JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY

SCHOOL OF BIOLOGICAL AND PHYSICAL SCIENCES

UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE COMMUNITY HEALTH AND DEVELOPMENT & BACHELOR SCIENCE PUBLIC HEALTH

COURSE CODE: SCH 3112

COURSE TITLE: ORGANIC CHEMISTRY

INSTRUCTIONS

1. Answer question 1(Compulsory) in section A and ANY other 2 questions in section B
2. Candidates are advised not to write on the question paper
3. Candidates must hand in their answer booklets to the invigilator while in the examination room
4. Some important information/formula are found on the last page of the questions paper

SECTION A **30 marks**

a) Define hyperventilation 2 mrks
b) Define pH and give the normal range of human blood pH values. 2 mrks
c) Discuss the role of the following in Acid Base Balance in the blood; 4 mrks
    i. Lungs
    ii. Kidney
d) Distinguish between Metabolic and Respiratory Acidosis 2 mrks
e) Describe how the pH of the blood changes with an increase in the level of carbon dioxide 2 mrks
f) State TWO causes of increased levels of carbon dioxide 2 mrks

g) Explain how the respiratory and renal systems attempt to compensate for acidosis 4 mrks

h) Determine

a. the pH of a solution containing 0.25 mol/lit of aqueous acetic acid

b. the pH of a mixture solution after adding 0.10 mol/lit of sodium acetate and state the effect of the additional solution to the pH of aqueous acetic acid.
$Ka = 1.8 \times 10^{-5}$ 5 mrks

i) Consider the reaction: $SO_2 + O_3 \rightarrow SO_3 + O_2$. A rate study of this reaction was conducted at 298 K. The data that were obtained are shown in the table.

$[SO_2]$, M	**$[O_3]$, M**	**Initial Rate, M.s**
0.25	0.40	0.118
0.25	0.20	0.18
0.75	0.20	1.062

i. What is the order of reactions with respect to SO_2 and O_2
4 mrks

ii. Write the rate law for this reaction 1mrk

iii. Determine the value and units of the rate constant, $2.36\ M^{-1}.\ s^{-1}$ 2 mrks

iv. Calculate the rate of reaction when the concentrations of SO_2 and O_2 are given as 0.6 M and 0.25, respectively 2 mrks

SECTION B
QUESTION 2 20 MARKS

a) Discuss how the following factors affect the equilibrium; 6 mrks

i. Concentration

ii. Temperature

b) For the reaction, $2SO_2(g) + O_2(g) \rightleftharpoons 2SO_3(g)$

i. Write the equilibrium constant expression, Kp. 2 mrks

ii. Determine the value for Kp if $Kc = 2.8 \times 10^2$ at 1000 K 4 mrks

c) Draw the structure for each of the compounds below. 2 mrks

i. 2,3-dimethylbutane

ii. 4-ethyl-2-methylheptane

d) If 20.0 cm^3 of a Sulphuric acid solution was titrated with a standardized solution of 0.0500 mol/dm^3 (0.05 M) potassium hydroxide. And using phenolphthalein indicator for the titration, the acid required 36.0 cm^3 of the alkali KOH for neutralization.
Determine the concentration of the acid in g/lit? H=1 ;S=32; O= 16; K= 40 6 mrks

QUESTION 3 20 MARKS

a) State Le Chatelier's Principle 2 mrks

b) Discuss how the following factors affect the rate of reaction 6 mrks

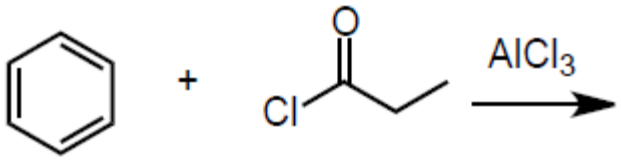
i. Temperature
ii. Concentration
iii. Catalyst

c) At 1000°C, cyclobutane (C_4H_8) decomposes in a first-order reaction, with the very high rate constant of 87 s^{-1}, to two molecules of ethylene (C_2H_4). 4 mrks

(a) If the initial C_4H_8 concentration is 2.00 M, what is the concentration after 0.010 s?

(b) What fraction of C_4H_8 has decomposed in this time?

d) Study the Friedel-Crafts Acylation reaction below and predict the compounds formed 2 mrks



e) Carboxylic acids have higher boiling points than Alcohols. Explain 2 mrks

f) Compare and contrast covalent and ionic compounds with regard to 4 mrks

i. Volatility.
ii. Electrical conductivity

QUESTION 4 20 MARKS

a) Define the term equivalence point 2 mrks

b) Explain TWO reasons why Aldehydes are more reactive that Ketone 4 mrks

c) A certain reaction proceeds through the first order kinetics. The half-life of the reaction is 180s. Determine the percentage of the initial concentration that will remain after 900s. 4 mrks

d) Use standard electrode potentials provided below to answer the questions that follow:

Equations	E^o
$Cr^{+3}_{(aq)} + 3e^- \rightarrow Cr_{(s)}$	$E^0 = -0.74$ V
$Cu^{+2}_{(aq)} + 2e^- \rightarrow Cu_{(s)}$	$E^0 = +0.34$ V
$Fe^{+2}_{(aq)} + 2e^- \rightarrow Fe_{(s)}$	$E^0 = -0.44$ V
$I_{2\,(s)} + 2e^- \rightarrow 2I^-_{(aq)}$	$E^o = +0.54$ V

a) Use the half-cell reactions for Fe(s)/$Fe^{2+(}$aq) and Cu(s)/ $Cu^{2+(}$aq) to construct an electrochemical cell and predict its standard voltage and state whether the reaction is spontaneous or not. 5 mrks

b) State and explain the function of the salt bridge in an electrochemical cell 3 mrks

c) Briefly explain one importance of Redox process in industrial process 2 mrks