I and HO^- when :

- a. the concentration of CH_3I is triplet , it increases , b. the concentration of HO^- is doubled, it increases , c. a and b

6- The reaction of toluene with bromine in the presence of sun light to give benzyl bromide is :

- a. nucleophilic substitution reaction ,
b. free radical substitution reaction , c. electrophilic substitution reaction

7- Which of the following is not nucleophile?

- a. CH_3-CH_3 , b. C_6H_6 , c. $CH_2=CH_2$

8- In which of the following mechanisms are alkenes the major reaction products ?

- a. $E1$ only , b. S_N1 only , c. $E2$ only , d. Both $E1$ & $E2$

9- trans-1-bromo-2-methylcyclohexane react with $NaOCH_3/CH_3OH/\Delta$ to give :

- a. 3-methylcyclohexene only , b. 1-methylcyclohexene only , c. no reaction

10- The halides ions are better leaving groups because they are :

- a. small anions , b. weak bases , c. stable anions , d. b and c

11- Which of the following substances favors S_N2 reaction:

- a. $(CH_3)_3CCH_2Br$, b. $(CH_3)_3CBr$, c. $(CH_3)_2CHBr$, d. $CH_3CH_2CH_2CH_2Br$

12- S_N1 reactions involving chiral center usually proceed with:

- a. inversion of configuration , c. equal amounts of inversion and retention of configuration.
b. retention of configuration.

13- Reaction mechanism exhibits second-order kinetics , stereospecific and regioselective is :

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a. S_N1 , b. $E1$, c. S_N2 , d. $E2$

14- which of the following statements does not correct describe S_N2 reaction ?

- a. substitution occurs with inversion of stereochemistry , c. the rate law is bimolecular .
b. tertiary halides react faster than secondary halides . , d. all are incorrect .

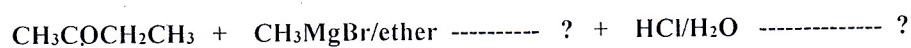
15- The reaction of 1,3-Butadiene with Br_2 give:

- a. 3,4-dibromobutene major product. , c. 1-bromo-2-butene major product.
b. 1,4-dibromo-2-butene major product. , d. 2,3-dibromobutene major product.

16- Which of the following alkanes when reacts with $i-O_3$, $ii-Zn/H_2O$, the only product obtained is ethanal

- a. 1-butene , b. 2-butene , c. 1-pentene , d. 2-pentene

17- Choose the product that obtained from the following reaction:



- a. 3-methyl-2-butanol , b. 2-methyl-2-butanol , c. 2-pentanol d-2-methyl-1-butanol

18- Which of the following compounds when reacts with secondary amines gives enamine

- a. CH_3CH_2CHO , b. $CH_3CH_2CONH_2$, c. CH_3CH_2COOH , d. CH_3CH_2COOEt

19- Reaction of phosphorus ylides with carbonyl compounds to give alkenes , the reaction name is :

- a. wurtz , b. claisen , c. wittig , d. clemmensen reaction

20-Choose the reagent that can convert $RCOCH_3$ to RCH_2CH_3

- a. $LiAlH_4$ /ether , b. $NaBH_4$ /ethanol , c. H_2/Ni , d. $i-NH_2NH_2$, $ii-KOH$ /heat

21-Which of the following acids is the strongest?

- a. 4-Chlorobutanoic acid , b. 3-chlorobutanoic acid , c. 2-chlorobutanoic acid , d. butanoic acid

22- Pent-3-en-2-one classified as:

- a. unsaturated ketone , b. saturated ketone , c. unsaturated aldehyde , d. saturated aldehyde

23- Hydration of acrylic acid using H_2SO_4/H_2O /heat gives:

- a. 3-hydroxypropanoic acid , b. 2 hydroxypropanoic acid , c. mixture of a and b

24-Which of the following esters can form an enolate on treatment with strong base?

- a. HCO_2Et , b. $PhCO_2Et$, c. CH_3CO_2Et , d. $EtOCO_2Et$

25- Which of the following alkyl halides, when reacts with sodiacetoacetic ester followed by treatment with $i-KOH$, $ii-HCl$, iii -heat gives 2-butanone as the major product:

- a. CH_3CH_2Br , b. $(CH_3)_2CHBr$, c. $CH_3CH_2CH_2Br$, d. CH_3Br

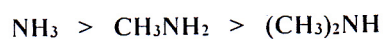
Question No. 2. :

(25 marks)

Put (T) in the front of correct statement and (F) in the front of wrong statement:

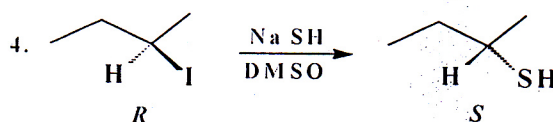
26. Carbanion stabilized by alkyl substituents by inductive effect and hyperconjugation.

27. In the following example, the order of increasing basicity is :



28- 2-Iodobutane reacts with sodium sulfide in DMSO gave 2-butanethiol via S_N2 mechanism.

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- 29- A benzyne reacts with alkenes to yield cyclic compounds.
- 30- The molecularity of an elementary reaction is the number of molecules or ions involved in the formation of one activated complex.
- 31- BF_3 was classified as a Lewis base.
- 32- The compound $\text{CF}_2=\text{CBr}_2$ can exist as cis and trans isomers.
- 33- The same factors that make the carbocation more stable also make the transition state leading to it less stable.
- 34- Regioselectivity is defined as which functional group will react.
- 35- In the E1cB reactions, the C-X bond breaks first, giving carbanion intermediate that loses H^+ to form the alkene.
- 36- PCC convert ethanol to acetic acid.
- 37- Reaction of propyne with $\text{Hg}_2\text{SO}_4/\text{H}_2\text{SO}_4/\text{H}_2\text{O}$ yields propanal.
- 38- The name of PhCOCH_3 according to IUPAC system is 1-phenylethanone.
- 39- Reaction of acetic acid with $2\text{CH}_3\text{Li}$ /ether followed $\text{HCl}/\text{H}_2\text{O}$, work up gives acetone.
- 40- Reduction of RCOCl using DIBAL-H /ether at -78°C yields RCHO .
- 41- Propanone is reactive than propanal towards nucleophiles.
- 42- LiAlH_4 /ether reduce benzoic acid to benzyl alcohol.
- 43- Heating of RCONH_2 with P_2O_5 yields RCN .
- 44- Most aldehydes and ketones form stable hydrates.
- 45- Reduction of cyclohexanone using Zn(Hg)/HCl gives cyclohexane.
- 46- Reaction of CH_3CHO with CH_3MgBr /ether, followed by dil.HCl , affords n-propanol.
- 47- $\text{CH}_3\text{CH}_2\text{CHO}$ undergoes aldol reaction.
- 48- The name of CH_3COCl according to IUPAC system is ethanoyl chloride.
- 49- Acid chlorides reacts with alcohols to give esters.
- 50- Sodium malonic ester reacts with CH_3Br followed by dilute acid yields butanoic acid.

اجمل الامنيات بالتوفيق

الممتحنون

اد/ اميمة الطوخي

اد/ شعبان محمد رضوان

Final Exam for Computational Chemistry (C234)

Answer the following question:

(The exam is in four pages)

Question One: Choose the correct answer(s) for each of the following:

(50 Marks)

- has/have electron correlation.
a) CIS b) HF c) DFT d) CCSD
- The basis set 6-31+G(d,p) contains polarised functions on
a) H b) C c) N d) O
- The basis set is triple zeta.
a) 3-21G* b) 6-311G c) 6-31+G(3df,3dp) d) 6-311G(d,p)
- The basis set has diffuse functions for all atoms.
a) 6-31G(d) b) 6-31+G(d,p) c) 6-311+G(d,p) d) 6-31++G(d)
- is/are based on the HF method.
a) DFT b) CISD c) CCSD(T) d) MP2
- is the most accurate method in this group.
a) DFT b) CCSD(T) c) HF d) CCSDT
- is the fastest method in this group.
a) DFT b) CCSD c) MP2 d) PM6
- cannot be used for modelling UV-Vis spectra.
a) CISD b) CCSD(T) c) DFT d) CCSD
- have no imaginary frequencies.
a) Reactants b) Products c) Transition states d) Saddle points
- The approximation states that the kinetic energy of nuclei is zero.
a) Born-Oppenheimer b) Slater c) Hartree d) Fock
- The Schrödinger equation can be solved exactly for
a) H b) He⁺ c) H₂⁺ d) Li⁺
- A wave function must
a) be antisymmetric b) conform to Pauli exclusion principle
c) a and b d) neither a or b

13. suggested that the electron–electron repulsion in the Hamiltonian is replaced with an effective field.
 a) Fock b) Hartree c) Slater d) a and b
14. Hartree's wave function
 a) is antisymmetric b) conforms to Pauli exclusion principle
 c) a and b d) neither a or b
15. proposed writing the wave function as a Slater determinant.
 a) Fock b) Hartree c) Slater d) Max Born
16. In the Hartree-Fock method, the wave function of O_2 is described by Slater determinant(s).
 a) 1 b) 8 c) 16 d) 32
17. The energy of will always be higher than the true energy.
 a) HF b) DFT c) CCSD(T) d) MP2
18. is appropriate for modelling chemical reactions.
 a) CCSD b) CISD c) CCSD(T) d) DFT
19. can be used for geometry optimization.
 a) HF b) DFT c) Molecular mechanics d) PM6
20. is widely used to study organic reactions, biological processes, and solid-state materials.
 a) HF b) DFT c) CCSD(T) d) Full-CI
21. is the most flexible basis set in this group.
 a) STO-3G b) 6-311G(d) c) 6-31G(d) d) 6-31++G
22. A wavefunction of a molecule contains information about
 a) position of nuclei b) momentum c) total energy d) potential energy
23. use(s) a single Slater determinant.
 a) HF b) CISD(T) c) CCSD d) Full-CI
24. The advantage(s) of HF is/are
 a) low cost b) electron correlation c) variational d) fast
25. An important limitation to DFT is/are
 a) high cost b) lack of electron correlation
 c) poor treatment of long-range interactions d) not variational
26. The advantage(s) of DFT is/are
 a) low cost b) electron correlation c) variational d) fast

27. The advantage(s) of CCSD(T) is/are
- a) low cost b) electron correlation c) high accuracy d) fast
28. DFT methods are appropriate for modelling non-covalent interactions.
- a) LDA b) Dispersion corrected c) GGA d) Hybrid
29. The is the second energy derivative of the potential energy with respect to reaction coordinate.
- a) force constant b) Hamiltonian c) Jacobian d) frequency
30. functions improve the flexibility of the basis set.
- a) Polarization b) Diffuse c) Minimal d) Single-zeta
31. is more accurate than HF.
- a) CIS b) CCSD(T) c) CCSD d) Full-CI
32. relies on experimental parameters.
- a) CIS b) molecular mechanics c) semi-empirical d) HF
33. is the least accurate method in this group.
- a) DFT b) molecular mechanics c) semi-empirical d) HF
34. is more flexible than 6-31G.
- a) 6-31G(d) b) 6-31G(d,p) c) 6-311G d) STO-3G
35. is more accurate than DFT.
- a) CCSD b) CCSD(T) c) CISD d) Full-CI
36. basis sets are recommended for modelling hydrogen bonding.
- a) Polarized b) Diffused c) Double zeta d) Minimal
37. is the lowest point in the whole PES.
- a) Local minimum b) Global minimum c) Local maximum d) Global maximum
38. The second derivative of the transition state with respect to the reaction coordinate is
- a) 0 b) 1 c) positive d) negative
39. The second derivative of a stable conformer with respect to the reaction coordinate is
- a) 0 b) 1 c) positive d) negative
40. The first derivative of the transition state with respect to the reaction coordinate is
- a) 0 b) 1 c) positive d) negative
41. In the Hamiltonian operator, increase(s) the energy of the molecule.
- a) kinetic energy b) e-e interaction c) e-N interaction d) N-N interaction
42. The most problematic term in the Hamiltonian operator is
- a) kinetic energy b) e-e interaction c) e-N interaction d) N-N interaction

43. does not treat electron correlation using a wave function.
 a) CCSD b) MP2 c) CISD d) DFT
44. functionals combine exchange from HF and DFT.
 a) LDA b) Dispersion corrected c) GGA d) Hybrid
45. use(s) perturbation theory.
 a) CCSD b) CCSDT c) CCSD(T) d) MP2
46. studies the physical movements of atoms and molecules in time.
 a) Molecular dynamics b) DFT c) CCSD(T) d) PM6
47. is based on classical physics.
 a) Molecular mechanics b) DFT c) CCSD(T) d) PM6
48. doesn't include electrons.
 a) Molecular mechanics b) DFT c) CCSD(T) d) PM6
49. has the smallest exponent.
 a) STO-3G b) 6-311G(d) c) 6-31G(d) d) 6-31++G
50. is/are planar.
 a) Ethylene b) Butadiene c) Benzoic acid d) Ethane

Please insert your answers in the following table:

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50

Atomic numbers: H = 1, He = 2, Li = 3, C = 6, N = 7, O = 8

Good Luck

Dr. Ahmed A. K. Mohammed



Assiut University
Faculty of Science
Chemistry Department



June, 2023
Time: 2 hours

Final Examination of Introductory Quantitative Analysis for 2nd Level Students (C-240)

Answer Five Questions Only:

(50 Mark)

1. a) Write briefly on:
 - i) Liebig method.
 - ii) Redox indicators.
- b) Chloride in a brine solution is determined by, Volhard method. A 10mL aliquot of the solution is treated with 15 mL of standard 0.1182 M AgNO₃ solution. The excess silver is titrated with standard 0.101 M KSCN solution, requiring 2.38 mL to reach the red Fe(SCN)²⁺ end point. Calculate the concentration of chloride in the brine solution, in g/L.
- c) In acid medium, calculate the normal concentration of KMnO₄ solution that is 0.02M.

$$\text{MnO}_4^- + 8 \text{H}^+ + 5 \text{e}^- = \text{Mn}^{2+} + 4 \text{H}_2\text{O}$$
2. a) Define:
 - i) The titer.
 - ii) Chelating agents.
- b) A divalent metal M²⁺ reacts with a ligand (L) to form 1:1 complex, ML²⁺ (K_f=1×10⁸). Calculate the pM in a solution prepared by mixing equal volumes of 0.2M metal ion and 0.2 M ligand.
- c) Express the titer of 0.02 M K₂Cr₂O₇ in mg Fe₃O₄/mL.

$$\text{Cr}_2\text{O}_7^{2-} + 6 \text{Fe}^{2+} + 14 \text{H}^+ = 2 \text{Cr}^{3+} + 6 \text{Fe}^{3+} + 7 \text{H}_2\text{O}$$
3. a) Mohr method must be carried out in a neutral solution. Explain why?
- b) Calculate the pAg and pCl in a solution prepared by mixing 50 mL each of 0.1 M AgNO₃ and 0.1 M NaCl (K_{sp}(AgCl) = 1.21 × 10⁻¹⁰).
- c) What is the electrode potential (vs. NHE) in a solution containing 0.5M KBrO₃ and 0.2 M Br₂ at pH 2.5? ε° = 1.52 v.

$$2 \text{BrO}_3^- + 12 \text{H}^+ + 10 \text{e}^- = \text{Br}_2 + 6 \text{H}_2\text{O}$$
4. a) What is a conjugate acid? Conjugate base? Give example(s).
- b) An amine, RNH₂, has a pK_b of 4.2. What is the pH of a 0.2 M solution of the base?
- c) How many milliliters of 0.5 M NaOH should be added to 10.0 g of trishydrochloride (pK_a = 8.075, M.wt = 157.596) to give a pH of 7.60 in a final volume of 250 mL?

5. a) Distinguish between co-precipitation and post-precipitation.
- b) A solution containing calcium was analyzed with the 6 results listed below. Use the Q test to determine the results of trial 5 can be rejected? Ca^{2+} concentration ($\mu\text{g/mL}$): 2.83, 2.54, 2.91, 2.75, 3.05, and 2.72. ($Q_{\text{tabulated}} = 0.56$).
- c) The total phosphate concentration in a blood sample is determined to be 3×10^{-3} M. If the pH of the blood sample is 7.45, what are the concentrations of H_2PO_4^- and HPO_4^{2-} in the blood ($\text{pK}_{\text{a}2} = 7.12$).
6. a) Contrast accuracy with precision.
- b) Calculate the pH of a 0.01 M NaCN
 $(\text{K}_{\text{a}(\text{HCN})} = 7.2 \times 10^{-10}, \text{K}_{\text{w}} = 1 \times 10^{-14})$.
- c) A 0.7011 g of an impure chloride containing sample was treated with excess AgNO_3 , where a 0.9805 g of AgCl was obtained. What is the mass percentage of chloride in the sample?

(At.wts: O = 15.999 , Cl = 35.453 , Fe = 55.847 , Ag = 107.870).

Good Luck

Examiners: **Prof. Dr. Hassan Sedaira**
 Prof. Dr. Elham Y. Hashem

Answer the following questions:

1-Answer Two Only from the following: (16.5 Marks)

- a) Derive the kinetic equation for determination the specific rate constant for the following reaction:
- $$A+B \xrightarrow{K_2} \text{Products}$$
- b) Discuss the effect of temperature on the reaction velocity.
- c) At 378.5 °C the half-life period for the first order thermal decomposition of ethylene oxide is 363 min and the energy of activation of the reaction is 52,000 Cal/mol. From these data estimate the time required for ethylene oxide to be 75% decomposed at 450 °C. (R=1.978)

2-Answer Two Only from the following: (33.5 Marks)

- a) Derive the relation between the free energy change and the equilibrium constant for any gaseous reaction.
- b) Derive and discuss the relation between the enthalpy change of a reaction and its temperature.
- c) If the heat of combustion of methane is equal to -191.77 Kcal. and the heat of formation for Carbon dioxide and water are -94.05 and -57.80 Kcal respectively. Calculate the heat of formation for methane.

3-Answer Three Only from the following:

- a) Compare graphically and mathematically between the amount of work performed in the following processes that accompanied by change in volume from V_1 to V_2 .
- Isothermal and reversible process.
 - Constant pressure and reversible process.
 - Isothermal and irreversible process.
- b) Consider the following reaction ($\text{Zn} + \text{Cu}^{++} \rightarrow \text{Zn}^{++} + \text{Cu}$) that proceed in a cell contains 1M of solutions from each Cu^{+2} and Zn^{+2} ions and possess a voltage of 1.1 Volt. Calculate the corresponding free energy change and the equilibrium constant for the above reaction.
- c) Derive the following relations:
- Equilibrium constant and temperature and its correlation with Le Chatelier's principle.
 - The relation between the e.mf of an electrochemical cell and the concentration of its cations constituents.
- d) For the reaction $\text{N}_2 + \text{O}_2 \rightarrow 2\text{NO}$ the enthalpy change of formation of NO is 21. Kcal/mol. and the absolute entropy of NO, N_2 and O_2 are 50.34, 45.77 and 49.01 Kcal/mol. respectively. Calculate ΔG and K for the reaction.

Good Luck



Chemical Manufacturing processes



Assiut university
Industrial Chemistry Program

Faculty of Science
Date: 15/6/2023

50 marks

Time 2 hours

Answer the following questions:

1. What are the conventions and format recommended for laying out a Block Flow Process Diagram (BFPD) (4 Marks)
2. What the advantage of Block Flow Plant Diagram? (3 Marks)
3. What are the main information which necessary for a typical commercial PFD? (4 Marks)
4. Explain the petroleum manufacturing processes? (6 Marks)
5. In PFD, consider the unit operation P-201A/B and what each number or letter means. (4 Marks)
6. Describe briefly the main steps to manufacture the following materials, taking into the consideration the input and output materials, the main chemical and physical changes, the operating conditions and support your answers by flow sheet diagrams. (6+7+7 Marks)
 - A. Manufacture of urea fertilizer?
 - B. Production of alumina from Bauxite ore by Bayer process?
 - C. Production of Portland cement?

Choose the best correct answer:

(9 Marks)

1. The main raw materials that are used in manufacture of cement are.....
 - A. Limestone, sand and clay
 - B. Sandstone and clay
 - C. Dolomitic limestone and sandstone
2. Clinker is produced in cement industry after
 - A. The firing stage
 - B. The crushing stage of the raw materials
 - C. The grinding stage of the raw materials
3. Large plants utilized in the manufacture of liquids, oils, gases, and powders usually are
 - A. Continuous Process
 - B. Batch process
 - C. Semicontinuous process
4.consisted of a series of blocks representing different equipment or unit operations that were connected by input and output streams and the important information.
 - A. Block Flow process Diagram
 - B. Block Flow Diagram
 - C. Block Flow Plant Diagram
5. allows us to get a complete picture of what this plant does and how all the different processes interact.

- A. Block Flow process Diagram C. Block Flow Plant Diagram
B. Block Flow Diagram
6. In the ----- each block in the diagram represents a process function and may, in reality, consist of several pieces of equipment.
A. Block Flow process Diagram C. Block Flow Plant Diagram
B. Block Flow Diagram
7. The process flow diagram (PFD) represents a quantum step up from the BFD in terms of the amount of information that it contains. The PFD contains the bulk of the chemical engineering data necessary for the design of a chemical process
A. False B. True
8. The basic information provided by a BFD can be categorized into one of the following: Process topology, Stream information and Equipment information.
A. True B. False
9. Manufacturing is the process of converting raw materials into products.
A. True B. False

Prof. Dr. Gomma A. Elsayed