

: 100 min

Chemistry 102
Final Examination

Feb. 10, 1998
S. Sadek

Name : _____ .

I.D. # : _____ .

Score :

I _____ / 22

II _____ / 22

III _____ / 16

IV _____ / 12

V _____ / 10

VI _____ / 18

Grade : _____ / 100

GOOD LUCK



I (22%) Answer the following questions :

In electrochemistry , what does S H E stand for ?

In a reaction mechanism , what is the rate determining step ?

Define rate law :

Determine the change in entropy in terms of enthalpy and energy changes .

By means of a potential energy diagram , show what is meant by the activation energy of a reaction .

What is the function of a catalyst ?

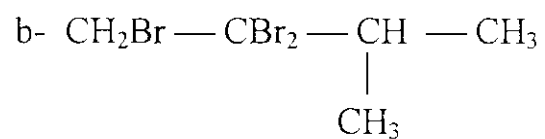
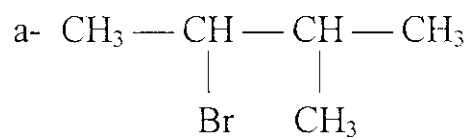
Given $K_{sp}(\text{AgCl}) = 1.8 \times 10^{-10}$ and $K_{sp}(\text{AgBr}) = 5.0 \times 10^{-13}$. If AgNO_3 solution is added to a solution containing NaCl and NaBr , which of the two salts will precipitate first ? Explain .

If we consider the spontaneous radioactive decay to be a chemical reaction, what is the order of this reaction ? Derive an expression to determine the rate constant .

II A (4%) There are two possible structures of C_2H_6O . Draw them and give IUPAC names .

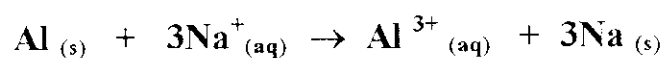
B (10%) Draw all the structural isomers of the straight chain $C_4H_8Cl_2$. Give systematic names for each isomer and indicate chiral centers .

C (8%) Starting with 3-methyl -1- butyne and any other needed reagent, show how would you prepare :



III A (8%) The pH of a 0.060 M weak monoprotic acid is 3.44 . Calculate the dissociation constant and the percent ionization of the acid.

B (8%) Given Faraday's constant ($F = 96500 \text{ J/V mole}$) and knowing that the reduction potential ε° and of Al^{3+} and that of Na^+ are - 1.66 V and - 2.71 V respectively, determine the emf ε° and ΔG° for the following reaction :



IV (12%) A solution (S) is obtained by mixing 4.00 ml of hydrochloric acid solution 0.0800 M with 6.00 ml of sulfuric acid solution 0.0500 M . The resulting solution (S) dissolves completely a certain mass (m) of zinc granules .

a- Determine the pH of solution (S) .

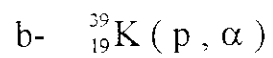
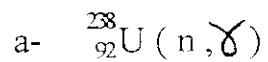
b- Determine the number of moles of zinc granules dissolved and deduce the value of mass (m) .

V (10%) In the electrolysis of a given mass (m) of fused (molten) sodium chloride sample (80.0 % pure) , 8.96 L of chlorine gas are produced at S.T.P.

a- Write the reactions taking place at the anode and at the cathode and deduce the overall reaction .

b- Calculate the mass (m) .

VIA (9%) Write equations representing the following nuclear transformations , and identify the products :



B (9%) The half-life of tin - 110 is 4 hours . If you were given 80 mg of tin at 9:00 a.m. on a Monday morning , how much of it would you have at 5:00 p.m. the next day ?