

Chemistry Department

May 2025

Faculty of Science

Time: 3h 2h

Assiut University

Final exam of course 453C (industrial chemistry)
for 4th level Biotechnology program students

Part I

(33 marks)

Answer the following questions

1. Complete the following (4 Marks)

- A) Calcination of phosphatic rock used for phosphatic fertilizers is used to remove.....
- B) During decomposition of phosphoric rock by sulphuric acid, evolved HF reacts with silica present in the rock to form the gaseous products.....and.....
- C) Chalk has a rendering it a suitable raw material for wet process of cement manufacture
- D) $3(\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2 \cdot 2\text{H}_2\text{O}) \rightarrow \dots + \dots + 6\text{H}_2\text{O}$ (ceramic reaction)

2. Give reasons for **FOUR** of the following (8 Marks)

- A) Firing of ceramics is an important process in the manufacture of ceramic products.
- B) Applying neutralising mixtures in the third stage (ageing) of superphosphate manufacture.
- C) Importance of C-S-H (calcium silicate hydrate)-hydrogel which results upon cement hydration due to reaction of C_2S or C_3S with H_2O .
- D) Glass-reinforced plastic (GRP) resists compressive and tensile forces very well.
- D) Firing too hot and too long of glass melt causes devit .

4. The sugar-phosphate backbone of a nucleic acid is directional.

Q5. Draw the structures of the following species: (10 Marks)

1. (S)-thyroxine (T₄)
2. Azidothymine.
3. Adrenaline
4. Deoxyadenosine 5'-monophosphate.
5. Cytidine 5'-monophosphate.
6. Liothyronine.
7. Cortisol
8. Tyrosine
9. Tryptophan.
10. Melatonin.

Good Luck

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



Final Examination in Selected Topics in Organic Chemistry (C-414)

Answer the following TWo sections: (50 Marks)

Section (A): Chemotherapy (17 Marks)

Q1. Answer the following questions:

- 1- How can you estimate the sulfa drugs in biological fluids? (3 points)
- 2- Write on alcohols and phenols as disinfectants. (2 points)
- 3- Structure elucidation of compound **B** ($C_6H_9O_3N_3S$) of vitamin **B1**. (5 points)
- 4- The synthesis of Penicillin. (3 points)
- 5- (4 points)
 - A- What are the two types of anti-ulcer drugs? 1.5 points
 - B- What is the triple therapy for eradicating the helicobacter pylori? 1.5 points
 - C- Write the structure of Omeprazole. 1 point

Section (B): Protein Synthesis and Hormones (33 Marks)

Q2. Define the bond for which of the following roles: (4 Marks)

- (a) The types of RNA and the function of each.
- (b) HIV-1 virus and the types of AIDS treatment.

Q3. Answer the following questions (15 Marks)

1. Discuss the steps of protein synthesis.
2. Explain the types of hormones giving an example for each type.
3. Define the endocrine glands, the types and the function of each type.

Q4. Put (✓) for the correct statement and (×) for the wrong one: (4 Marks)

1. A retrovirus is a virus containing RNA.
2. A protease inhibitor a substance that prevents the synthesis of viral proteins.
3. In the initiation step, the tRNA binds to the AUG codon of the mRNA on the ribosome.

10. Separation of proteins by size occurs based on
- a) molecular mass b) Stokes radius c) pI d) a and b
11. is used to separate molecules in solution by the use of semipermeable membranes.
- a) Ion-exchange chromatography b) affinity chromatography
c) salting out d) Dialysis
12. Reverse osmosis separates proteins on the basis of
- a) size b) IP c) solubility d) denaturation temperature
13. is defined as the migration of charged molecules in a solution through an electrical field.
- a) Dialysis b) Osmosis c) Electrophoresis d) Affinity chromatography

Question Two: Give reasons for **only six** of the following: (12 marks)

1. It is important to measure both pH and chlorine residual for water samples at the same time.
2. Turbidity of water samples should be measured on site.
3. Silica with small particle size are used in HPLC columns.
4. Ammonium sulfate is used for salting out proteins.
5. Proteins aggregate and precipitate at certain pH.
6. Chlorine is widely used as a disinfectant for water.
7. Solvent fractionation is usually performed at 0°C or below.

Question Three: Answer **only four** of the following: (12 marks)

1. Explain briefly how you can determine the concentration of SO₂ in air.
2. Mention the most common methods of protein purification.
3. Mention the factors that can precipitate or dissolve a protein.
4. Explain briefly the main disadvantage of purifying proteins by salting out.
5. Mention the factors that determine how far a protein will migrate in an electrical field.

Good Luck

Dr. Ahmed A. K. Mohammed

Final Exam for Analytical Chemistry II (C-441)

Answer the following questions:

Question One: Choose the correct answer: (26 marks)

1. refers to the extent to which a method can be used to determine an analyte in a mixture without interference from similar components.
a) Selectivity b) Working range c) Confirmation d) Robustness
2. requires that the measurement to be performed by more than one technique that are based on difference physico-chemical principles.
a) Selectivity b) Working range c) Confirmation d) Robustness
3. The results of methods with high don't change by small alterations in the experimental parameters.
a) Selectivity b) Working range c) Confirmation d) Robustness
4. is the lowest concentration of analyte that be determined with an acceptable level of uncertainty.
a) LOD b) LOQ c) Confirmation d) Precision
5. should be tested immediately for water samples because it will change during storage or transport.
a) Residual chlorine b) pH c) Turbidity d) All of the preceding
6. The main contaminant to water in most communities is
a) faecal b) **Pb** c) **As** d) fluorine
7. Before starting a protein sequence, it is necessary to know the protein's
a) isoelectric point b) solubility
c) denaturation temperature d) All of the preceding
8. Organic solvents the ionization of charged amino acids.
a) increase b) decrease c) doesn't affect
9. is the most commonly used protein separation technique
a) Ion-exchange chromatography b) Affinity chromatography
c) Salting out d) Dialysis

Please turn the page over

Section (II) Electrochemical

(17 marks)

Answer the following:

Q1: Complete the following: (5 marks)

- 1- Polarization refers to the deviation of from its equilibrium potential when a current passes through it.
- 2- The types of polarization contributes to the over potential are
- 3- polarization is due to the energy barrier that must be overcome for an electron transfer to occur at the electrode surface.
- 4- In batteries with poorly conducting electrolytes, significant voltage drops can occur due to polarization.
- 5- In oxygen reduction on a cathode, the polarization increases if oxygen supply to the electrode surface is
- 6- The internationally accepted primary reference is the standard electrode.
- 7- is the rate of forward or backward electrode reaction at equilibrium.
- 8- In dispersion of colloidal suspensions, Zeta (ξ) potential is a measure of the magnitude of between particles.
- 9- The interphase between metallic electrode and an aqueous solution of an electrolyte behave like
- 10- Ionic strength is a measure of the in the solution.

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

- 1- Describe the energy profile of electrode reaction $\text{Ag}^+(\text{aq}) + \text{e}^- = \text{Ag}(\text{s})$, in absence and in application of $\Delta\Phi$ potential to reduction process. Derive the electrochemical rate equation for this electrode reaction.
- 2- Starting from the Butler-Volmer equation for a one-electron electrode reaction. Drive the "linear polarization resistance" and the Tafel's equations.
- 3- If the hydrogen overvoltage (η_{H_2}) for zinc in 0.1M acid solution at applied current density $1 \times 10^{-5} \text{ A cm}^{-2}$ is 0.15 V, using Tafel equation calculate the exchange current density for hydrogen evolution reaction assuming the cathodic Tafel's slope (b_c) = 0.135 V.
- 4- By applying Debye – Huckel Limiting Law, calculate the activity coefficient of 0.01M sulfuric acid aqueous solution at 25° C, where $A=0.509$?

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

Prof. Dr. Abd El-Aziz A. Said , Prof. Dr. Abou El-Hagag Abd El-Aziz Mohamed



**Surface chemistry and Electrochemistry Examination for 4th
Students (Chem.432)(Chemistry Major)**

Time : 3 h Date: 28/5 / 2025



Faculty of Science
Chemistry Department

Section (I) Surface Chemistry (33 Marks)

Answer the Following Questions:

I) True (T) or False (F) of the following statement: (5 Marks)

- 1- Kind of defect introduced by doping is dislocation defect ()
- 2- F-center is a type of stoichiometric defect ()
- 3- Semiconductor oxides can exhibit high electron mobility ()
- 4- Adsorption occurs because of balanced forces acting on the surface of the solid or a liquid ()
- 5- Higher the critical temperature of a gas, greater is its extent of adsorption ()
- 6- Chemisorption involves the formation of compounds on the surface and irreversible ()
- 7- The addition of a catalyst to a reaction shifts the equilibrium to favor the products ()
- 8- Lowering the activation energy of a reaction will decrease the reaction rate ()
- 9- A catalyst works by changing the molecular structure of the reactants and products ()
- 10- When a catalyst is added to a chemical system in equilibrium, a little product will be produced ()

II)- Very short answer questions : (4 marks)

- 1- Why are adsorbate particles attracted and retained on the surface of adsorbent ?
- 2- Why does the electrical conductivity of semiconductors increases with rise of temperature ?
- 3- "Adsorbents in finely divided form are more effective " why?
- 4- The effect of temperature on the extent of physical and chemical adsorption.

III)-Short answer on the following questions: (8 marks)

1. What are the effects of promoters and poisons on the catalyst activity?
2. Write the steps of reaction on the catalyst surface in heterogeneous catalysis.
3. Explain why does conductivity of germanium (Ge^{4+}) crystals increase with Gallium (Ga^{3+}).
4. Influence of Li^+ dopant on the electrical conductivity of NiO semiconductor.

Vi) Answer four questions only from the following: (16 Marks)

- 1- Explain the precipitation method used for synthesis of industrial catalysts taking in your consideration all factors affecting their final properties.
- 2- "support or carrier is an important component in heterogeneous catalysis" Explain this statement and what are the important characteristic features of supports.
- 3- Discuss the suggested scheme by Roginskii for choosing or developing of a catalyst.
- 4- Prove the Gibbs adsorption equation, from that calculate the average area occupied by each molecule.
- 5- How are electrons created within n-and P-type semiconductors by doping .

Assiut University

Faculty of Science
Chemistry Department



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

Date: Sunday, 25-5-2025

Time: 2 hours.

Answer the following questions:

(50 Mark)

Question 1.

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

Question 2.

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

Question 3.

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

Question 4 (Answer Two only):

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

Good Luck
Examiner
Prof. Dr. Kamal Ibrahim Aly

48- A cosmetic is considered adulterated if it contains any poisonous or deleterious substance which may render it injurious to users under the conditions prescribed in the labeling.

- a. True. b. False.

49- The conversion of the disulfide bonds into monosulfide cross-links after applying hair straightening preparations is called.....

- a. Halitosis.
b. Hyperhidrosis.
c. Lanthionization.
d. None of the answers.

50- Kaolin's use in face powders should not exceed 50 %.

- a. True. b. False.

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

Good Luck

39- In Lather shaving creams, because of the inclusion of a greater amount of water and their creamy consistency, they are subjected to stability problems and the problems of viscosity stability and product separation.

- a. True.
- b. False.

40-are highly volatile essential oils, responsible for the first perceptible odors and freshness of the blend forming the fragrance. They are commonly light scents which fade first, including bergamot, cinnamon or gardenia.

- a. Top notes.
- b. Middle notes.
- c. Base notes.

41- Are most common essential oils that have a role in the stimulation of hair growth and prevention of hair loss.

- a. Vanilla and jasmine.
- b. Sandalwood and frankincense.
- c. Peppermint oil and rosemary oil.
- d. None of the answers.

42- Palmarosa essential oil containing geraniol at a relative low dose presents a high potential for mitigating the effects of acne, due to a strong antibacterial character, and the inhibition of the tyrosinase activity and the reduction of the cytokines.

- a. True.
- b. False.

43-is very opaque, and used to cover birthmarks, vitiligo, hyperpigmentation and scars.

- a. Sheer foundation.
- b. Light foundation.
- c. Medium coverage foundation.
- d. Full coverage foundation.

44- The label of cosmetic products should include product name, net quantity, name and address of the manufacturer, and the ingredients.

- a. True.
- b. False.

45- Compact powders are not durable and easily smudged by sweat.

- a. True.
- b. False.

46- Too low pressure applied in compressing compact powder will result in a cake that will easily disintegrate.

- a. True.
- b. False.

47- Zinc oxide is better as a covering agent than titanium dioxide in face powder formulation.

- a. True.
- b. False.

- 29- is a skin whitening agent that acts post melanin synthesis.
a. kojic acid. b. Hydroquinone.
c. Glycolic Acid. d. Arbutin.
- 30- is a skin whitening agent that suppresses the transfer of melanosomes to the epidermal keratinocytes.
a. Niacinamide.
b. Licorice Extract (glabridin).
c. Ethyl Ascorbic Acid.
d. None of the answers.
- 31- Brushless shaving creams are water-in-oil emulsions of the vanishing cream type.
a. True. b. False.
- 32- is oil soluble skin whitening agent that inhibits tyrosinase by chelating the copper contained within the tyrosinase enzyme resulting in a deactivated enzyme.
a. Kojic Acid.
b. Kojic Acid Dipalmitate.
c. Hexylresorcinol.
d. None of the answers.
- 33- Triethanolamine is usually avoided in lather creams because it will often discolor with age, and upon hydrolysis can produce ammonia.
a. True. b. False.
- 34- is an amphiphilic compound that mimics the tyrosinase natural substrate, tyrosine. It acts as a skin lightening agent via binding to tyrosinase directly by competing with its natural substrate, L-tyrosine, and blocking its enzymatic activity.
a. Hexylresorcinol.
b. Glycolic acid.
c. Lactic acid.
d. None of the answers.
- 35- For moderate oily skins, should apply light powder with large amount of talc.
a. True. b. False.
- 36- Emulsion binders such as triethanolamine stearate allow for a uniform distribution of both the oil and water phase in the preparation of compact powder.
a. True. b. False.
- 37- Shaving soap must lather quickly, which is a property of the coconut oil soaps. However, the lather must be thick and long-lasting, which is more characteristic of the fatty acid soaps of palm oil. So, combination between them will give a better product.
a. True. b. False.
- 38- Shaving sticks are composed mainly of stearic acid and contain larger percentages of potassium stearate than the bar soaps with small amounts of glycerol.
a. True. b. False.

- 18- Broad Spectrum sunscreen, provides UV protection against.....
a. UVA wavelength. b. UVB wavelength.
c. UVC wavelength. d. Both UVA and UVB wavelengths.
- 19- According to FDA, a Water-resistant sunscreen product is a product that does not lose more than 25% of its effectiveness after a 40-minute swim.
a. True. b. False.
- 20- A waterproof sunscreen product retains its protective capabilities after of swimming.
a. 40 minutes. b. 80 minutes.
c. 120 minutes. d. 20 minutes.
- 21- Prevent sun rays from reaching the skin by reflecting and dispersing them.
a. Physical sunscreens. b. Chemical sunscreens.
c. None of the answers.
- 22- Common ingredients of physical sunscreens include: Benzophenones, Avobenzone, p-aminobenzoic acid.
a. True. b. False.
- 23- is a sunscreen chemical that offers broad-range protection against UVA rays.
a. Ethyl hexyl methoxy cinnamate.
b. Digalloyl trioleate.
c. Benzyl salicylate.
d. Avobenzone.
- 24- Zinc oxide is an FDA-approved sunscreen and is allowed in concentrations up to 25%.
a. True. b. False.
- 25- The protection measures when the UV-index is from 6-7 require.....
a. To cover head and eyes.
b. To cover head and eyes, use strong SPF sunscreen.
c. To cover head and eyes, use low SPF sunscreen.
d. None of the answers.
- 26- A sunscreen with SPF protection +50, provide % UVB protection of.....
a. 100%. b. 99%.
c. 98%. d. 93%.
- 27- A sunscreen is not recommended to be used for children.....
a. Below 6 years.
b. Below 10 years.
c. Below 6 months.
d. None of the answers.
- 28- When applied to the skin, imparts a brownish color similar to a suntan.
a. P-aminobenzoic acid. b. Dihydroxyacetone.
c. Tretinoin. d. All of the answers.

- 9- Wet hair can increase the length up to 30% and return to original length when it is dried, due to break of disulfide bonds.
 a. True. b. False.
- 10-Characterized by hair that takes a long time to dry, can be resistant to coloring and other chemical processes.
 a. Low porosity hair.
 b. Medium Porosity Hair.
 c. High porosity hair.
 d. None of the answers.
- 11- Aerosol OT is an example of anionic surfactant that is less irritating to skin and eye so used in formulating baby shampoo.
 a. True. b. False.
- 12- Combining cationic surfactants with anionic surfactants in the same formulation, results in shampoos with increased cleansing ability.
 a. True. b. False.
- 13- are used as thickeners in shampoo preparations, however the temperature variation largely affects their solubility.
 a. Alkanolamides.
 b. PEG-6000 distearate and PEG-55 propylene glycol oleate.
 c. Natural Gum and HPMC.
 d. Sodium chloride and ammonium chloride.
- 14- Ethylene glycol mono and distearate are the most often used pearlescent agents in shampoo formulations.
 a. True. b. False.
- 15- used as pH regulators, Adjust the shampoo pH-values to the natural hair and scalp pH (5.5 – 6.0).
 a. Glycolic acid or citric acid.
 b. Selenium sulfide or zinc pyrithione.
 c. EDTA.
 d. Styrene/acrylate copolymers.
- 16-are shampoo formulations comprising from 4 to 35% of baking soda and from 65 to 96% of starch, proposed for a quick cleansing of children's hair.
 a. Jelly Shampoos. b. Two Layer Shampoos.
 c. Solid Shampoos. d. Aerosol Shampoos.
- 17- test is used to evaluate the detergency and cleaning action of shampoos.
 a. Barnet and Powers. b. Brookfield.
 c. Canvas disk. d. Ross-Miles.



Instructors: Dr. Nermin Eleraky

Pharmaceutics Dept.
Final Cosmetics and perfumes industries Exam (Chem 414).

Time Allowed: Two hours

6 pages

Date: May 26, 2025

Answer the following questions:

Total marks = 50

Choose the best answer for the following statements and put your answer in the
answer sheet:

- 1- Demi-permanent dyes, contain 6% hydrogen peroxide and low levels of ammonia.
a. True.
b. False.
- 2- Temporary hair styling preparations depend on the breakage of disulfide bonds between keratin filaments and their rearrangement into the desired shape.
a. True.
b. False.
- 3- Is a condition of excessive sweating, leads to unpleasant body odor that can adversely affect the person's ability to attain a normal and healthy life.
a. Lanthionization.
b. Hyperhidrosis.
c. Halitosis.
d. None of the answers.
- 4- A "deodorant" is not an antiperspirant, but an "antiperspirant" can be a "deodorant."
a. True.
b. False.
- 5- 2,4,4' trichloro-2-hydroxydiphenylether (Triclosan) is the main component of antiperspirant formulation.
a. True.
b. False.
- 6-Are clear to translucent aqueous or hydroalcoholic solutions, used as pH balancers.
a. Toners.
b. Moisturizers.
c. Cleansing creams.
d. None of the answers.
- 7- is the reduction of the rate of trans-epidermal water loss through damaged skin or protecting healthy skin from the effects of severely drying environment via applying quaternary ammonium complexes, mineral oils, or albumin.
a. Restoration.
b. Occlusion.
c. Toning.
d. None of the answers.
- 8-is the growing phase that determines hair length and can last for 1-10 years.
a. Telogen phase.
b. Catagen phase.
c. Anagen phase.
d. None of the answers.

7. The following data were obtained by liquid-chromatography on a 20-m capillary column and 0.293 mL/min flow rate. (5 points)

	t_R (min)	W, (min)
Nonretained	1.19	—
A	8.04	0.15
B	8.26	0.15
C	8.43	0.16

Calculate and comment on the results when necessary.

- The number of theoretical plates for each compound.
- The average number of theoretical plates for the column.
- The average plate height for the column.
- The resolution, R_s .
- The selectivity factor, α , for the pairs of A, B and B, C.

5. The drug chlorpromazine, CPZ gives an adsorptive stripping voltammetric peak at a carbon-paste electrode. A 10.0 mL of unknown sample containing CPZ yielded a peak height of 1.60 μA . When 0.50 mL of a standard solution of 0.30 μM CPZ was spiked to the sample, the peak increased to 3.20 μA . Find the concentration of chlorpromazine in the unknown sample.

(3 points)

6. The concentrations of Fe^{3+} and Cu^{2+} in a mixture can be determined following their reaction with hexacyanoruthenate (II), $\text{Ru}(\text{CN})_6^{4-}$, which forms a purple-blue complex with Fe^{3+} ($\lambda_{\text{max}} = 550 \text{ nm}$) and a pale-green complex with Cu^{2+} ($\lambda_{\text{max}} = 396 \text{ nm}$). The molar absorptivities ($\text{L mol}^{-1} \text{ cm}^{-1}$) for the metal complexes at the two wavelengths are summarized in the following table.

	ϵ at 550 nm ($\text{L mol}^{-1} \text{ cm}^{-1}$)	ϵ at 396 nm ($\text{L mol}^{-1} \text{ cm}^{-1}$)
Fe^{3+}	9970	84
Cu^{2+}	0.0	856

When a sample containing Fe^{3+} and Cu^{2+} is analyzed in a cell with a pathlength of 1.00 cm, the absorbance at 550 nm is 0.183 and the absorbance at 396 nm is 0.109. What are the molar concentrations of Fe^{3+} and Cu^{2+} in the sample?

(5 points)

Part II: Problems and Questions

1. Apply Beer's Law to determine the missing values in the table below.

(25 points)

(4 points)

[Analyte] (M)	Absorbance (A)	%T	Molar absorptivity (L mol ⁻¹ cm ⁻¹)	Pathlength (cm)
1.40 × 10 ⁻⁴			1120	1.00
.....		27.35%	750	1.00

2. Describe the disadvantages of the Flame atomization technique.

(2 points)

-
-
-
-
-

3. What factors influence the selection of a working electrode in voltammetry? Provide examples.

(2 points)

-
-
-
-
-

4. Define the following terms:

(4 points)

Term	Definition
a) Bathochromic shift (red shift)	
b) Hypsochromic shift (blue shift)	
c) Hyperchromic effect	
d) Hypochromic effect	

18. In a chromatographic separation, which of the following is most appropriate for the qualitative analysis of a substance?
- (a) Taking factor. (b) Capacity factor.
(c) Retention time. (d) Resolution.
19. What does retention time (t_R) represent?
- (a) Time taken for sample injection for the analyte to reach the detector.
(b) Distance moved by solvent.
(c) Detector response type.
(d) None of these.
20. How does increasing the particle size of the stationary phase affect the efficiency of separation in chromatography?
- (a) Increase efficiency. (b) No effect on efficiency.
(c) Decrease efficiency. (d) Increase peak height.
21. Which of the following is NOT a characteristic of a good supporting electrolyte?
- (a) Highly soluble to increase ionic strength.
(b) Chemically inert, meaning it does not react with other solutes.
(c) Redox-active, so it participates in redox reactions.
(d) Non-complexing, ensuring it does not form complexes.
22. The auxiliary (counter) electrode in polarography is _____.
- (a) Dropping mercury. (b) Mercury pool.
(c) Graphite electrode. (d) Platinum wire electrode.
23. The current in voltammetry arises from the concentration gradient of electroactive species, driven by the movement of ions from a region of higher concentration in the bulk solution to a lower concentration near the electrode surface is _____.
- (a) Diffusion current. (b) Residual current.
(c) Migration current. (d) Convection current.
24. Supporting electrolyte is used in voltammetry to eliminate the _____.
- (a) Diffusion current. (b) Residual current.
(c) Migration current. (d) Convection current.
25. All voltammetric measurements should be conducted in _____.
- (a) nitrogen free solution. (b) oxygen free solution.
(c) supporting electrolyte solution. (d) b and c are correct.

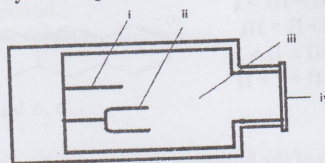
1	2	3	4	5	6	7	8	9	10	11	12	13
14	15	16	17	18	19	20	21	22	23	24	25	

9. What are the reasons leading to chemical deviations in UV-Vis molecular spectroscopy?
- Instrumental errors in wavelength calibration.
 - Chemical phenomena involving analyte molecules such as association, dissociation, and interaction with the solvent.
 - Variation in the intensity of the light source.
 - All of these.

10. Wavelength Selector is a device used in the spectrophotometer to function as _____.
- a light source.
 - a detector.
 - a nebulizer.
 - a monochromator.

11. The diagram below shows a Hollow Cathode Lamp. Identify its components.

- (i) Quartz window (ii) Anode (iii) Cathode (iv) Ne
- (i) Cathode (ii) Anode (iii) Ne (iv) Quartz window
- (i) Anode (ii) Cathode (iii) Quartz window (iv) Ne
- (i) Anode (ii) Cathode (iii) Ne (iv) Quartz window



12. What is the primary purpose of Zeeman background correction in Atomic Absorption Spectroscopy?

- To enhance the atomization process.
- To correct the spectral interferences caused by background molecular absorption.
- To increase the resolution of the absorption peaks.
- All of these.

13. In size exclusion chromatography, solute molecules are separated based on _____.

- Molecular phase.
- Molecular composition.
- Molecular geometry and size.
- Molecular formula.

14. Ion exchange chromatography achieves separation based on _____.

- Electrical mobility of ionic species.
- Electrochemical process.
- Partition chromatography.
- Adsorption chromatography.

15. Column efficiency is measured in terms of the number of theoretical plates (N), which is:

- Inversely proportional to square root of plate height (H).
- Directly proportional to square root of plate height (H).
- Directly proportional to plate height (H).
- Inversely proportional to plate height (H).

16. The basis of the chromatography technique for separating components of a mixture is _____.

- the differing movement of particles of different mass in an electrical field.
- the interaction of the components with stationary and mobile phases.
- the absorption of infrared radiation by the components.
- the deflection of charged particles in a magnetic field.

17. Retention factor, k , describe

- The distribution of an analyte between stationary and mobile phases.
- The migration rate of an analyte through a column.
- The velocity of the mobile phase.
- Both (a) and (c).

Assiut University
Faculty of Science
Chemistry Department

Date: 24/5/ 2025
Time: 2 hours
Instructor: Prof. Dr. M. S. Ibrahim

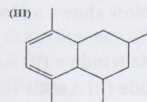
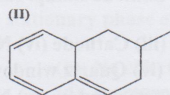
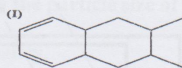
Instrumental Analysis (C-445)
(Final Exam., Second Semester 2024-2025)

Answer the following questions : (50 points)

Part I: Choose the correct answer: (25 points)

1. Using woodward-Fieser rule, rank each of the following molecules from highest to lowest λ_{max} (nm).

- a) II > III > I
b) I > II > III
c) III > II > I
d) III > I > II



2. Which of the following techniques allow for the direct analysis of solid metal samples?
a) Flame atomic absorption spectroscopy. b) Graphite furnace absorption spectroscopy.
c) Both (a) and (b). d) None of these.
3. The interference caused by phosphate (PO_4^{3-}) or sulfate (SO_4^{2-}) in the atomic absorption spectroscopy (AAS) determination of calcium (Ca^{2+}) can be eliminated by _____.
(a) Addition of excess concentration of NO_3^- . (b) The presence of releasing agent (Sr^{2+} or La^{3+})
(c) Addition of excess concentration of Ba^{2+} . (d) All of these.
4. Which of the following atomization methods is used for mercury determination?
a) Flame method. b) Hydride generation method.
c) Electrothermal method. d) Cold-Vapor method.
5. The principal use of the hollow cathode lamp in AAS is that:
(a) It generates atomic emission lines using laser source.
(b) It generates atomic emission lines using the element which is being analysed.
(c) It generates atomic emission lines using any element.
(d) All of these.
6. Ionization of analyte atoms in flame AAS can be eliminated by:
Analyte $\leftrightarrow$ Analyte $^+$ + $\bar{e}$
(a) Increasing the temperature of flame. (b) Using oxygen or nitrous oxide as an oxidant.
(c) Addition of complexing agent (EDTA). (d) Addition of potassium salt.
7. Which of the following is a source of UV radiation?
a) Tungsten lamp. b) Deuterium lamp.
c) Both (a) and (b). d) None of these.
8. What is the main function of a double-beam spectrophotometer compared to a single-beam spectrophotometer?
(a) It enhances the absorption of a single sample.
(b) It enhances the resolution of the monochromator.
(c) It split the light into two beams for simultaneous measurement of sample and reference.
(d) All of these.



Date: Friday, 30/05/2025

Time: 2 hours + 15 min. Oral

Answer Seven Only the following questions:**(50 points)**

- 1) " Carbon Fibers..... the wonder polymer..... stronger than the steel". Show by equations the steps of production of this polymer.
- 2) Explain by (equations or structures): Types of copolymers- Backbiting- Dianion, Self initiator.
- 3) In the living polymerization, show by equations how can we put an ending for the living chain (Carbanion).
- 4) Is it possible to make polyethylene from cyclohexane? If not, say why? then show examples of ring opening polymerization?
- 5) Mention the : Advantages, Disadvantages, Uses and Care for:
 - i) Cotton
 - ii) Wool
 - iv) Acrylic
 - v) Polyesters
- 6) Why would a hole appear when a dilute alkali is spilt on a fabric made of polyester? then, define the peptide linkage and Illustrate your answer with 2-aminopropanoic acid ?
- 7) Explain the term "vulcanization of rubber". What are the differences between natural rubber and vulcanized rubber?
- 8) What are the three main types of degradable plastics? Why are they degradable ?

Oral (اجباری):**(10 Mark)****Complete the following table:**

Polymer	Abbreviation	Structural formula of monomer	Structural formula of polymer
Polymethylmethacrylate	(i)	(ii)	(iii)
Polyvinyl chloride	(iv)	(v)	(vi)
Polypropylene	(vii)	(viii)	(ix)

Good Luck**Examiner:****Prof. Dr. Kamal Ibrahim Aly**

III]- Mark Right (✓) or Wrong (X) on the following statements, and

Justify your answer :

(2 x 10 = 20 Marks)

- 1- Natural gas and light oil fractions are best feed stocks for synthesis gas. ()
- 2- Hard coal contains higher amount of water and carbon. ()
- 3- The production of synthesis gas from natural gas and oxygen involves only Exothermic process. ()
- 4- Autothermal process is only involved in synthesis gas production from oil and steam. ()
- 5- Carbon monoxide can be applied with H_2 for production of methanol and higher hydrocarbons. ()
- 6- Yeast can synthesize protein from methanol but not from ethanol. ()
- 7- Cyanuric chloride is a Dimer of cyanogen chloride. ()
- 8- Ag catalysts are not preferred for oxidative dehydrogenation of CH_3OH to $HCHO$ ()
- 9- Methanol has low octane number with clean combustion. ()
- 10- The Code number of $CHFCl$ is 12 ()

Good Luck

Prof. Dr. Aboel Magd A. Abdel Wahab

Petrochemical Industries (409C)
Final Exam. for the 4th level Students (Industrial Chemistry)

Answer on the following Questions: (50 Marks)

Note: Support your answer with chemical equations whenever possible.

I]- Write on the following: (3 x 5 = 15 Marks)

- 1- The different energy sources for chemical industries.
- 2- The different applications of Hydrogen gas in Refinery and Petrochemical Industries.
- 3 -Preparation and Application of Single cell proteins.
- 4 -The present and future applications of Methanol.
- 5 – The principal industrial synthesis based on propylene

II]- Complete the following equations : (3 x 5 = 15 Marks)

- | | | |
|--|---------------------------------|---|
| 1- $\text{CH}_4 + \text{O}_2 + \text{H}_2\text{O}$ | $\xrightarrow{\text{Catalyst}}$ | ? |
| 2- 6 Urea molecules | $\xrightarrow{\text{Catalyst}}$ | ? |
| 3- $\text{CH}_2 = \text{CH}_2 + \text{Cl}_2$ | $\xrightarrow{\text{Catalyst}}$ | ? |
| 4- $\text{HCOOCH}_3 + \text{HCHO}$ | $\xrightarrow{\text{Catalyst}}$ | ? |
| 5- Toluene + Ethyl Chloride | $\xrightarrow{\text{Catalys}}$ | ? |

ملحوظة هامة : الأسئلة صفحتان



Assiut University
Faculty of Science
Chemistry Department



May: 2025
Time: 2 hours

Second Semester Examination for
Plant and Microbial Biotechnology Program Students
Subject: Analytical Chemistry (C- 460)

Answer the following questions:

(50 Marks)

Q1) Answer two only from the following:

(12.5 Marks)

a) Write on the following:

- i- The limitation of volumetric precipitation titration reaction.
- ii- Half wave potential ($E_{1/2}$) and factors affected on it.

b) Complete:

- i- The oxidizing agent is----- and the reducing agent is -----
- ii- The indicator in Mohr method is ----- while in Volhard method ----- and in Fajan method are -----.

c) Give the reason for:

- i- Oxygen must be removed from the cell before recording the polarogram in polarographic technique.
- ii- Mohr method is applicable in neutral solution.

Q2) Answer two only from the following:

(12.5 Marks)

a) Write on:

- i- Determination of the equivalent point in potentiometric titration and its advantages.
- ii- Standard hydrogen electrode.

b) During the titration of 100ml 0.1 N HCl using 0.1N NaOH . Calculate the pH value:

- i- before the titration
- ii- after the addition of 50 ml NaOH
- iii- at the end point
- iv- after the end point.

c) Define the following:

- i- Ilkovic equation
- ii- Buffer solution.

Q3) Answer two only from the following:

(12.5 Marks)

a) Write on the following:

- i- Interferences and limitation of Mohr method.
- ii- Types of polarographic current.

b) Show how you can prevent chloride ions from the interaction with silver thiocyanate in Volhard method.

Q4) Answer two only from the following:

(12.5 Marks)

a) Write on the following:

- i- Fajan method.
- ii- Advantages of dropping mercury electrode.

b) Drive the pH for the titration of 100ml (1N) CH_3COOH using (1N) NaOH. ($K_a=1.86 \times 10^{-5}$)

- i- Before the titration.
- ii- During the titration.
- iii- At the end point.
- iv- after the end point.

c) Define:

- i- Molar conductivity, equivalent conductivity and specific conductivity.
- ii- Nernst equation.

-----Good Luck-----
Examiner: Prof. Dr. Azza M.M.Ali

2. The reference electrode that is thermally more stable is
 - a) Calomel electrode
 - b) Silver-silver chloride electrode
 - c) Both are equally stable
 - d) Both are unstable
3. Mercury covered by a layer of mercurous chloride in contact with saturated potassium chloride solution is a description of which of the following types of electrodes?
 - a) Sodium
 - b) Calcium
 - c) Silver/silver chloride
 - d) Calomel
4. A very common interference for the glass pH electrode is
 - a) CO_2
 - b) F^-
 - c) Na^+
 - d) EDTA
5. Indicator electrodes that respond directly to changing activity of electrode ions
 - a) Electrodes of first kind
 - b) Inert metal electrodes
 - c) Reference electrodes
 - d) Electrodes of second kind
6. Electrodes made of pH sensitive glass may be used in the analysis of
 - a) pCO_2
 - b) pO_2
 - c) pH
 - d) (a) and (c) are correct
7. In potentiometry, how many electrodes are used to make measurements?
 - a) Three electrodes (indicator, auxiliary, reference)
 - b) Two electrodes (indicator, reference)
 - c) Four electrodes (indicator, auxiliary, counter, reference)
 - d) You don't need electrodes to make the measurements.
8. The EMF of the sample cell is determined by the following formulas
 - a) $E_{\text{cell}} = E_{\text{ind}} - E_{\text{ref}} + E_j$
 - b) $E_{\text{cell}} = E_{\text{ref}} - E_{\text{ind}} - E_j$
 - c) $E_{\text{cell}} = E_{\text{ind}} - E_{\text{ref}} - E_j$
 - d) $E_{\text{cell}} = E_{\text{ref}} + E_j - E_{\text{ind}}$
9. The reaction that occurs in the electrolyte solution of the pCO_2 electrode resulting in a change in pH is
 - a) $\text{CO}_2 + \text{H}_2\text{O} \rightarrow \text{H}_2\text{CO}_3 \rightarrow \text{H}^+ + \text{HCO}_3^-$
 - b) $2\text{H}^+ + \text{CO}_3^{2-} \rightarrow \text{H}_2\text{CO}_3$
 - c) $\text{H}_2\text{CO}_3 \rightarrow \text{H}_2\text{O} + \text{CO}_2$
 - d) $\text{CO}_2 + \text{H}_2\text{O} \rightarrow 2\text{H}^+ + \text{CO}_3^{2-}$
10. The suitable reference electrode for the electrochemical analysis at temperatures above 80°C is
 - a) Calomel electrode
 - b) Silver/ Silver Chloride electrode
 - c) a and b
 - d) Mercury electrode

Good Luck,!!!

Examiners: Prof.Dr. Hassan Sedaira

Prof.Dr. Elham Y. Hashem

Dr. Mohamed Kotb

Department of Chemistry		Date: 22/5/2025
Faculty of Science		Time: 3 hours

**Final Examination of Selected Topics in Analytical Chemistry (C-444)
for 4th level Students**

Answer Five Questions Only: (50 Mark)

I. a) What is the distribution coefficient and the distribution ratio?
b) Discuss the effect of pH on the extraction of benzoic acid from aqueous solution into ether.
c) Two extractions with 25 ml portions of an organic solvent removed 89% of a solute from 100 ml of an aqueous solution. Calculate the K_D of the solute.
d) The distribution coefficient of I_2 between an organic solvent and water is 6.0 (org / aq). If 200 ml of 0.001 M aqueous I_2 is shaken with 100 ml of organic solvent until equilibrium is reached, how many milliliters of 0.06 M $Na_2S_2O_3$ is required to titrate the I_2 in a 25 ml aliquot of the organic solvent?

II. a) How can you make metal ions to be soluble in organic solvents?
b) Give an example for the extraction of metal ions as their ion association complexes.
c) Describe the equilibrium steps involved in the solvent extraction of metal chelates.
d) Ninety percent of a metal chelate is extracted when equal volumes of aqueous and organic phases are used. What will be the percent extracted if the volume of the organic phase is doubled?

III. a) Deduce Lambert-Beer's Law and clearly define each term used.
b) Write short notes on Yoe's method of molar ratio.
c) What types of electrons in molecules are generally involved in the absorption of UV/Vis radiation?
d) What is the molecular weight of a compound if it has a molar absorptivity of 850, and 0.052 gm/40 ml of the compound yield 17% transmittance in a cell with 1 cm pathlength.

IV. a) Write short notes on internal conversion and stock shift.
b) Describe the principles of fluorescence techniques, why is fluorescence more sensitive than molecular absorption?
c) Write on photometric titration of mixture of Bi^{3+} and Cu^{2+} with standard EDTA solution and sketch the graph.
d) A simultaneous determination of Co^{2+} and Ni^{2+} can be based upon the UV/Vis absorption of their 8-hydroxyquinolinal complexes. The molar absorptivities of Co-complex are 3529 and 428.9 while those of Ni-complex are 3228 and 10.2 $L\ mol^{-1}\ cm^{-1}$ at 365 and 700 nm respectively. Calculate the molar concentration of Co and Ni in a solution mixture, its quinolinal complex has an absorbance of 0.598 and 0.039 at the wave length 365 and 700 nm respectively.

V. a) What are the different types of ion selective electrodes (ISE)? Explain only one of them.
b) Why is an internal reference electrode needed inside a glass electrode?
c) Discuss the principals of potentiometric titration and explain how the end point is determined using it.
d) What is the source of the junction potential and how does it affect the measured potential?

VI. **Choose the correct answer for the following:**
1. In Daniel cell $Zn/ZnSO_4$ acts as
a) Cathode
b) Both a and b
c) Anode
d) Reference electrode

See next page...

1

Q3: Choose the correct answer.

(15 x 1=15 marks)

Note: Indicate your answer in a table (Table 2).

- 1- Lactose is a disaccharide, formed from.....
a) 2 Glucose units b) 2 Fructose units c) Glucose, Galactose units d) All of above
- 2- are reducing sugars because they contain an aldehyde group in their open-chain form.
a) Acetic acid b) Aldoses c) Ketoses d) Carbonyl
- 3- Reaction of glucose with Fehling solutions produces.....
a) Glycolic acid b) Acetic acid c) formic acid d) Not react
- 4- Fructose is an optically active compound which contains.....chiral carbon atoms.
a) 3 b) 4 c) 5 d) 6
- 5- is a polysaccharide formed from poly glucose monomers.
a) Ammonia b) Lactose c) Starch d) Fructose
- 6- Maltose is a Sugar.
a) Reducing b) Oxidizing c) Basic d) All of above.
- 7- Glucose has isomers.
a) 17 b) 16 c) 12 d) 10
- 8- Monosaccharide can be oxidized by
a) Fehling solutions b) Tollen's reagent c) HNO_3 d) All of above
- 9- Sucrose is a disaccharide produces from binding glucose and fructose monomer by bond.
a) Ionic b) Covalent c) Glycosidic d) Chelating
- 10- Monosaccharides have as a general formula.
a) $\text{C}_n\text{H}_{2n-2}$ b) $\text{C}_n\text{H}_{2n}\text{O}_n$ c) C_nH_{2n} d) $\text{C}_n\text{H}_{2n}\text{N}_2$
- 11- Alanine is a amino acid.
a) Neutral b) Acidic c) strong acidic d) Basic
- 12- Amino acids have as function groups.
a) Carboxylic and Amino b) Only Amino
c) Carboxylic and Amide d) Only Carboxylic
- 13- Glycine is a simple one of acids.
a) Halogen b) Carboxyl c) Amino d) Hydroxyl
- 14- Simple lipids are esters of fatty acids with.....
a) Fatty alcohol b) Acetic acid c) Methanol d) H_2O
- 15- are complex biological molecules composed of long chains of amino acids.
a) Fats b) Oils, Waxes c) Terpenoids, Phosphatides d) Proteins

انتهت الاسئلة..... بالتوفيق
الممتحن / د. أماني عبدالرحمن عثمان



Final Examination of Biochemistry (413 C)
For 4th Year Students

Answer on the following questions: (50 Marks)

Q1: Show the difference between the following pairs: (4 x 5=20 marks)

- 1- Simple lipids and Derived lipids.
- 2- DNA and RNA.
- 3- Neutral fats and Waxes.
- 4- Phospholipids and Lipoproteins.

Q2: Write True (✓) or False (x) for the following statements: (15 x 1=15 marks)

Note: Indicate your answer in a table (Table 1).

- 1- All carbohydrates are polyhydroxy aldehydes or ketones or compounds that hydrolyze to produce them. ()
- 2- Glucose provides energy for the brain and ½ of energy for muscles and tissues. ()
- 3- Monosaccharides contain chiral carbon atoms. ()
- 4- A reducing sugar is a sugar with an aldehyde group that reduces a metallic oxidizing agent. ()
- 5- A strong oxidizing agent such as HNO₃ can oxidize the aldehyde and the alcohol groups. ()
- 6- Cellulose is a polymer of glucose that forms plant cell walls. ()
- 7- Maltose is a disaccharide with an α(1, 4) glycosidic link between (C₁, C₄) OH of 2 glucoses. ()
- 8- Lipids are compounds of biological origin that dissolve in non-polar solvents. ()
- 9- Lipids include fats, oils, terpenoids, phosphatides, waxes and starch. ()
- 10- Lipoproteins are important cellular constituents that are present both in the cellular and subcellular membranes. ()
- 11- Cholesterol enters in membrane structure and is used for synthesis of adrenal cortical hormones, sex hormones vitamin D₃ and bile acids. ()
- 12- Diastereomers are stereoisomers that are not enantiomers. ()
- 13- Epimers, two sugars that differ only in the configuration around one carbon atom. ()
- 14- Chiral centers are carbon atoms which have 5 different atoms bonded to it. ()
- 15- Amino acids bind with each other by glycosidic bond to produce proteins. ()

b. Differentiate between:

1. Shotcrete & Lightweight concretes.
2. Segregation & Bleeding in concrete

Question No. 4: Problem solving (5 marks)

Design the concrete mix by weight & volume using absolute volume method, considering the below information:

- The fresh concrete consistency is Plastic
- Consider water cement ratio = 50%
- The compressive strength after 28 days should= 300 kg/cm^2
- The passed percentage of aggregate through sieve 3/16 = 35%
- Specific weight of cement = 3.15
- Specific weight of aggregate (sand & gravel) = 2.65
- Volumetric weight of aggregate (sand & gravel) = 1700 Kg/cm^2

With my best wishes

16. Pick up the incorrect statement from the following:

- A. Water cement paste hardens due to hydration
- B. During hardening cement binds the aggregates together
- C. Cement provides strength, durability and water tightness to the concrete
- D. Water cement ratio has no impact on concrete compressive strength
- E. All the above.

17. Factors that affect consistency:

- A. Materials: mainly water percentage & Cement Fineness
- B. Aggregate size
- C. Weather
- D. Admixtures
- E. All the above

18. Factors affect compressive strength:

- a. Materials, design mix
- b. Manufacturing of concrete (mixing, transportation, casting & compacting)
- c. Curing
- B. Concrete age & tests circumstances
- C. All the above

19. The maximum content of cement in concrete is

- A. 450 Kg/m³
- B. 350 Kg
- C. 250 Kg/m³
- D. 550 Kg/m³
- E. 700 Kg

20. Concrete is a commonly used structural material because of its

- A. Strength and Durability
- B. Fire resistance
- C. Sound Insulation
- D. Cost effectiveness
- E. All the above

Question no. 3: Essay (20 mark)

a. Write notes about

- 1. Two Types of Concrete Admixtures (including definitions & functions)
- 2. Two examples of Non-Destructive testing of concrete (including testing steps)
- 3. Creep (Illustrative drawings are necessary)

10. High strength concrete may has grade = kg/cm^2
- A. 200
 - B. 225
 - C. 275
 - D. 350
 - E. 700
11. Permissible compressive strength of concrete grade 300 is
- A. 100 kg/cm^2
 - B. 150 kg/cm^2
 - C. 200 kg/cm^2
 - D. 250 kg/cm^2
 - E. 300 kg/cm^2
12. The factor/s which affects workability, is
- A. water content and its temperature
 - B. shape and size of the aggregates
 - C. grading and surface textures of the aggregates
 - D. air entraining agents
 - E. all the above.
13. Pick up the correct statement from the following:
- A. An increase in water content must be accompanied by an increase in cement content
 - B. Angular and rough aggregates reduce the workability of the concrete
 - C. Large size aggregates increase the workability due to lesser surface area
 - D. The slump of the concrete mix decreases due to an increase in temperature
 - E. All the above.
14. Shrinkage:
- A. Occurs in Concrete when it got hardened in air
 - B. It causes problems in concrete in all causes
 - C. Drying shrinkage is not affected by concrete mix components
 - D. All of the above
 - E. None of these
15. Durability:
- A. is concrete resistance against deterioration
 - B. includes concrete resistance for absorption and permeability
 - C. is affected by cement type
 - D. All of the above
 - E. None of these

4. Slump shape may be:
 - A. Flow
 - B. Shear
 - C. True
 - D. All the above
 - E. None of these
5. Concrete with required compressive strength = 350 Kg/cm^2 includes around of cement:
 - A. 350 kg
 - B. 150 kg
 - C. 350 g
 - D. 3 bags
 - E. 450 kg
6. Pick up the incorrect statement from the following:
 - A. Tricalcium silicate (C_3S) hydrates rapidly
 - B. Tricalcium silicate (C_3S) generates more heat of hydration
 - C. Tricalcium silicate (C_3S) develops early strength
 - D. Tricalcium silicate (C_3S) has more resistance to sulphate attack
 - E. None of these.
7. The heat of hydration of cement is dependent on:
 - A. Composition of cement
 - B. Fineness of cement
 - C. Temperature
 - D. All of the above
 - E. None of these
8. Water cement ratio is
 - A. volume of water to that of cement
 - B. volume of concrete to that of water
 - C. weight of concrete to that of water
 - D. weight of water to that of cement
 - E. both (A) and (D) of the above.
9. Pick up the correct statement from the following:
 - A. Water enables chemical reaction to take place with cement
 - B. Aggregate is not required for the hydration of cement
 - C. Water is not required for hydration of cement
 - D. Strength of concrete structure doesn't depend upon cement
 - E. Both (A) and (B) of the above.

21. The hardened concrete ended by the final setting time.
22. Consistency refers to the degree of wetness, it refers to Relative Fluidity which means the percentage between water quantity and the dry material volume, so it can't be dry.
23. Slump test can be used to measure fresh concrete properties.
24. Size of aggregate is one of the Factors that affect workability.
25. Compacting factor test can be used to determine Concrete workability.
26. Compressive strength of concrete is one of the green concrete properties.
27. Mechanical Concrete mixing is done only in ready-mix plants.
28. Using clean aggregate is an important factor while mixing concrete.
29. If cement/aggregate ratio is 1:6 it is rich concrete mix, while if the ratio reaches 1:4 the mix becomes so poor.
30. 5C approach decarbonization levers are clinker, cement, concrete, construction, and (re)carbonation.

Question No. 2: Multiple Choice, choose the appropriate answer (10 mark)

1. Mortar is:
 - A. Cement + Gravel
 - B. Cement + water + Gravel
 - C. Fine Aggregate + Gravel + water
 - D. Cement paste + Sand
 - E. None of these.
2. Since adding water, the Concrete passes with the following main phases:
 - A. Fresh Concrete + Green Concrete
 - B. Hardened Concrete + Fresh Concrete
 - C. Preparation phase + Green Concrete
 - D. Fresh Concrete + Green Concrete + Hardened Concrete
 - E. None of these
3. The main properties for fresh concrete:
 - A. Consistency
 - B. Segregation
 - C. Workability
 - D. Bleeding
 - E. All the above

Notes: Exam consists of 6 pages, Solve all questions

Question No. 1: Indicate whether the sentence or statement is true or false (15marks)

1. Concrete is a mixture of cement, water and aggregates and in some cases admixtures.
2. Concrete can't be considered as a permeable material by nature.
3. The quality control of concrete structures is more guaranteed than steel structures.
4. Cementing medium (paste) generally, is the product of reaction between hydraulic cement and water.
5. There are only two types of shrinkage Plastic Shrinkage & Autogenous Shrinkage.
6. The Passive Protection Layer that is formed by concrete, supports protecting steel reinforcement.
7. In case of mixing more than one type of admixture, carefully check the impact on concrete first before usage.
8. Self-compacting concrete is also known as Self-consolidating concrete (SCC), is a highly flowable concrete that can spread into place & fill the formwork.
9. Shotcrete is applied by either the dry or wet process.
10. Self-Healing concrete includes the technique of using healing bacteria.
11. C₃A causes many problems in cement, and it can be eliminated.
12. In traditional concrete, the failure occurred in the cement paste.
13. Creep is defined as the decrease in strain under a sustained constant stress after considering other time-dependent deformations.
14. Around 75% of concrete shrinkage occurred during the first year of concrete age.
15. Consistency is one of the main properties for hardened concrete.
16. Both slump test & Schmidt hammer are non-destructive testing of concrete.
17. Concrete is made with several types of cement and may contain pozzolan & admixtures.
18. Fresh concrete has the ability to take the form of any desired shape.
19. Coarse aggregate means sand + cement while fine aggregate means sand only.
20. The start of Fresh concrete phase is by the initial setting time.



Assiut University
Faculty of Science
Chemistry Department



May: 2025
Time: 2 hours

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

Answer the following questions: (50 Marks)

Q1) Answer two only from the following: (12.5 Marks)

- a) Write on the following: i- Acid – Base indicator ii- Electrochemical cell.
b) If you are provided with 0.1M NH_4OH (100ml) and is titrated with 0.1 M HCl. Drive the pH value at:
i- The beginning of the titration. ii- After the addition of 50 ml HCl.
iii - At the end point and mention the indicator used and why?
c) Give the reason for:
i- Supporting electrolyte is used in polarographic analysis.
ii - Mohr method is applicable in neutral solution.

Q2) Answer two only from the following: (12.5 Marks)

- a) Complete:
i -The indicator used in the titration of strong acid with strong base are ----- while the indicator ----- is used in the titration of weak acid with strong base.
ii -The indicator ----- is used in Mohr method and ----- are used as indicator in Volhard method while in Fajan method the indicators are -----.
b) Write on the following:
i- Half wave potential and factors affected on it. ii- Limitation of argentometric titration.
c) Give the reasons for:
i- Immiscible liquid nitrobenzene is added in the titration in Volhard method.
ii- Pure nitrogen is passed through the polarographic cell before the recording the polarogram.

Q3) Answer two only from the following: (12.5 Marks)

- a) Define Ilkovic equation and then calculate the diffusion current (i_d) for the reduction of $5 \times 10^{-4} \text{ M Zn}^{+2}$ which has diffusion coefficient $D = 0.72 \times 10^{-3} \text{ cm}^2/\text{sec}$, $m = 15 \text{ mg/sec}$ and $t = 4 \text{ sec/drop}$.
b) Define the following:
i- Molar conductivity, specific conductivity and equivalent conductivity.
ii- Nernst equation.
c) The equivalent weight of KMnO_4 is 1/5 its molecular weight while in basic medium the equivalent is 1/3 its molecular weight in basic medium. (Comment).

Q4) Answer two only from the following: (12.5 Marks)

- a) Define the following:
i- Standard hydrogen electrode. ii - Buffer solution.
b) Complete:
i- The equation which gives the relation of half wave potential $E_{1/2}$ and diffusion current i_d is -----.
ii- The oxidation is ----- while the reduction is -----.
c) Write on the determination of the equivalent point in potentiometric titration. (two only) and its advantages.

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

Examiner: Prof. Dr. Azza M.M. Ali

- D) Dry process in cement kilns requires less fuel compared to the wet process .
- E) C_4AF makes cement more resistant to seawater.
- F) When the content of PbO in lead glass is more than 18% then it is named crystal glass.
- G) Oxides, nitrides and borides are not considered ceramics.
- H) C-glass is an aluminosilicate glass with high MgO content.
- I) Breaking of tempered glass produces the characteristic "spider web" cracking pattern.
-

Part II:
(17 points)

Answer Four Only from the following questions:

- 1) Explain the classification, properties, and applications of the Pigments
- 2) Write on the composition, applications and advantages of water-based printing inks.
- 3) Discuss the types of pulping, and the stages of manufacture of paper?
- 4) Compare between the properties in Dyes and Pigments ?
- 5) Write short notes about the following two Theories:
 - i) Witt's Theory
 - ii) Armstrong Theory?

Examiners

Prof. Dr. Aref A. M. Aly

Prof. Dr. Kamal Ibrahim

3. Answer the following (8 Marks)

- A) Give the role that mullite and the vitreous phase play in affecting the properties of ceramic products.
- B) "Borosilicate glass is characterized by a number of excellent properties". Discuss this statement.
- C) During the manufacture of glass CO_2 and SO_2 that are of environmental impact are evolved. Give the possible sources of such gases.
- D) Draw the system used in the rolling process in glass shaping and comment.

4. Choose the correct answer in the following (4Marks)

- A) Which of the following cement components possesses a high late strength (more than 7 days)?

- C_3S - C_2S - C_3A
- C_4AF

- B) Glass is physically defined as

i) non rigid ii) supercooled liquid
iii) of definite melting point iv) crystalline.

- C) E-glass is characterized by its:

i. good electrical properties ii. chemical resistance
iii. high tensile strength iv. all these items

- D) Properties of glass-ceramics are:

i) zero porosity ii) toughness iii) translucency
iv) all these properties.

5. Mark the correct sentence with ($\sqrt{}$) and the wrong one with (x)

(9 Marks)

- A) Devitrification of glass is more likely on the tin side of the glass manufactured by the float process.
- B) Annealing of glass articles is a process performed to reduce the strain in the glass products above a predetermined maximum.
- C) Froth floatation of phosphatic rock does not require a deslimed feedstock.

Chemistry Department

May 2025

Faculty of Science

Time: 3h 2h

Assiut University

Final exam of course 453C (industrial chemistry)

for 4th level Biotechnology program students

Part I

(33 marks)

Answer the following questions

1. Complete the following **(4 Marks)**

- A) Calcination of phosphatic rock used for phosphatic fertilizers is used to remove.....
- B) During decomposition of phosphoric rock by sulphuric acid, evolved HF reacts with silica present in the rock to form the gaseous products.....and.....
- C) Chalk has a rendering it a suitable raw material for wet process of cement manufacture
- D) $3(\text{Al}_2\text{O}_3 \cdot 2\text{SiO}_2 \cdot 2\text{H}_2\text{O}) \rightarrow \dots + \dots + 6\text{H}_2\text{O}$ (ceramic reaction)

2. Give reasons for **FOUR** of the following **(8 Marks)**

- A) Firing of ceramics is an important process in the manufacture of ceramic products.
- B) Applying neutralising mixtures in the third stage (ageing) of superphosphate manufacture.
- C) Importance of C-S-H (calcium silicate hydrate)-hydrogel which results upon cement hydration due to reaction of C_2S or C_3S with H_2O .
- D) Glass-reinforced plastic (GRP) resists compressive and tensile forces very well.
- D) Firing too hot and too long of glass melt causes devit.