

الفرقة الأولى

Assiut university

June, 2023

Faculty of Science

Time: 3h

Chemistry Department

Final exam of "Inorganic chemistry III" course code 324C for the third level students

ملحوظة: الامتحان يقع في اربع صفحات

Part I (16 Marks)

Answer the following

A. Complete FOUR of the following (4 Marks)

- i. Sc_2O_3 is abase compared to lanthanide oxides.
- ii. Breaking of bonds by emitted particles in a sample of a radioactive actinide element is equivalent to a process of.....
- iii. The first and second ionization energies of lanthanides are comparable to those of.....metals.
- iv. $\text{Ln}(\text{OH})_3$ isbasic than $\text{Al}(\text{OH})_3$ which is.....
- v. Very pure thorium can be obtained by thermal decomposition of.....

B. Give reason for the following (4 Marks)

- i. Decrease of basicity of lanthanide hydroxides and oxides by increasing atomic numbers.
- ii. Ce^{+4} has a high tendency to be hydrated.
- iii. Actinides show higher oxidation states ranging from +4 to +7 while lanthanides exhibit a maximum oxidation state of +4.
- iv. U-O system is one of the most complex oxide systems known.

C. Mark the correct sentence with ✓ and the false one with ✕ (5 Marks)

- i. Due to the larger ionic radius of scandium, its chemical behavior is intermediate between aluminium and lanthanides.

- ii. Sulphates of lanthanides are less soluble in cold water than in hot water.
- iii. Binding energy of 4f in lanthanides is higher than that of 5f in actinides.
- iv. Actinide compounds are more basic than lanthanide ones.
- v. $\text{Eu}(\text{OH})_2$ has a better solubility in water, so it can be easily separated from $\text{Ln}(\text{OH})_3$.

D. Choose the correct answer A, B, C or D (3 Marks)

1. Oxidation state +7 is shown by :
 A) Pa and U B) Np and Pu C) Am and Cm
 D) all of these pairs
2. Among the quadrivalent lanthanides, it was found that one of the following quadrivalent lanthanide ions is sufficiently stable in solution as well as in solid state:
 A. Ce(IV) B. Pr (IV) C. Tb(IV) D. Dy (IV)
3. The anhydrous lanthanide trichlorides are obtained by heating the oxides or oxalates with:
 A) Cl_2 B) HCl C) NH_4Cl D) the three reactions are possible.

Part II (17Marks)

1- Answer the following question: (5Marks)

According to LFT calculate the total energy (E) of the $[\text{Fe}(\text{H}_2\text{O})_6]^{+2}$ and $[\text{Fe}(\text{CN})_6]^{-4}$ complexes and predict the number of unpaired electrons,

(where $\Delta_{\text{oct.}} = 9350\text{cm}^{-1}$; $\Pi_c = 19600\text{cm}^{-1}$; $\Pi_e = -2000\text{cm}^{-1}$)

2-Answer three only of the following questions: (12Marks)

- a- Discuss the factors affecting on pairing energy and 10 Dq in case LFSE
- b- According to MO theory of the ions $[\text{Ni}(\text{H}_2\text{O})_6]^{+2}$; $[\text{Ni}(\text{Cl})_4]^{-2}$ and $[\text{Ni}(\text{CN})_4]^{-2}$

- i- Draw orbital splitting diagram
- ii- Calculate the values of S and number unpaired electrons
- c- What will be the final concentration of Co^{+2} hydration of 100 ml of 2.00M ethylene diimine (en) solution are added to 50 ml of 0.20M Co^{+2} solution ($K_f = 8 \times 10^{13}$)
- d- Explain why :
 - i- $[\text{Fe}(\text{H}_2\text{O})_6]^{+3}$ complex show zero crystal stabilized energy
 - ii- The LFSE and S of $[\text{Mn}(\text{H}_2\text{O})_6]^{+2}$ equal $-8Dq$ and $3/2$ respectively
 - iii- When substitution H_2O molecule by CN^- ions in complex $[\text{Fe}(\text{H}_2\text{O})_6]^{+2}$ β_6 equal $[\text{Fe}(\text{CN})_6]^{-4} / [\text{Fe}(\text{H}_2\text{O})_6]^{+2} [\text{CN}]^6$

Part III (17 Marks)

A) Explain five only of the following: (5 Marks)

- 1- $[\text{Fe}(\text{H}_2\text{O})_6]^{3+}$ ion is more paramagnetic than $[\text{Fe}(\text{CN})_6]^{-3}$ ion. (Use CFT)
- 2- Only high spin tetrahedral complexes are known.
- 3- Inner orbital square planar hybridization of $[\text{Cu}(\text{NH}_3)_4]^{2+}$ is unstable.
- 4- Ability of crystal field splitting energy is in the order:
 $\text{CN}^- > \text{NH}_3 > \text{H}_2\text{O} > \text{F}^-$
- 5- $[\text{HgI}_3]^-$ has trigonal planar geometry.
- 6- $[\text{NiCl}_4]^{2-}$ ion is paramagnetic and has tetrahedral geometry.

B) Answer three only of the following: (12Marks)

- 1-a) Predict which of the following complex ions have inner or outer octahedral Hybridization:



b) State the different limitations of CFT.

- 2-a) Magnetic moment value of $[\text{MnBr}_4]^{2-}$ ion is 5.9 B.M. On the basis of VBT predict the type of hybridization and geometry of the

complex ion.

b) Show the different electronic transitions for d^1 and d^4 complex ions on weak octahedral field and their assignment.

3-a) Calculate CFSE values in terms of Δ_o and P for HS and LS octahedral complexes of Co(II) ion.

b) Identify the ground terms of d^2 and d^6 electronic configuration of free ions.

4-a) The enthalpy of hydration of Cr^{2+} is $-460 \text{ Kcal mol}^{-1}$. In the absence of crystal field stabilization energy the value of enthalpy of hydration is $-435 \text{ Kcal mol}^{-1}$. Calculate the value of Δ_o for $[\text{Cr}(\text{H}_2\text{O})_6]^{2+}$.

b) Write on the main assumptions of VBT.

Atomic numbers : Cr=24, Mn=25, Fe=26, Co=27, Ni=28, Cu=29, Hg=80

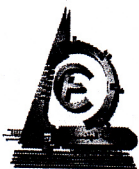
Good Luck

Examiners:

Prof. Dr. Aref A. M. Aly

Prof. Dr. Mohamed Abd El-Hakeem

Prof. Dr. Asmaa Ibrahim



Faculty of Engineering
Assiut University
2nd Semester – Final Exam
2022/2023– June, 2023
Time: 2 Hours
Marks: 100

Industrial chemistry Program
Course: Industrial Pollution
Control and Industrial safety
code: Chem 400
3rd level, – bylaw:



Important
remarks
This exam measures
• A7, b4, c1., d3.
No. of papers : 6 - No. of questions: 100

Answer the following questions:

First question:

(25 marks equally divided)

- 1- What are the main sources of errors when sampling in still air?
- 2- A battery of cyclones can treat a large gas flow **(YES) OR (NO)**
- 3- A power plant burns 3 ton of fuel per hour and discharges the combustion products through a stack. The fuel has 4 % S and the wind speed at 10 m above the ground of the stack is 2.5 m/sec. The atmospheric stability class is (C). Determine the emission rate SO₂ per second.
- 4- The factor that is not affecting the development of lung diseases is (chose)
i. composition, ii. Size iii. concentration iv. Color
- 5- Dust particles can be defined as fine divided solid matter and can be considered in two aspects: What are these aspects?

Second question:

(25 marks equally divided)

- 1- Sampling in moving stream is done to measure the emissions and concentrations of pollutants at or **(complete)**
- 2- The unit of measurement in Laser dust monitor is the :
i.Count Per Minute ii.µg/m³ iii. Both the previous
- 3- What are the main air pollution quantities that should be measured?
- 4- What are the main categories of the threshold limit values for the exposure of air pollutants?
- 5- If the estimated allowable total dust concentration in a dust sample is 5 mg/m³. What is the silica content in that sample?

With all best wishes

Prof. Mohamed Abuel-kassem Mohamed

M. Abuel-kassem

Assiut university

June, 2023

Faculty of Science

Time: 3h

Chemistry Department

Final exam of "Inorganic chemistry III" course code 324C for the third level students

ملحوظة: الامتحان يقع في اربع صفحات

Part I (16 Marks)

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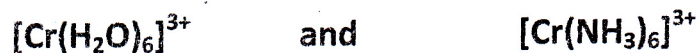
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Good Luck

Examiners:

Prof. Dr. Aref A. M. Aly

Prof. Dr. Mohamed Abd El-Hakeem

Prof. Dr. Asmaa Ibrahim

Final exam of course 310 C (glass industry) for the third level students of the industrial program.

ملحوظة: الامتحان يقع في ثلاث صفحات

(50 Mark)

1. Answer the following (12Marks)

- a. Draw the basic components of the **float process** and then comment.
- b. Give the importance of the following sizing (coating) components in fiberglass industry:
 - i) Lubricants
 - ii) binders
 - iii) coupling agents
- c. Write on the following
 - i) Radial and concentric cracks of glass fracture
 - ii) Environmental impact of glass industry regarding CO_2 and SO_2

2. Complete the following (10 Marks)

- a. Because of its high density lead oxide glass (crystal glass) possesses a high.....giving the glassware a brilliant appearance.
- b. Coatings in glass containers industry involve application of a thin layer of.....at the hot end while at the cold end a layer of.....is applied.
- c. Fibrization of glass fibers involves a combination of two processes.....and.....
- d. The crucibles of pot furnace are made ofor.....
- e. Toughened or tempered glass is a glass processed by controlled.....and.....treatments.
- f. One of the factors responsible for glass fracture is.....

3. Give reasons for FIVE of the following (10 Marks)

- a. Too hot and long firing of glass cause devitrification.
- b. Use of sodium sulphate (salt cake) in glass industry including its contribution in chemical reactions in the tank furnace.
- c. Use of waste glass (cullet) as a raw material in glass industry.
- d. Addition of arsenic oxide to the glass melt in tank furnace
- f. Polyester resin is preferred for wetting the chopped strand mat (CSM).
- g. Bushings in glass fiber furnace is heated and heat should be precisely controlled.

4. Choose the correct answer (10 Marks)

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

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

(8 Marks)

- a. Beck line appears inside the glass fragment when the refractive index of liquid (in which the fragment is immersed) is higher than that of the glass.
- b. 96% silica glass is translucent and has very high thermal expansion coefficient.
- c. Glass has the crystal structure and hence it breaks.
- d. Gelcoat used in fiberglass molds gives the mold a shiny appearance.
- e. The pot furnace in glass manufacture possesses higher capacity than tank furnaces.
- f. Number of glass fibers as well as their direction affect the durability of glass fiber cloth.
- g. Every 10% of cullet (recycled glass) used as a raw material in glass manufacture results in 7% reduction in carbon emission.
- h. Wired glass usually falls apart into splinters when it breaks.

Good Luck

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

Assiut University

Date: 1-6-2023

Faculty of Science

Time: 2h

Chemistry Department

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

Answer the following questions:(50 M)

Question No.1(10M)

- 1)Write four methods for determination of reactivity of rock phosphate.(2.5M)
- 2) Explain the Heber –Bosh method for production of ammonia NH_3 .(7.5M)

Question No.2(10M)

- 1) Choose the correct answer:(2.5M)
 - a) The emission of sulfur dioxide gas according to the Egyptian Environmental Law 2015 equal (1500-800-450) mg/m^3 in production of H_2SO_4 acid by contact process.
 - b) The emission of fluorine gas according to the Egyptian Environmental Law 2015 equal (15-5-20) mg/m^3 in production of SSP .
- 2) Explain how sulfuric acid is produced by contact proses and write the equation of the reaction.(7.5M)

Question No.3(10M)

- 1)Write the structure of pure fluorapatite .(2.5)
- 2)There are two methods for production of phosphoric acid explain one of these methods with equation. (7.5M)

Question No.4(10M)

- 1) Write the equation for production of these fertilizers:

Di-ammonium phosphate(DAP)-Mono-ammonium phosphate(MAP)-Single superphosphate(SSP)-Potassium sulfate - Ammonium sulfate (AS)-Ammonium Nitrite (AN).(7.5M) انظر خلفه

2) Write the conditions Process operating variables in urea production. (2.5M)

Question No.5 (10M)

- 1) What is the purpose of Primary and Secondary reforming for ammonia production. (2.5M)
- 2) What is the advantage of direct granulation of TSP. (2.5M)
- 3) Write the basic chemical reaction involved in production of triple superphosphate(TSP). (2.5M)
- 4) Write the reaction mechanism of V_2O_5 catalyst using in production of H_2SO_4 by contact process. (2.5M)

Good luck Dr. Atef .H. Ali

Assiut University	Second Semester	June 2023
Faculty of Science	Analytical Chemistry (1) (C-342)	Time: 2 hour
Chemistry Department	Third Level (Credit Hours)	

Answer the Following Questions:

Questions	Q.1	Q.2	Q.3	Q.4
Marks	20	10	10	10

Q.1: Mark (T) for true and (F) for false statements:

- 1- The addition of KCl solution reduces the convection current in polarography.
- 2- Microelectrodes reach the state of polarization very slowly.
- 3- A sample contains two different ionic species at different concentrations. The two ions can be distinguished in polarography by their half-wave potentials.
- 4- For reversible cyclic voltammetric systems, E_{pa} and E_{pc} are dependent of the scan rate.
- 5- With linear sweep voltammetry, the potential scan rate is usually much slower than with DC polarography.
- 6- Solid electrodes based on carbon have faster electron transfer rates than metal electrodes.
- 7- In differential pulse voltammetry small pulses of constant amplitude are superimposed on a staircase wave applied to the working electrode.
- 8- The dissolved oxygen present in experimental solution in acidic medium gets easily reduced at DME to form H_2O_2 , in the first step.
- 9- The current that arises due to the charging of a mercury drop that grows is known as the faradic current.
- 10- The counter electrode is so important in keeping a constant reference electrode potential.
- 11- In polarography or voltammetry, voltage is applied between the working and counter electrodes.
- 12- Reference electrodes should possess a high signal-to-noise ratio.
- 13- The conductivity of metal is due to mobility of protons and electrons.
- 14- The conductance (G) is directly proportional to the surface area.
- 15- The conductance of an electrolytic solution is unaffected by ion velocity.
- 16- In a conductance cell, the Pt electrodes must be covered by Pt black. this will give low surface area.

- 17- Conductance shows an additive effect if electrolytes react with each other.
- 18- An increase of temperature by 1°C is accompanied by 20% increase in conductance.
- 19- Conductivity is customarily reported in smaller units as $\mu\text{S}/\text{cm}$.
- 20- Equivalent conductance is the conducting power of all the ions produced by one gram equivalent of an electrolyte in a given solution.

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20

Q.2: (A) A conductivity cell has two platinum electrodes separated by a distance 1.5 cm and the cross sectional area of each electrode is 4.5 cm^2 . Using this cell, the resistance of electrolytic solution was measured as $15\ \Omega$. Find the specific conductance of the solution.

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(B) Favipiravir (FVP) possesses high utility for treating patients with COVID-19. The drug FVP gives an adsorptive stripping voltammetric peak at a carbon-paste electrode. A 50.0 mL sample containing FVP yielded a peak height of $0.37\ \mu\text{A}$. When 2.0 mL of $3.0\ \mu\text{M}$ FVP was spiked to the sample, the peak increased to $0.80\ \mu\text{A}$. Find the concentration of Favipiravir in the sample.

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Q.3: Write the mathematical equation for Only Two from the following:

(A) Molar conductivity (Λ_m) $\text{S m}^2\text{mol}^{-1}$.

(B) Heyrovsky-Ilkovic equation:

(C) Randles-Sevcik equation:

(D) Ilkovic equation:

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Section I- Quantum Chemistry Section:

(17 Marks)

Answer Only One from the following question:

- 1- A) If $\Psi = C e^{im\phi} + D e^{-im\phi}$ is a solution for Schrödinger equation for a microscopic particle moving in a circle with radius r . Confirm that the rotational energy for that particle is quantized and equal to $m^2 \frac{\hbar^2}{2I}$. (note: $e^{ix} = \cos x + i \sin x$)

- B) 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.

Answer the following questions:

- 2- Confirm that the allowed wavelengths for a particle moving in one dimensional box is given by the relation $\lambda = \frac{2a}{n}$ where a is the length of the box and n is the principle quantum number.
- 3- Calculate the wavelength in Å for an electron accelerated between potential differences 220 volt.

Section II- Molecular Spectroscopy Section:

(17 Marks)

Answer Only Five of the following questions:

- 1- 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.
- 2- An irradiated sample of MgO has a strong ESR line at 0.163 T, when the spectrometer is operating at 9.4 GHz. What is the g -value of the line, (Bohr magneton $\beta = 9.273 \times 10^{-24} \text{ JT}^{-1}$).
- 3- The absorption of $5.4 \times 10^{-4} \text{ M}$ solution of Fe^{3+} at 530 nm was 0.54, when measured in a cell with 1 cm path length. Calculate molar absorption coefficient.

Turn Over →

- 4- Write the rule of mutual exclusion, and show when NO_2^+ ion will be infrared active and when Raman active.
- 5- Calculate the degrees of freedom for acetate ion and draw its vibrational modes.
- 6 - Find the frequency at which a proton NMR spectrometer should be operating under a magnetic field 1.8 T ($g_N = 5.449$, $\mu_N = 5.0504 \times 10^{-27} \text{ JT}^{-1}$, $h = 6.626 \times 10^{-34} \text{ Js}$).

Section III- Kinetic Theory of Gases Section:

(16 Marks)

Answer Only Five of the following questions:

- 1- Drive the probability density equation ($F(\epsilon)d\epsilon$) and plot $F(\epsilon)$ for the molecular translational energy of an ideal gas molecular at 300 K versus the energy (ϵ).
- 2 - The vapor pressure of solid beryllium was measured by using a Knudsen cell. The effusion hole was 0.318 cm in diameter, and they found a mass loss of 9.54 mg in 60.1 min at a temperature of 1457 K. What is the vapor pressure?
(mass weight of Be= 9.012)
- 3 - For molecular oxygen at 25°C , calculate the collision frequency z_{11} at a pressure of 1 bar. The collision diameter of oxygen is 0.361 nm.
- 4- 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.
- 5- Calculate the viscosity of molecular oxygen at 273.2 K and 1 bar. The molecular diameter is 0.36 nm. (mass weight of $\text{O}_2 = 32$)
- 6- What is the mean relative speed of hydrogen molecules with respect to oxygen molecules at 298 K?

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

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

With Our Best Wishes

Examiners:- 1- Prof. Dr. AbdelRahman A. Dahy

2- Dr. Mostafa Farrag

Final exam

Chem 334 (Corrosion chemistry)

second semester 2022-23

Time: 3 hours

Answer the following:

Q1 Choose the correct answer

(10 marks)

- 1-Dust particles absorb moisture from the air due to their nature
a) microscopic b) hygroscopic c) heterogeneous d) catalytic
- 2-..... occurs when dissimilar metals are physically joined in the presence of an electrolyte.
a) pitting corrosion b) uniform corrosion c) galvanic corrosion d) crevice corrosion
- 3- is a localized form of corrosive attack.
a) pitting corrosion b) uniform corrosion c) galvanic corrosion d) atmospheric corrosion
- 4-Some inorganic compounds work as cathodic inhibitors like
a) K_2SO_4 b) $ZnSO_4$ c) Na_2CO_3 d) KOH
- 5- Crevice corrosion is usually attributed to
a) mechanical stress b) high temperature c) lack of conductivity d) lack of oxygen
- 6- Corrosion along grain boundaries leads to form corrosion.
a) erosion b) intergranular c) uniform d) crevice
- 7- Dezincification is an example of..... corrosion.
a) stress b) galvanic c) de-alloying d) intergranular
- 8-Some sulfate reducing bacteria produce, which can cause stress cracking.
a) H_2S b) H_2SO_4 c) SO_2 d) S
- 9- The environmental factor for the corrosion process is
a) temperature b) moisture c) pH d) all above
- 10-There are compounds react with dissolved oxygen and remove it from the neutral or alkaline corrosive environment, these oxygen scavengers such as
a) Na_2SO_3 b) Na_2SO_4 c) $CaCO_3$ d) all above
- 11- Passivators form passive oxide films on the surface of corroded metal, such as
a) HCl b) NaOH c) NH_3 d) $NaNO_2$
- 12- For material selection of nitric acid storage tank is
a) tin b) polymer c) stainless steel d) Cu alloy
- 13- For material selection of distilled water storage tank is
a) tin b) zinc c) copper d) steel
- 14- The corrosion rate can be decreased by
a) decreasing anodic polarization only b) increasing anodic or cathodic polarization
b) decreasing cathodic polarization only d) decreasing anodic or cathodic polarization
- 15- High hydrogen overvoltage could be attained by
a) increasing of anodic polarization b) increasing of cathodic polarization
c) increasing of anodic or cathodic polarization d) decreasing of anodic or cathodic polarization
- 16- To keep steel structure safe from corrosion damage, the corrosion current should not exceed
a) $10 \mu A/cm^2$ b) $5 \mu A/cm^2$ c) $2 \mu A/cm^2$ d) $0.5 \mu A/cm^2$
- 17- The most common unit in corrosion rate is mpy, which means
a) mils per year b) millimeter per year c) meter per year d) other
- 18- Hydrogen embrittlement may be occurred by using protection method like
a) anodic protection b) coatings c) cathodic protection d) metal selection

(Continue أنظر بالخلف)

19- The susceptibility to stress corrosion cracking is affected by.....

- a) chemical composition of metal b) environmental temperature
c) stress level d) all correct

20- For cathodic protection of a steel tank metal is a suitable sacrificial anode.

- a) Al b) Zn c) Ni d) Cu

Answer Four only from the following:

Q2 Complete the following statements:

(10 marks)

- 1- Dust particles can form galvanic couple with metal on the surface, dust particles act
- 2- The corrosion of metals in acids is common example of corrosion
- 3- The scratched or abraded area is part and the rest of metal is
- 4- The metals and alloys in service are thermodynamically
- 5- intrusion is the principal cause of corrosion problems
- 6- Organic inhibitor molecules attach to metal surfaces by
- 7- The Pourbaix diagram is a
- 8- corrosion as measured by weight loss, may be minimal.
- 9- Stainless steel is an alloy of iron with at least 10%
- 10- Stainless steel is characterized by on the surface.

Q3 a) Define the microbial corrosion, give example, its mechanism of action and methods of protection against it.

(6 marks)

b) Calculate the cell potential and determine the corrosion behavior of iron in this cell at 25°C.



(4 marks)

Where, $E^\circ (\text{Sn}^{2+}/\text{Sn}) = -0.14\text{V}$, and $E^\circ (\text{Fe}^{2+}/\text{Fe}) = -0.44\text{V}$, $R = 8.314 \text{ JK}^{-1}\text{mol}^{-1}$, $F = 96485 \text{ C mol}^{-1}$.

Q4 a) The corrosion current of Fe in a specific condition is 0.065 mAcm^{-2} , calculate the corrosion rate in mpy where density and atomic mass of Fe is 7.87 gcm^{-3} and 55.8, respectively.

(5 marks)

b) Explain the electrochemical corrosion of steel and formation of rust; indicate your answer by chemical equations and sketchy draw.

(5 marks)

Q5a) Pitting is one of dangerous type of corrosion; define the pitting, its characterization, causes, and methods of protection against it.

(5 marks)

b) Define the inhibitor and its action against corrosion, and indicate the types of inhibitor.

(5 marks)

Q6 Give short notes on the following:

(a) Boiler corrosion and its control

(4 marks)

(b) Types of cathodic protection, advantages and limitations

(4 marks)

(c) Graphitization

(2 marks)

مع اطيب التمنيات بالتوفيق..

الاستاذ الدكتور / أبو الحجاج عبدالعزيز هرماس



Final Examination for the 3rd Year Students (Inorganic Chemistry C-321)

Section I (33 Marks)

A) Choose the correct answer from the following: (15 Marks)

1) Cobalt..... oxidation state is relatively unstable in simple compounds, but is very important in complexes.

- (a) I (b) II (c) III (d) IV

2) Reduction of $[\text{Ni}(\text{CN})_4]^{-2}$ by potassium in liquid ammonia gives.....

- (a) $\text{K}_4[\text{Ni}(\text{CN})_4]$ (b) $\text{K}_3[\text{Ni}(\text{CN})_5]$ (c) $\text{K}_5[\text{Ni}(\text{CN})_6]$ (d) Non of the previous

3) The highest oxidation state normally obtained for cobalt is.....

- (a) III (b) IV (c) V (d) Non of the previous

4) Complexes of Ni^{2+} with ammonia and ethylene diamine are

- (a) Triagonal (b) Square Planar (c) Tetragonal (d) Octahedral

5) The dimethylglyoxime forms a stable complex molecule with Ni^{2+} , which is stabilized due to the formation five-membered chelate ring.

- (a) One (b) Two (c) Three (d) Four

6) The oxidation stateof Cu and Au disproportionate in water.

- (a) +1 (b) +2 (c) +3 (d) +4

7) The metals ingroup have the highest electrical and thermal conductivities known.

- (a) Copper (b) Nickel (c) Cobalt (d) Titanium

8) In copper group the oxidation state (+I) for the most of the simple compounds and complexes are

- (a) Paramagnetic (b) Diamagnetic (c) Both a,b (d) Non of the previous

9) The oxidation state +3 of the titanium show band in the visible spectrum.

- (a) One (b) Two (c) Three (d) Four

10) In the titanium group elements, the metals are unreactive or passive at low temperatures, while at higher temperature over..... they become reactive.

- (a) 300°C (b) 400°C (c) 500°C (d) 600°C

- 11) The most common crystalline form of the TiO_2 is.....
- (a) Rutile (b) Anatase (c) Brookite (d) Non of the previous
- 12) The hydrolysis of TiCl_4 by water gives titanium oxide.
- (a) III (b) IV (c) V (d) Non of the previous
- 13) The tendency to form simple ionic compounds for vanadium with increasing oxidation state.
- (a) Increase (b) Decrease (c) Both a,b (d) Non of the previous
- 14) The Cr^{2+} is very strong agent.
- (a) Reducing (b) Oxidizing (c) Both a,b (d) Non of the previous
- 15) Vanadium..... oxide in the Contact Process for the manufacture of sulphuric acid.
- (a) III (b) IV (c) V (d) Non of the previous

B) Choose the (T) or (F) mark for the following statements (18 Marks)

- 1) Ni is less reactive than Pd and Pt. ()
- 2) The oxidation states of cobalt (-I), (0) and (+I) are not exist. ()
- 3) The red coloured complex precipitated by Ni^{2+} and dimethylglyoxime is used both for the detection and quantitative estimation of Ni. ()
- 4) Cobalt chloride is used as a test for water since on dehydration pink coloured octahedral $[\text{Co}(\text{H}_2\text{O})_6]^{2+}$ ions turn into blue coloured tetrahedral $[\text{Co}(\text{H}_2\text{O})_4]^{2+}$ ions. ()
- 5) The complex $\text{K}_2[\text{NiF}_6]$ is known, and is slowly hydrolysed by water. ()
- 6) The nobility in currency metals group increases from $\text{Cu} \rightarrow \text{Ag} \rightarrow \text{Au}$. ()
- 7) The ligands in the anhydrous salts of CuF_2 and CuSO_4 are weak and do not cause a big ligand field splitting of energy levels. ()
- 8) The covalent and ionic radii in titanium group increase normally from Ti to Zr. ()
- 9) TiO is amphoteric, it dissolves in both bases and acids, forming titanates and titanyl compounds. ()
- 10) Vanadium has a very wide range of oxidation states from (-I) to (+V). ()
- 11) The d-d spectra are possible for the (+V) state of vanadium. ()
- 12) The chromium metal reacts with oxygen only on strong heating. ()

- 13) Chromyl chlorides are covalent acid chlorides and are readily decomposed by water. ()
- 14) Permanganate solutions are stable in acidic solution. ()
- 15) The catalytic properties of the transition elements are due to presence of unpaired electrons in their incomplete d- orbitals. ()
- 16) Many transition metal compounds are are colorless and diamagnetic. ()
- 17) The atomic volumes of the transition elements are high compared with neighbouring groups I and II elements. ()
- 18) Strong field ligands lead to a larger splitting energy. ()

Section II (17 Marks)

- 1- Name each of the following coordination compounds: (5 Marks)
 i) $K[AgCl_2]$, ii) $[Pt(NH_3)_4(NO_2)Cl]SO_4$, iii) $[Cr(en)_2Cl_2]^+$,
 iv) $[Co(NH_3)_5(ONO)]Cl_2$ and v) $[(NH_3)_5Cr(OH)Cr(NH_3)_5]Cl_5$
- 2- The magnetic moment of $[MnBr_4]^{2-}$ is 5.9 B.M., what is the hybridization scheme and the geometry of this complex ion? (Atomic no. for Mn = 25). (5 Marks)
- 3- For the following coordination compounds show whether EAN rule is applied or not?
 i) $[Cr(en)I_4]^-$, ii) $K_3[Fe(CN)_6]$, iii) $[AgCl_2]^-$ and iv) $[Cu(NH_3)_4]^{2+}$
 (Atomic no. for Cr = 24, Fe = 26, Cu = 29, Kr = 36, Ag = 47 and Xe = 54). (4 Marks)
- 4- Write the formulas for Three only of the following coordination compounds: (3 Marks)
 (i) Tetraamminediaquacobalt(III)chloride
 (ii) Potassiumtetracyanonickelate(II)
 (iii) Tris(ethylenediamine)chromium(III)chloride
 (iv) Iron(III) hexacyanoferrate(II)
 (v) Hexaammine iron(III) nitrate

Best Wishes

Examiners: Dr. Mohamed Abdel megeed and Dr. Muhammad Abdelshakour

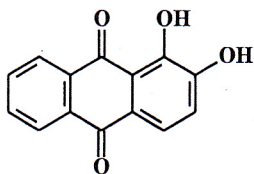


Final exam in 307 Course (dyes) for 3rd level Industrial chemistry students

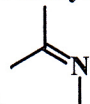
Answer the following questions:(50 marks)

Chose the correct answer of the following(25 marks)

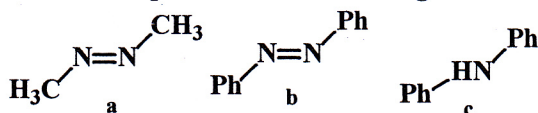
- The light ray wavelength range less than 380 nanometer is: a. Infrared (IR)
b. ultra violet c. X ray
- The short wave length ray in the visible light is: a. Red b. Blue c. Ultraviolet
- The white light consists of a mixture of seven colors according to their wavelength are: a. Violet – Indigo – Blue – Green – Yellow – Orange – Red
b. Red – Orange – Yellow – Green – Blue – Indigo – Violet.
c. Violet–Yellow - Orange – Indigo - Green – Blue – Red
- Light transmission is:
a. The amount of light that can successfully pass through glass and other types of materials
b. The reflection of light from a surface such that an incident ray is reflected at many angles, rather than at just one angle c. reflects all light which arrives from a given direction at the same angle,
- Transparency material: a. materials permit to part of light pass through it.
b. permit to light pass through it c. reflect the light to at the same angle from surface of this material.



- The structure of: a. Ingrain dye b. Alizarin dye c. purpurin dye
- the above dye is: a. direct dye b. Mordant dye c. Disperse dye
- the above dye was used for dyeing: a. Cotton fibers b. wool fibers c. hydrophobic Fibers
- Fluorescence is: a. substance that has absorbed light and the emitted light with a longer wavelength. B. It is an optical property that makes an object appear bluish under reflected light c. This phenomenon of color perception variation as a result of changing lighting conditions such as changing the light source.
- The part of a molecule responsible for its color called: a. chromogen
b. Chromophore c. Oxochrome
- Juglone dye was considered: Azoic dye b. Anthraquinone dye c. Naphthoquinone dye
- indanthrone was considered: a. Azoic dye b. Anthraquinone dye c. Naphthoquinone dye
- Kermesic acid is related to: Anthraquinone dyes b. Indigo dyes c. Phthalocyanines
- Ingrain dye is related to: a. Azoic dyes b. Indigo dyes c. Phthalocyanines
- colourless chemical compound that can be converted by chemical reaction into coloured compound called: a. chromogen b. Chromophore c. Oxochrome
- functional group of atoms with one or more lone pairs of electrons when attached to a chromophore, alters both the wavelength and intensity of absorption called: a. chromogen Chromophore c. Oxochrome
- fibers which composed of proteins which for more than 95% is: a. Silk cocoons b. Kenaf Fiber c. Flax
- methyl orange shows red colors at pH: a. under 4.4 b. over 6.2 c. between 4.4 and 6.2



- The name of this chromophore is: a. Methine b. trimethyl methane c. Methcyanine
- Which colored compound in the following:



21. Oxochrome group: a. the group is essential part in molecule to give color. b. group helping to appearing color or increasing the color hue. c. the group responsible about color in dyes.
22. (NH₂) group has: a. bathochromic effect b. Hypsochromic effect c. neither a nor b.
23. Indigo and the anthraquinone derivatives are examples of: a. mordant dyes b.vat dyes c. direct dyes
24. Alizarin was considered as: a. Alpha naphthoquinone dyes b. anthraquinone dye c. Methine dyes
25. Halochromism : a. the group which when attached to chromophore the colour appear b. changing the color as the pH changes

II. Put (✓) mark in the front of correct statement and (X) in the front of wrong one(25 Marks):

1. Opalescence It is a property that makes the object resolution turn blue under reflected light
2. The orange colure was produced from mixing the blue and yellow colures.
3. A chromophore is a colored part in the molecule.
4. Leaves change color in the Fall because their chromophores break down and stop absorbing red and blue light.
5. An auxochrome is a functional group of atoms attached to the chromophore which modifies the ability of the chromophore to absorb light
6. The object to appear colored it must have at least one chromophore.
7. 1,2-dimethyldiazene CH₃N=NCH₃ was appeared orange because it has azo group.
8. Although that benzene containing conjugated double bonds system appeared colorless because absorb part of light's waves with wave length less than 285 .
9. nitroaniline was colored than nitrobenzene. That is anino group is donating electron group
10. Azo dyes show different colors as pH changes. Therefore, they are used as indicators.
11. Exhaustion: In any dyeing process, whatever the chemical class of dye being used, heat must be supplied to the dye bath. ✓
12. Mechanism of fading colure by light proceeds through free radical formation.
13. Acid dyes are usually applied on wool, silk and nylon
14. Dyes which having chelating sites to form stable coordination complex with metal ions from metal salts called Vat dyes.
15. water-insoluble dyes, such as indigo and the anthraquinone derivatives called Mordant dyes
16. Indigosol. Dyes are readily applied to cellulosic fibers and are subsequently converted to parent vat dye by oxidation treatment.
17. Reactive dye is the dye that can react with a fiber to form covalent bonds.
18. Disperse dye is a category of synthetic dye intended for cotton and related hydrophilic fibers
19. 5,5,7,4 tetrahydroxy antocyanidol was produced from Onion skin by boiling to extract it.
20. lawsone (2-hydroxyl-1,4-naphthoquinone was known as Hina.
21. Indican hydrolyzes in water and releases β-D-glucose and oxoindole
22. alizarin and purpurin were considered anthraquinone dyes.
23. Indanthrone synthetic vat dye.
24. Lawsone dye is anthraquinone dye.
25. Juglone is isomer of lawsone.

Good luck

Prof. Dr. Adel M. Kamal El-Dean



Photochemistry and Reactive Intermediates (313 C)

Final Examination

Answer the following two sections

(50 Marks)

(Note: Express your answer by equation whenever possible)

Section (A): (Photochemistry)

(25 Marks)

Q1: Choose the correct answer A, B, C, or D:

(10 Marks)

1- 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.

2- In the ACQ materials, the main reason for quenching the fluorescence light is of aromatic rings.

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

3- $T_1 \xrightarrow[h\nu]{\Delta} S_1 \longrightarrow S_0$ Transfer is:

- A) Phosphorescence. B) Fluorescence. C) Slow fluorescence. D) Photosensitization.

4- To study the fast photoreactions and the elucidation of the photochemical mechanisms we can use:

- A) Lasers. B) Flash Lamps. C) Fluorescent Tubes. D) Incandescent Lamps.

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

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

6- The absorption spectra 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.

7- In ketones, the excitations are existing in the far UV range.

- A) $\sigma \rightarrow \sigma^*$. B) $n \rightarrow \sigma^*$. C) $\pi \rightarrow \pi^*$. D) B & C only

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

- A) Blue. B) Bathochromic. C) Hypochromic. D) Red.

9- Photoisomerization reactions may exist in

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

10- In the AIE materials, the main reason for the disappearance of fluorescein color in the solution is of aromatic rings.

- A) Rotation motion. B) π - π Interactions. C) Vibrational motion. D) No rotation.

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Q2: Answer the following questions:

(15 Marks)

- 1- Discuss the storage of Solar Energy in Inorganic Compounds.
- 2- Discuss the difference between Norrish type I and Norrish type II reactions.
- 3- By using the Jablonski diagram, explain the transitions between the excited state and the ground state.
- 4- By equations, discuss the photoreduction reaction of benzophenone in toluene.
- 5- What is the difference between AIE and ACQ materials? How can you measure this property for any organic compound?

Section (B): (Reactive Intermediates)

(25 Marks)

Answer the following questions:

Q1- Choose (T) for a true sentence or (F) for a false sentence:

(10 Marks)

- 1- There are two reasonable structures for alkyl carbanions, a planar sp^3 and a pyramidal sp^3 hybridized. ()
- 2- Electron-donating substituents will stabilize electron-rich carbon. ()
- 3- The thermal cleavage of covalent bonds is a method for the generation of free radicals. ()
- 4- The photolysis of diazirine produces a carbocation as an intermediate. ()
- 5- Wanger-Meerwein rearrangement involves five-membered ring intermediates. ()
- 6- The Bulky groups impede reaction and increase the lifetime of radicals. ()
- 7- The benzyl cation is substantially less stable than the methyl cation. ()
- 8- Homolysis of the carbon-carbon bond to carbon leads to an intermediate known as a carbanion. ()
- 9- Benzyne is an example of a neutral reactive intermediate. ()
- 10- The addition of negative ions to a carbon-carbon double bond gave carbocation. ()

Q2- Give short notes on Two only of the following terms:

(6 Marks)

- (I) The Nomenclature, structure, and the factors affecting the stability of carbocations.
- (II) The free radicals and their methods of generation.
- (III) Oxidation of phenols, by equations.

Q3- Discuss Three only of the following rearrangements, using chemical equations:

(9 Marks)

- 1- Pinacol Rearrangement
- 2- Favorskii Rearrangement.
- 3- Wagner - Meerwein Rearrangement.
- 4- 1,2-Phenyl Migrations.

Thank you & Good Luck

Ass. Prof. Ahmed Abdou O. Abeed & Dr. Abdelreheem A. Saddik

Final Examination of Natural Products and Biochemistry for
312 C Students

Answer the following questions:

Section A: Natural Products Chemistry

(25 Marks)

1. Write on the following:

(8 Marks)

- Starting with 6-methylheptenone, synthesis of α -ionone
- Prove by equation that cholesterol has two carbonyl groups are not the same ring.
- Prove that piperic acid has side chain with two double bonds.
- Conversion of allyl bromide into hygrinic acid

2. Discuss the following:

(8 Marks)

- Conversion of farnesol into squalene.
- Prove that adrenaline has terminal NH-CH_3 , one alcoholic and two phenolic OH groups
- Starting with α -pinene, synthesis of limonene.
- Prove by equations that nicotine has two moieties pyrrole and pyridine.

3. Explain the following points:

(9 Marks)

- Starting with α -pinene, synthesis of phytol.
- Starting with phenol, preparation of piperic acid.
- Conversion of oestrone into oestradiol
- Starting with 5β -cholanolic acid, synthesis of 1,3-dimethylphenanthrene.
- Conversion quinoline into N-methyl-1,2,3,4-tetrahydroquinoline.

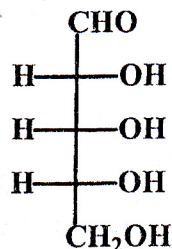
Section B: Biochemistry

(25 Marks)

Choose the correct answer:

(15 marks)

1. The following structure is corresponding to:



- a. D- Ribose b. D- Arabinose c. D- Xylose e. D. Luxose

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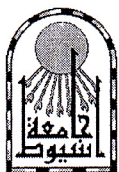
2. The structure in the previous question if oxidized with nitric acid gave:
 - a. Mono carboxylic acid
 - b. achiral dicarboxylic
 - c. chiral dicarboxylic acid.
3. Glucose when reduced with sodium borohydride gave alcoholic sugar:
 - a. Sorbitol
 - b. mannitol
 - c. mixture from a & b
4. Epimer is:
 - a. A two structure of the same sugars differs at carbon No. 1 which attached with OH group pointed to right and in the other attached with OH pointed to left.
 - b. Two sugars differ in their structures about one carbon.
 - c. Two forms of the same sugar one of them is D- and the other is L-
5. Inverted sugar name means:
 - a. name of sucrose when dissolved in water and inverted into solution
 - b. sucrose hydrolysis which inverted into glucose and fructose
 - c. inverted sugar name of due to the inversion of the direction of rotation changed from right to left.
6. Which disaccharide when hydrolyzed produce two Glucose bonded by (1-1) linkage:
 - a. Trehalose
 - b. cellobiose
 - Lactose
7. Lactulose is a disaccharide sugar found in:
 - a. Mammalian milk
 - b. is formed from glucose & galactose
 - c. semisynthetic sugar formed produced by isomerization of lactose.
8. Hyaluronic acid is
 - a: homopolysaccharide
 - b. heteropolysaccharide
 - c. stored poly saccharide
9. Maltose can be found in:
 - a. Germinated seeds
 - b. when cellulose hydrolyzed with enzyme or acid
 - c. in mammalian milk
10. Glucose and mannose were considered:
 - a. Epimers
 - b. enantiomers
 - c. aneomers
11. Hydrolysis of Chitin gave:
 - a. Glucose + galactose
 - b. Glucose
 - c. N-acetylglucosamine
12. Which of the following are enantiomers:
 - a. L-Threose & L-Erythrose
 - b. D-Threose & D-Erythrose
 - c. D-Threose & L- Threose
13. Which of the following is ketoses:
 - a. D-Ribulose
 - b. D-Ribose
 - D-Arabinose
14. D-Fructose & D-Tagatose are:
 - a. Epimers
 - b. enantiomers
 - c. anomers
15. D. mannose containing:
 - a. Plane of symmetry
 - b. point of symmetry
 - c. no symmetry factors
16. Glucose & galactose are epimers at:
 - a. C2
 - b. C3
 - c. C4
17. Celluobiose:
 - a. can be hydrolyzed with a-glycosidase enzyme.
 - b. it is underwent mutarotation
 - c. it has only one form of structure
18. Maillard browning reaction occurred as result of:
 - a. condensation of reducing sugar with amines
 - b. due to the formation of furfural.
 - c. Maillard reaction occurred as results of effect of fungi and bacteria on sugars.
19. Caramelization:
 - a. occurred due to the presence of amines in sugar solution.
 - b. At high temperatures
 - c. Due to the high pH of the sugar solutions.
20. From Essential amino acids:
 - a. Phenylalanine
 - b. arginine
 - c. cysteine

21. From non-essential amino acids: a. Phenylalanine b. asparagine
c. L-lysine
22. From AAs with acidic side chain: a. Ornithine b. Aspartic acid
c. Lysine
23. From Neutral polar Aliphatic AAs: a. Serine b. Glycine c. Valine
24. From Ketogenic amino acid: a. Leucine b. Glutamine. c. Glycine
25. From achiral amino acids: a. alanine b. tryptophan c. Glycine
26. The isoelectric point is: a. the pH at which an amino acid is electrically neutral b. the pH at which the amino acid cannot form Zwitterion
c. the pH at which the amino acid is acidic
27. Glucogenic AA: their metabolic fate gave: a. glucose b. ketonic bodies
c. fats
28. Some AAs Classified as Semi essential amino acids like:
a. Histidine b. Glycine c. tyrosine
29. L. carbohydrates meaning that: a. this sugar rotate plane of polarized light to right. b. this sugar rotates plane of polarized light to left.
c. highest numbered chiral carbon pointing to the left.
30. Isomaltose: a. Has two glucose molecules linked through an α (1 $\rightarrow$ 6) bond b. has two glucose molecules linked through an α (1 $\rightarrow$ 4) bond.
c. isomaltose has one molecule of glucose and one molecule of galactose linked through an α (1 $\rightarrow$ 6) bond. d. isomaltose has one molecule of glucose and one molecule of galactose linked through an α (1 $\rightarrow$ 4) bond.

Complete the statement in one or few word..... (10 Marks)

1. Giving mannose and Glucose the same osazone that is meaning.....
2. We can't differentiate between aldoses and ketoses by Tollen's reagent because.....
3. A carbohydrate that has two to ten monosaccharides covalently bonded to each other called
4. Glucose and galactose are epimers at C No....
5. Disaccharide which in hydrolysis gave Fructose and galactose called ...
6. Disaccharide which formed by two glucose bonded between C1 -C1 called
7. Hyaluronic acid molecule consists of +
8. Difference between cellobiose and maltose is
9. Lengthening of carbon chain in aldoses with reaction with HCN called synthesis
10. Reaction of reducing sugars in their solution with such compounds containing amino group, this reaction is called reaction

Best Wishes
Prof. Adel Kamal El-Dean
Prof. Abdel-Aal Gaber



Assiut University

Applied Industrial Chemistry Program
2022-2023 Final Exam
Course Title : Instrumentation & Process Control
Course Code: Eng 300
Time: 2 H, Full Marks:50
Date: 27 /5/2023



Faculty of Science
Chemistry Department

Answer The Following Questions:

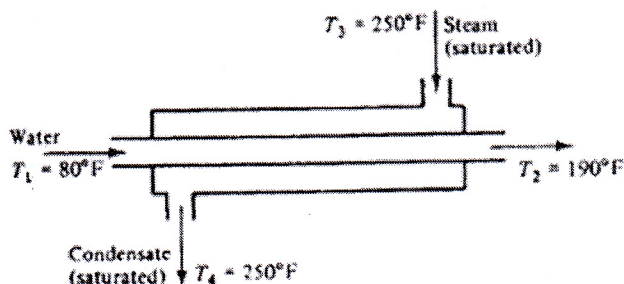
The exam consists of four questions on two pages

Question No. 1 (7 Marks). (a=3; b=2; c=2)

- Define the following terms for a sensor: sensitivity, accuracy, and resolution.
- Draw the block diagrams of feedback, and feedforward control systems.
- What is the difference between hydrometer and hygrometer?

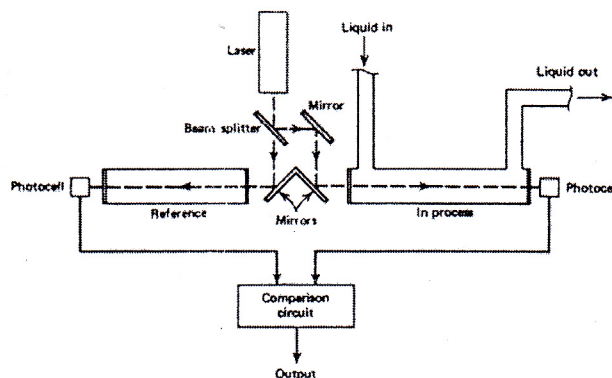
Question No. 2 (10 Marks) (a=8; b=4)

- Consider the heat exchanger shown in the Figure. Consider that the temperature $T_2 = 190^\circ\text{F}$ is our basic control objective. Construct feedback and feedforward control configurations that will satisfy the control objective in the presence of disturbances (state one of these disturbances). Show how to apply the DDC in case of feedforward control configuration.
- What is meant by gas sensors? Explain how to measure the CO_2 concentration.



Question No. 3 (15 Marks) (a=2; b=3; c=5; d=5)

- Define the following terminologies and give an example for each: transducer, and smart sensor.
- What is meant by optimizing the performance of the chemical process? Give an example.
- Describe the steps that you would go through in designing a control system for maintaining the pH of the liquid in a stirred tank at a desired value?
- Explain the operation principles of the process shown below. State a practical application of this process.



Question No. 4 (18 Marks).(3 marks for each Fig.)

- a. For Fig.(1) to Fig.(6): Describe the object and state its applications. Explain the operation principles of the objects in Fig.(1), Fig.(2) and Fig.(4).

الاجابة تكون في جدول كالآتي في كراسة الاجابة :

Fig. Number	Object name	Applications	Operation principles

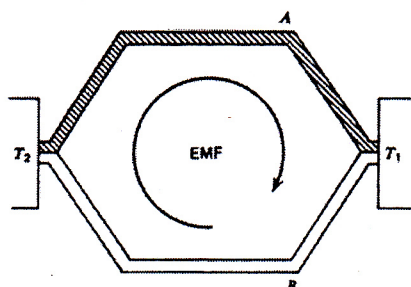


Fig.(1)

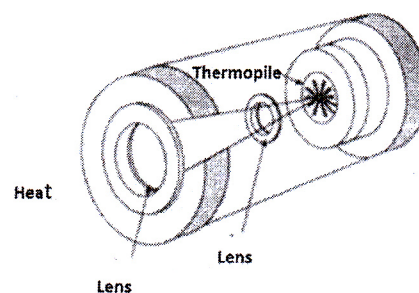


Fig.(2)

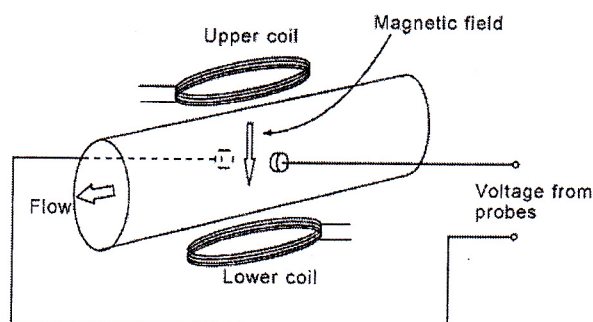


Fig.(3)

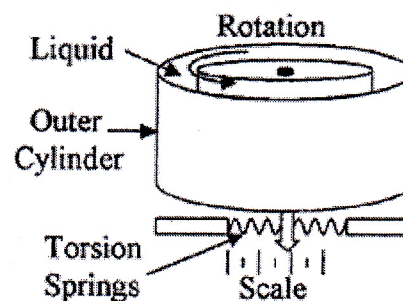


Fig.(4)

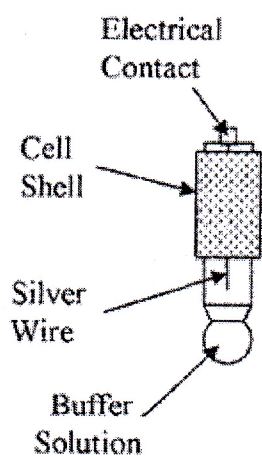


Fig.(5)

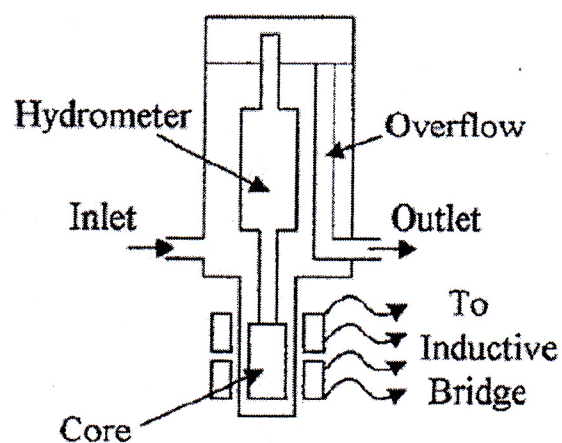


Fig.(6)

Best Wishes

Dr.-Eng.: Amer Abdelfattah Nouredin



أمتحان النظري للفصل الدراسي الثاني
للعام الجامعي 2022/2023م



الزمن: ساعتان

اسم المادة وكودها: ع.ت.أ 1308 كيمياء وتحليل اغذية الاغذية والالبان

الفرقة: الثالثة – كلية العلوم

لجنة الممتحنين: أ.د. سامي ابراهيم محمد الصياد

أجب عن جميع الأسئلة التالية :

ضع علامة (√) أو (x) أمام العبارات الاتية : (60) درجة

- 1- () اهم المواد الحافظة شائعة الاستخدام في حفظ الاغذية حامض البنزويك وبنزوات الصوديوم و حامض السوربيك وسوربات الصوديوم.
- 2- () Phenoxetol-2-phenoxy ethanol تستخدم في حالة حفظ المستحضرات الإنزيمية وهي مادة تعتبر مضادة للبكتيريا والفطريات في آن واحد.
- 3- () Precision يقصد به مدي تطابق النتائج لذات العينة أو مكرراتها داخل نفس المعمل تحت نفس الظروف.
- 4- () Sensitivity يقصد بها الطريقة التحليلية المستخدمة في تقدير مكون ما بأنها أقل كمية يمكن قياسها من المكون بهذه الطريقة (أقل فرق يمكن قياسه بين عينتين).
- 5- () يستخدم الجاروف في سحب العينات السائلة بينما أنبوبة سحب العينات تستخدم في أخذ عينات الحبوب والبقوليات.
- 6- () من أهم طرق الحفظ للعينات لحين تحليلها التبريد عند 8 °م (في الثلاجة) في حالة إجراء التحليل في غضون ساعات محدودة من سحب العينة والتجميد عند - 40 °م أو أقل إذا كان التحليل سيتم بعد فترة طويلة.
- 7- () الماء الموجود في الأغذية كوسط اذابة يطلق عليه الماء المرتبط كيميائياً Chemical Water.
- 8- () يتم الكشف عن غش الأغذية Food Adulteration من خلال تقدير الرطوبة بطرق مباشرة كما في حالة غش اللبن بالماء والذي يؤدي إلى خفض نسبة (TSS) والمواد الصلبة الكلية Total Soluble Solids والتي يمكن قياسها بطرق مختلفة مثل استخدام اللاكتوميتر Lactometer.
- 9- () تعد الكربوهيدرات من المصادر الرئيسية للطاقة التي يحصل عليها الإنسان من غذائه (حوالي 70%) ، ولها صفاتها الطبيعية ودورها الوظيفي الهام في المنتجات الغذائية.
- 10- () ينصح تغدياً أن يكون النشا هو المصدر الرئيسي للطاقة التي يحصل عليها الإنسان من الكربوهيدرات.
- 11- () عند تقدير الرطوبة باستخدام الحرارة المرتفعة في حالة المنتجات المرتفعة في محتواها من السكر – قد يحدث عنها تكرمل Caramelization أو هدم Decomposition للسكر مع فقد الماء.
- 12- () يعتبر الجليكوجين الصورة المخزنة من الكربوهيدرات في الكبد بينما الجلوكوز بمثابة السكر الرئيسي في الدم.

(Signature)

- 13- () Oligosaccharides وهي تتكون من إرتباط 2- 10 وحدات من السكريات الأحادية مع بعضها بواسطة مجموعة OH- من سكر مع مجموعة مختزلة من سكر آخر حيث ترتبط الجزيئات برابطة جليكوسيدية glycosidic bond مثل سكر ثنائي كالكروز ، المالتوز.
- 14- () Clarification تجري علي المستخلص السكري لمعظم الأغذية قبل إجراء عملية التقدير الكمي- حيث أن المستخلص يحتوي علي بعض الشوائب والتي تعيق عملية التقدير للسكريات بها- فمثلاً العكارة الناتجة عن البروتينات والنشا الذائب تؤثر علي القياسات البولاريمترية.
- 15- () من أهم المواد المروقة المستخدمة لترويق المستخلصات السكرية هي خلاص الرصاص المتعادلة $(CH_3-COO)_2Pb$ وخلاص الرصاص القاعدية $(CH_3-COO)_2Pb.Pb(OH)_2$.
- 16- () تضاف كربونات الكالسيوم عند استخلاص السكريات من عينه غذائية.
- 17- () الفورمالدهيد (الفورمالين) يستخدم لحفظ البذور الزيتية والفاكهة واللبن- ولايستخدم الفورمالدهيد لحفظ العينات المراد تقدير الكربوهيدرات بها.
- 18- () يستخدم التولوين كأحد المذيبات العضوية عند تقدير الرطوبة بطريقة بيدويل.
- 19- () لا يفضل تقدير الرطوبة بفرن التجفيف العادي خاصة في العينات المرتفعة في محتواها من السكر او الدهن .
- 20- () سكر القصب من السكريات البسيطة المختزله بينما سكر اللبن من السكريات المركبة غير المختزله
- 21- () Hydrophilic balance هي توزيع جزيئات المكون الليبيدي ما بين الوسطين الدهني والمائي.
- 22- () الأحماض الدهنية الضرورية (الأساسية) وتشمل أحماض اللينوليك – اللينولينك وهي لا يستطيع الجسم تكوينها لابد من الحصول عليها من مصادر خارجيه في الغذاء.
- 23- () تعتبر الليبيدات مصدر للفيتامينات الذائبة في الماء مثل A,K,E,D.
- 24- () Wet Extraction يعتمد على استخلاص الزيت أو الدهن من المواد الغذائية كما هي بدون تجفيفها قبل الاستخلاص مثل طريقه فولش.
- 25- () كلما احتوي الدهن علي كمية مرتفعة من الأحماض الدهنية غير المشبعة كلما إنخفضت نقطة انصهاره نسبياً ، وكان سائلاً علي درجة حرارة الغرفة مثل الزيوت النباتية.
- 26- () رقم الحموضة Acid value هو عبارة عن عدد ملليجرامات البوتاسا الكاوية اللازمة لمعادلة كافة الأحماض الدهنية المنفردة (الحرّة) الموجودة في 1 جم زيت أو دهن.
- 27- () يفضل الترميد الجاف للعينة عند تقدير العناصر المعدنية الصغري.
- 28- () يستخدم إختبار الـ TBA للتعرف علي محتوى العينة من السكريات.
- 29- () تقدير الرماد له أهميته في تقييم جودة السكر، الدقيق والمربي.
- 30- () المستخلص المتحصل عليه بطريقه فولش يعطي الـ total fat ، يصلح استخدامه لدراسة خواص الليبيدات.
- 31- () يقاس معامل الانكسار للزيت عند درجة 20 °م وللادهون عند 40 °م.
- 32- () يفضل استخدام عامل الترويق للمستخلص السكري في صورة محلول مخفف.
- 33- () من المهم استخلاص الليبيدات من العينة قبل استخلاص الكربوهيدرات وتقديرها.
- 34- () رماد المادة الغذائية هو عبارة عن المتبقي غير العضوي بعد حرق المادة العضوية وتعرف هذه العملية بالترميز Ashing.

العلماء

- 35- () (قلويه الرماد هي عبارة عن عدد مليلترات حمض الهيدروكلوريك (1 ع) والتي تتفاعل مع الرماد الذائب في الماء والناتج من 100 جم من المادة الغذائية ويفيد هذا التقدير في الكشف عن غش بعض الأغذية).
- 36- () (النشا والجليكوجين من السكريات العديدة والتي تدخل في البناء الهيكلي الصلب لجدر الخلايا).
- 37- () (من أهم الخواص الطبيعية للزيوت والدهون Physical Properties of Fats الكثافة والوزن النوعي ونقطه الانصهار).
- 38- () (يفضل استخلاص السكريات من العينة بالكحول الساخن 100%).
- 39- () (ينتج من احتراق 1 جم بروتين يعطى 4.3 كالوري).
- 40- () (Deleading تجري بهدف التخلص من الرصاص الزائد بعد عملية الترويق - حيث أن الرصاص يتداخل في التفاعلات التي تعتمد علي الإختزال).
- 41- () (Maltose هو سكر ثنائي يتكون من جزيئين جلوكوز مرتبطين برابطة جليكوسيدية ألفا 1-4 وينتج من التحلل المائي للنشا، ويشابهه السليولوز وينتج من تحلل السليولوز ولكن الرابطة بيتا 1-4).
- 42- () (السكريات العديدة التغذوية Nutritional polysaccharides وهي مركبات يتم تخزينها ميتابولزمياً في النبات والحيوان في صورة النشا والجليكوجين علي التوالي).
- 43- () (تلعب الكربوهيدرات دوراً حيوياً في العمليات الفسيولوجية في جسم الإنسان).
- 44- () (تستخدم Calcium Carbide(Gas production) method في تقدير الرطوبة في منتجات الفانيليا ، الدقيق ، الزيت ، عصير الفاكهة).
- 45- () (عادةً تتناسب قيمة المادة الغذائية طردياً مع مقدار ما تحتويه من رطوبة).
- 46- () (Sample unit وهي الحد الأدنى من مقاطع وحدة العينة التي يجب أخذها من الغذاء موضع التحليل).
- 47- () (Macro heterogeneity ويقصد به الاختلاف بين وحدات الغذاء الكلي Bulk أو Lot نفسه).
- 48- () (كلما كانت نسبة الرطوبة منخفضة كانت المادة سريعة التلف More Perishable).
- 49- () (Fructose وهو مشتق من أبسط السكريات الكيتونية Dihydroxyacetone ، فيوجد في عصائر الفاكهة وعسل النحل ، وهو أحلي السكريات).
- 50- () (يجب ارتفاع درجة حرارة العينة الغذائية عند تجهيزها للتحليل).
- 51- () (تقل درجة الذوبان للبيبيدات بزيادة درجة عدم التشبع).
- 52- () (يفضل حفظ عينات المحاليل السكرية والعصائر حمض الكبريتيك عندما يراد تقدير السكريات بها).
- 53- () (يجب عدم المحافظة علي ثبات حجم محلول الهضم مع الغليان للمدة المحددة عن تقدير الألياف الغذائية في العينة).
- 54- () (تعتبر البروتينات هي المادة الخام الأساسية في التخمرات الصناعية كما تساهم في إحساس الإنسان بالشبع).
- 55- () (يفضل الاستخلاص الجاف للبيبيدات من العينة خاصة عند تقدير الخواص الطبيعية والكيميائية للبيبيدات).



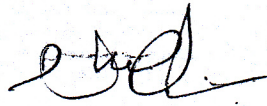
56- () يعتبر كلا من الماغنسيوم والصوديوم والبوتاسيوم من العناصر التي يحتاجها الجسم بكميات قليلة جدا.

57- () تستخدم طريقه كذاهل في تقدير البروتين في الاغذية بالطرق غير المباشرة .

58- () يستخدم الرقم اليودي للفرقة بين الزيوت الصالحة وغير الصالحة للاستهلاك الأدمي .

59- () يعتبر سكر الرافينوز من السكريات الاحادية بينما سكر الفركتوز من السكريات الثلاثيه .

60- () يستخدم جهاز بيدويل في تقدير الرطوبة للعينات التي تحتوي علي مركبات طيارة .



Final exam (Industrial Chemistry Program)

Chem 302 (Corrosion chemistry) second semester 2022-23

Time: 2 hours

Answer **Five only** from the following: (50 marks)

Q1 choose the correct answer

(10 marks)

1- A direct cost of corrosion is

- a) replace corroded materials b) inability to use the materials
c) cost of protection d) all above

2-The metal susceptible to pitting corrosion is like

- a) Zn b) Al c) Pb d) Mg

3- For material selection of distilled water storage tank is

- a) tin b) zinc c) copper d) steel

4- The necessary factor for the corrosion is

- a) the corroded metal b) the electrolyte solution c) the cathode d) all above

5- Caustic embrittlement of boilers is due to hydrolysis of

- a) CaSO_4 b) $\text{Mg}(\text{NO}_3)_2$ c) $\text{Ca}(\text{OH})_2$ d) Na_2CO_3

6-Dry corrosion is like

- a) reaction of steel in hot acid solution b) reaction of steel in hot gas
c) reaction of steel in hot moisture c) all above

7- The tin metal forms

- a) unstable surface oxide b) non adherent
c) stable surface oxide d) stable surface carbonate

8-Pitting corrosion occurs under conditions.

- a) stirring b) hot c) de-aerated d) stagnant

9- For cathodic protection of a steel tank, metal is a suitable sacrificial anode.

- a) Al b) Cu c) Ni d) Mg

10- The corrosion type which caused by relative motion between the metal surface and the corrosive fluid.

- a) stress b) intergranular c) crevice d) erosion-corrosion

Q2 Complete the following

(10 marks)

1- The oxide surface film is porous and non-protective layer like on metal.....

2- The oxide surface film is adhering protective non-porous layer like on metal.....

3- Wet corrosion is define as

4- A strained area is to the unstrained area of a metal forming galvanic corrosion.

5- The larger grains are to small ones of a crystalline metal forming galvanic corrosion.

6- Stainless steel is an alloy of iron with at least 10%

7- Stainless steel is characterized by on the surface.

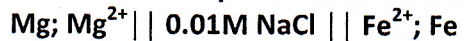
8- Insulating two dissimilar metals for protection against

9- Selection of proper materials for storage of "dilute sulfuric acid" is

10- In the oil extraction and processing industries have always been considered to be the first line of defense against corrosion.

(انظر بالخلف)

Q3 a) Calculate the cell potential and determine the corrosion behavior of iron in this cell at 25°C.



(5 marks)

Where, $E^\circ (\text{Mg}^{2+}/\text{Mg}) = -2.37\text{V}$, and $E^\circ (\text{Fe}^{2+}/\text{Fe}) = -0.44\text{V}$, $R = 8.314 \text{ JK}^{-1}\text{mol}^{-1}$, $F = 96485 \text{ C mol}^{-1}$.

b) Coating is one of important protection method against corrosion; explain the inorganic coatings, its type and examples. (5 marks)

Q4 a) Define the microbial corrosion, give example, its mechanism of action and methods of protection against it. (5 marks)

b) The corrosion current of Zn in a specific condition is 0.15 mAcm^{-2} , calculate the corrosion rate in mpy where density and atomic mass of Zn is 7.14 gcm^3 and 65.4, respectively. (5 marks)

Q5 Define the stress corrosion, its types and methods of protection. (10 marks)

Q6 Give short notes on two only of the following (10 marks)

- a) De-alloying
- b) Cathodic and anodic inhibitors
- c) Metallic coatings

مع اطيب التمنيات بالتوفيق..

الاستاذ الدكتور / أبو الحجاج عبدالعزيز هرماس