

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DIPLOMA

CHEM 0102: BASIC CHEMISTRY

STREAMS: DIP.

TIME: 2 HOURS

DAY/DATE: FRIDAY 20/12/2024

8.30 A.M. – 10.30 A.M.

INSTRUCTIONS:

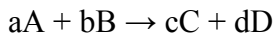
- Answer question one and any other two

QUESTION ONE (30 MARKS)

1. a i) Differentiate between a physical change and a chemical change 1 mark
- ii) Describe two Classification of matter 1 mark
- iii) State the four postulates of Daltons atomic theory 2 marks
- iv) write short notes on the structure of the atom 1 mark
- v) Differentiate between atomic number and mass number 1 mark
- b. i) Silver (Ag; $Z = 47$) has 46 known isotopes, but only two occur naturally, ^{107}Ag and ^{109}Ag .
Given the following data, calculate the atomic mass of Ag: 1 mark

Isotope	Mass (amu)	Abundance (%)
^{107}Ag	106.90509	51.84
^{109}Ag	108.90476	48.16

- ii) Boron (B; $Z = 5$) has two naturally occurring isotopes. Find the percent abundances of ^{10}B and ^{11}B given these data: atomic mass of B = 10.81amu, isotopic mass of ^{10}B = 10.0129 amu and isotopic mass of ^{11}B = 11.0093 amu 1.5 marks
- iii) Briefly describe the organization of the periodic table 1 mark
- c. i) Given the the equation below discuss how the rate law can be determined 1 mark



- ii) Distinguish between lyophobic and lyophilic colloids. (2 marks)
- iii) Describe the factors that affect the rate of a chemical reaction apart from Catalysts 4 marks
- iv) Write short notes on the intermolecular forces 2 marks
- v) Describe the periodic trends on polarizability 2 marks
- vi) A research chemist adds a measured amount of HCl gas to pure water at 25°C and obtains a solution with $[H_3O^+] = 3 \times 10^{-4} M$. Calculate $[OH^-]$. Determine if the solution neutral, acidic or basic? 2 marks
- v) what is pH of $10^{-12} M H_3O^+$ solution 1 mark
- vi) Describe the relations between pH, pOH, and pK_w 1 mark
- vii) In an art restoration project, a conservator prepares copper plate etching solutions by diluting concentrated HNO_3 to 2M, 0.3M, and 0.0063M HNO_3 . Calculate $[H_3O^+]$, pH, $[OH^-]$ and pOH of the three solutions at 25°C 1.5 marks
- viii) Name the following compounds. 5 marks
- i. $CH_3CH_2CHClCH_2CH_3$
 - ii. $CH_2=C=CHCH=CH_2$
 - iii. CH_3CHFCH_2F
 - iv. $CH_2=CHCH_2CH(CH_3)_2$
 - v. $CH_3C \equiv CCH_3$
- ix) Define an acid and base according to Brønsted- Lowry acid- base definition 1 mark

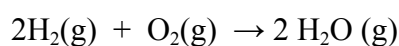
QUESTION TWO (20 MARKS)

- a)** Draw structures for the following compounds. 3 marks
- i. Cyclopentane
 - ii. Methyl cyclopentane,
 - iii. Isopropyl cyclopentane
- b)** Describe the application of radioisotopes in agriculture 4 marks
- c)** Distinguish between a True solution, Colloidal Solution, and Suspension 6 marks
- d)** Discuss two phases of colloids 2 marks

- e) Briefly describe three properties of colloids 3 marks
- f) State four applications of emulsions 2 marks

QUESTION THREE (20 MARKS)

- a) i) Name three properties of Colloidal solutions 1.5 marks
- ii) Describe colloids based on their Molecular sizes 1.5marks
- iii) Define electrophoresis 1 mark
- iv) Name two types of emulsions 2 marks
- b) i) Describe the application of emulsions 2 marks
- ii) State the applications of Colloidal solutions 2 marks
- iii) Explain why water is regarded as a polar molecule 1.5 marks
- iv) State the thermal properties of water 2 marks
- c. i) Define the term chemical Kinetics 0.5 mark
- ii) Hydrogen gas has a non-polluting Combustion product (water Vapour). It is used as a fuel aboard the space shuttle and in earthbound Cars with prototype engines 3 marks



- a) Express the rate in terms of Changes in H_2 , O_2 and H_2O with time.
- b) When O_2 is decreasing at 0.23 mol/L.s, at what rate is H_2O increasing
- iii) With the help of a diagram describe how catalysts affect the rate of a chemical reaction 3 marks

QUESTION FOUR (20 MARKS)

- i) Describe catalytic processes occurring in nature 4 marks
- ii) Briefly describe the theories of Chemical kinetics 2 marks
- iii) Discuss isomerism in organic chemistry 2 marks
- iv) Differentiate between aliphatic compound and aromatic compound 2 marks
- v) Draw Lewis structures for the following compounds. 10 marks
- Ammonia, NH_3
 - Hydronium ion, H_3O^+
 - Carbon (iv) oxide CO_2
 - Boron trifluoride, BF_3
 - Water (H_2O)

