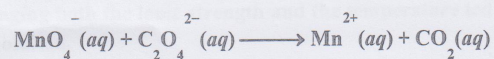
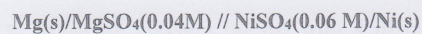


2. One type of calcium supplement tablet consists mainly of CaCO_3 but also contains several other substances (called fillers or binders). One such Ca tablet weighing 2.9072 g was added to 50.0 mL of 0.1 M HCl solution, which was in excess. Then the excess acid was titrated with 28.88 mL of 0.102 M NaOH solution. Calculate number of moles of CaCO_3 in the sample.

3. Balance the following equation:



4. Consider the following cell diagram:



(The standard reduction electrode potential (E°) for magnesium (Mg) is -2.37 V, and for nickel (Ni) is -0.25 V)

Calculate the cell voltage at 25°C. How does the cell voltage change when (a) $[\text{Mg}^{2+}]$ is decreased by a factor of 4 and (b) $[\text{Ni}^{2+}]$ is decreased by a factor of 3?

With my best wishes

Dr. Haitham El-Bery

6. What is the pH of 0.001M NaOH (aq) at 298 K?
(A) 1.0 (B) 8.0 (C) 3.0 (D) 11.0
7. A 1.0 M aqueous solution of an acid HA with pH = 6 is titrated with a 0.1 M NaOH solution. If the pH = 10 at the equivalence point, which of the following is most likely true about the acid HA?
(A) HA is strong acid
(B) HA is weak acid
(C) HA is strong electrolyte
(D) HA is chemically inert
8. 10mL of .1M NaOH is required to neutralize 20ml of unknown HCl. What is the concentration of the HCl.
(A) 0.05 M (B) 0.1 M (C) 0.2 M (D) 0.4 M
9. If a solution is neutral, which of the following must be true?
(A) $[H_3O^+] = [OH^-]$
(B) $[H_3O^+] < [OH^-]$
(C) $[OH^-] = [H_2O]$
(D) $[H_3O^+] > [OH^-]$
10. If a solution has a pOH = 1, it is also considered
(A) Neutral (B) Acidic (C) Basic (D) cannot be determined
11. The K_a of Hydrochloric acid is
(A) 1.0 (B) 1.0×10^{-14} (C) 1.0×10^{-7} (D) extremely large
12. In a neutralization reaction, the two products are:
(A) salt and acid
(B) base and acid
(C) water and salt
(D) water and base
13. In an acid-base titration, equivalent quantities of hydronium ions and hydroxide ions are present:
(A) At the beginning point
(B) At the endpoint



Final Exam for Biochemistry students of Faculty of Science

Answer the following questions:

Question 1: Put (✓) for the correct answer or (X) for the wrong statements (Answer 15 only) (15 Marks):

1. Changing both the ionic strength and the temperature led to changing the pH of the solution.
2. The buffer is a mixture of acid and its conjugate base.
3. The conjugate base of a weak acid is a strong base.
4. As K increases, pK increases.
5. When we measure the pH with a pH-meter, we are measuring the negative logarithm of the hydrogen concentration.
6. In Titrimetric Analysis, the reaction should be slow where reacted substance should react completely.
7. End point is the point of stoichiometric equivalence between the analyte and the reagent as determined by an indicator.
8. Most Acid-Base indicators are inorganic dye molecules which are either weak Acids or Bases.
9. The exact concentration of primary standard solution is determined by titration against secondary standard solution.
10. Back titration is used if the reaction between analyte A and titrant T is too fast for direct titration.
11. In titration of SA with SB, the pH at the equivalence point is >7 .
12. In titration of WA with SB, at half equivalence point the $\text{pH} = \text{pK}_a$.
13. pH at equivalence point increases as the acid strength (K_a) decreases.
14. Inflection point or maximum slope increases with weaker acid meaning that, equivalence point becomes more difficult to identify.

Part 2: Electrochemical section (17 marks)

Answer the following

Q1 Answer only three from the following (4 marks for each one):

- 1- Discuss the theories of electric double layer.
- 2- Explain the types of polarization (overpotential).
- 3- If you start from the *Butler-Volmer equation* for a one-electron electrode reaction:

$$I = I_0 \left[e^{\frac{-\beta F \eta}{RT}} - e^{\frac{(1-\beta) F \eta}{RT}} \right]$$

Derive the equation of "linear polarization resistance" and the Tafel's equation.

- 4- The exchange current density for the evolution of hydrogen at platinum is 8.0 A m^{-2} . What is the current density at 298 K for an overpotential 2 mV ?
($R = 8.314 \text{ J K}^{-1} \text{ mol}^{-1}$ and $F = 96485 \text{ C mol}^{-1}$)

Q2: State (✓) or (×) of the following

(5 marks)

- i) The polarization cell consists of four electrodes
- ii) The internationally accepted primary reference electrode is the SHE.
- iii) The exchange current (I_0) is the current of oxidation or reduction of reaction at equilibrium.
- iv) The zeta potential is used for determination of the absolute of cell potential in a given electrolyte.
- v) The magnitude and sign of the zeta potential depends on both nature electrolytes and its concentration.
- vi) The Galvani potential difference of an electrode can be measured directly.
- vii) The Debye-Huckel law is used to determine ionic strength of solution.
- viii) Electrocapillarity is a concept that describes the effect of an electric field on the capillary properties of a liquid in contact with a solid surface.
- ix) When a charged species of a substance is exposed to an electric field its chemical potential is called electrochemical potential.
- x) "iR" drop is an expression used in polarization of electrode.

أ. د. أبو الحجاج عبدالعزيز هرماس

3- Write short notes on the following:

(9 Marks)

- a) The factors are responsible for deactivation of a catalyst.
- b) The important characteristic properties of catalyst supports.
- c) The factors are influence in the amount of gas adsorbed on solid materials.

4- Answer two only from the following

(10 Marks)

- a- Mention the factors affecting thermal conductivity of solids and derive an equation that be used for calculation of specific heat of solids
- b- From adsorption isotherm data, apply the BET equation for calculation of specific surface area of a catalyst.
- c- Explain the precipitation method for manufacture of industrial catalyst and mention the forming operations.

5- Define the following terms

(4 Marks)

- (i) Turnover number (ii) Center of symmetry (iii) Schottky defect
- (v) Non-stoichiometric compound

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

Prof. Dr. Abd Al -Aziz Ahmed Said

Examination of surface and Electrochemistry for 4th student (chem. 432)

summer semester

Date: 4/9/2025



Assiut University



Faculty of Science
Chemistry Department

Time :3 h

Answer the Following Questions:

Section I

2-) Choose the correct answer

(5 Marks)

- Selective catalyst should
 - Increase the reaction rate
 - Change the reaction products
 - Increase the number of molecules adsorbed on the catalyst surface
 - Proceed the reaction to desired products.
- When n and P-type semiconductors are allowed to come into contact
 - Some electrons will flow from n to P
 - Some electrons will flow from P to n
 - The impurity element will flow from n to P
 - The impurity element will flow from P to n
- The thermal conductivity is corresponded to,.....
 - Lattice vibration
 - Contribution from electrons
 - Small contribution from electrons
 - All of them
- Which of the following is not characteristic of chemisorption
 - It is irreversible
 - It is specific
 - It is multilayer phenomenon
 - Heat of adsorption is about 100 kJ
- Which of the following statement is not true?
 - The value of adsorption enthalpy of physical adsorption is less than chemical adsorption
 - Physical adsorption occurs due to Van der Waal's forces
 - Chemical adsorption decreases at high temperature and low pressure
 - Physical adsorption is reversible

1- Put (✓) or (×) for the following sentences

(5 Marks)

- The heat of chemisorption is a measure of strength of the bonds formed between adsorbent and adsorbate ()
- The doping of NiO with monovalent metal decreases its electrical conductivity ()
- The number of charge carriers that can result from ordinary donor or acceptor ionization is $[D] + [A]$ ()
- Selective catalyst should proceed the reaction to products ()
- Structure promoter changes the chemical composition of the catalyst ()

Assiut University



Faculty of Science
Chemistry Department

Final Examination (Summer – Term) for B.Sc. (Biotechnology Program)
Industrial Chemistry (453 C)

Date: Tuesday, 2/09/2025

Time: 3 hours

Answer Ten Only from the following questions:

(50 points)

- 1) Define the following terms: Chromophore, Auxochromes, Bathochromic shift, Hybso-chromic shift.
- 2) Discuss briefly the Modern Theory for the relationship between color and constitution?
- 3) Compare between Dyes and Inorganic Pigments?
- 4) Draw the structure for each of the following Dyes:
a) Nitro and Nitroso Dyes b) Azo Dyes c) Anthraquinone Dyes
- 5) Write Short Notes on:
a) Slip casting b) Vitrification c) Thermal shock resistance in stoneware
- 6) Define the sintering of ceramics and then give three of the properties resulting after such sintering.
- 7) During the manufacture of glass, CO_2 and SO_2 that are of environmental impact are evolved. Give the possible sources of these two gases.
- 8) Give four important properties of glass-ceramics.
- 9) Compare between alite and belite after cement hydration in terms of:
a) Strength b) Heat of hydration c) Hardening
- 10) Give reasons for: Phosphatic rock calcination before use in phosphatic fertilizers manufacturing.
- 11) Explain the environmental and health hazards faced by workers in the glass industry and describe the precautions that can be taken.

Good Luck

Examiner:

Prof. Dr. Kamal Ibrahim Aly

Assiut University



Faculty of Science
Chemistry Department

Final Examination (Summer – Term) for B.Sc. (Chemistry major)
Applied Organic Chemistry (412 C): (Polymers & Fibers)

Date: Sunday, 24/08/2025

Time: 2 hours

Answer Seven Only the following questions:

(50 points)

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

Good Luck

Examiner:

Prof. Dr. Kamal Ibrahim Aly