

Section (A): Electrochemistry (17 Marks)

Answer only Three questions from the following:

- 1) a) What is the first Faraday's law.
b) What is the time in minute necessary to deposit 1 grams copper by passing current 0.5 A in CuSO₄ solution at 25°C. (F = 96485 C mol⁻¹, Cu = 63.54 g mol⁻¹)
- 2) Define the corrosion and explain by chemical equations the corrosion process of a piece of zinc in HCl aqueous solution in absence of oxygen.
- 3) In a short note define the following: Stern EDL – Pitting corrosion – Atmospheric corrosion
- 4) The exchange current density for the evolution of hydrogen at platinum is 3.0x10³ mA m⁻². Using the polarization resistance equation calculate the current density at 298 K for an over potential 5 mV? (R = 8.314 J K⁻¹ mol⁻¹, F = 96485 C mol⁻¹)

Section (B): Surface Chemistry (33 Marks)

Answer the following questions:

- 1- Define each of the following: (10 Marks)
(i) Adsorbent (ii) Turnover frequency (iii) Promoters (iv) Mesopores
(v) Selectivity.
- 2- How the porosity of solids could be assessed from adsorption isotherm data? (5 Marks)

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3- On applying the BET equation for determining the S_{BET} of a catalyst using N_2 gas as adsorbate, the slope and intercept were 72.6 and 1.2, respectively. Calculate the value of S_{BET} take into your consideration that surface area occupied by one molecule of N_2 is 16.4 \AA^2 .

(6 Marks)

4- Answer only three of the following:

(12 Marks)

- a- Compare between the chemisorption and physisorption.
- b- What is the effect of doping of silicon crystal with dopants of +5 and 3+ valance?
- c- Write short notes on the catalyst preparation with the co-precipitation method.
- d- State the postulates and the mathematical expressions of Langmuir adsorption isotherm.

Good Luck

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Final Exam. of Instrumental Analysis of BSc 4nd year students (C-445)

Answer the following questions

- I) Choose the correct answer of the following questions:
- ii) The wave number is defined as:
 $\nu^{-} = \dots\dots a) \frac{\nu}{b}, \dots\dots b) \dots\dots c) \frac{\nu}{C}$
- ii) The specific rotation of sugar:
 $[\alpha]_t = \dots\dots a) \frac{\alpha}{dx}, \dots\dots b) \frac{\alpha}{dM}, \dots\dots c) \frac{\alpha}{dC}$
- iii) In nephelometric measurements is the light source and receptor at
 a) left angle b) zero angle c) right angle
- iv) power radiated by the atom in flame AAS $P_T = \dots\dots$
- v) The Boltzmann distribution equation in AAS: $\frac{N_i}{N_0} = \dots\dots$
- II) Discuss the structural mechanism changes of methyl red with coloration at different acidity function.
- III-i) The specific rotation of nicotine is 162° at 590 nm. What is the concentration of solution (mol/L) if rotation is 0.52° with length of tube as 10 cm.

ii) In turbidimetric analysis of sulphate as Barium sulphate, in a large excess of $BaCl_2$, and different addition of Na_2SO_4 we have obtained the following data:

Vol. of sulphate (ml)	5	10	15	20	25	30	40
Scattring (S)	0.17	0.25	0.32	0.39	0.46	0.54	0.67

Using calibrated plot graph calculate:

(Mark: 5)

- 1) Turbidity coefficient (K)
- 2) Concentration of sulphate (mg) at: $S = 0.21$, and 0.50 ,
(1 ml vol. of sodium sulphate contains 2.5 mg of sulphate)

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IV) You are consider a redox reactions:



i) Write the equilibrium constant (K) and equilibrium Quantity (Q)

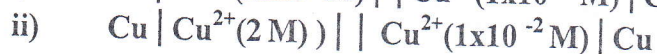
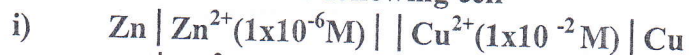
ii) The standard electrode potential for species A, and B as:

$$E_A^0 = \dots, \quad E_B^0 = \dots$$

$$\text{The cell potential } E_{cell} = E_B - E_A = \dots$$

$$\text{The electrode potential of the glass electrode: } E_{glass} = \dots$$

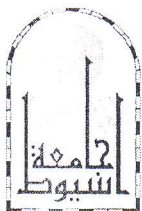
V) What is the emf of the following cell



$$\text{If: } E_{Zn}^0 = -0.763 V, \text{ and } E_{Cu}^0 = +0.337 V$$

iii) If diffusion current, constant (I) for Zinc is 8025 when m 62.5 mg/sec and t 4.3 seconds. If the diffusion current for unknown solution of Zinc is $4.3 \mu A$. what is the concentration of Zinc ion.

Examiner: Prof.Dr. S M Ahmed



Assiut University
Faculty of Science
Chemistry Department

Second semester (2019/2020)
Time: 2hrs

Final Exam For 413C students (Summer Course)

Answer the following questions: (50 Marks)

I. First question: (Answer two only) (10 Marks)

- 1- Discuss the different techniques which are used for protein characterization?
- 2- Compare between X-ray and NMR techniques for 3D protein structure determination?
- 3- Discuss the forces that hold the tertiary and quaternary structures of the proteins?

II. Second question (10 Marks)

- 1- Draw the chemical structure of Stearo-diolein.
 - a) What is the type of this triglyceride?
 - b) Calculate the Iodine number for Stearo-diolein.
 - c) Calculate the Saponification value for Stearo-diolein.
[Mol.Wt of Stearo-diolein = 887.45; A.Wt. of iodine =127; Mol.Wt. KOH =56]
- 2- Discuss the causes and the different types of rancidity?

III. Third question (10 Marks)

- 1- Give the reason for the followings:
 - a) The higher acidity of ascorbic acid.
 - b) Castor oil is inedible.
- 2- In brief accounts discuss two only from the followings:
 - a) The double helix structure of DNA.
 - b) The differences between DNA & RNA.
 - c) Components of nucleotides.

IV. Fourth question (10 Marks)

- 1- Show how can you do the following (answer two only):
 - a) Conversion of fructose to glucose.
 - c) Conversion of glucose (hexose) to arabinose (pentose).
 - d) Show with equations the effect of HCl, HNO₃, H₂SO₄ on glucose.
- 2- Discuss the post-translation modifications processes of the proteins?

-Look at the back-

V. Fifth question- Choose the correct answer of the followings (answer ten only): (10 Marks)

- 1- All protein-derived amino acids have at least one stereo centre and are chiral except:
a) Glycine b) Alanine c) Aspartic acid d) glutamic acid
- 2- The gradually change of rotation of α and β anomers of glucose to equilibrium value is called:
a) Mutarotation. b) Epimerization c) Condensation
- 3- Glucose cyclic structure formed by the reaction of -CHO with -OH on:
a) C5 b) C4 c) C3 d) C1
- 4- Lipids are compounds of biological origin that dissolve in:
a) All solvents b) Polar solvents c) Nonpolar solvents
- 5- Sucrose is non-reducing sugar and consists from:
a) Glucose + fructose, linked 1-2'. b) two glucose units linked 1-4'.
c) Galactose + glucose linked 1-4'. d) two glucose units linked 1-5'.
- 6-The presence of double bonds in fatty acids:
a) Lowers the melting point. b) Raises the melting point.
c) Do not affect the melting point. d) Reduces the responsibility for rancidity.
- 7- Polyunsaturated fatty acids:
a) Can be synthesized in human body. b) Cannot be synthesized in human body.
c) Their deficiency in diet leads to nutrition deficiency diseases. d) b & c.
- 8- In proteins, the amino acids joined by:
a) Peptide linkage b) Glycoside linkage c) Ionic bonds
- 9- Cellulose is a polysaccharide composed of several thousand of D-glucose units jointed by:
a) β -(1,4') glycosidic linkage. b) β -(1,2') glycosidic linkage
c) β -(1,5') glycosidic linkage. d) β -(2,5') glycosidic linkage.
- 10 - Which of the following fatty acids has the lowest melting point?
a) Palmitic acid b) Oleic acid c) Linoleic d) Stearic acid
- 11- Saponification number increasing as:
a) The molecular weight increases. b) The molecular weight decreases.
c) The number of double bonds increases. d) The number of double bonds decreases.

Good luck
Dr. Ahmed Mahmoud Sayed