

**ALUPE UNIVERSITY
COLLEGE**
... Bastion of Knowledge...

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**OFFICE OF THE DEPUTY PRINCIPAL
ACADEMICS, STUDENT AFFAIRS AND RESEARCH**

UNIVERSITY EXAMINATIONS

2017/2018 ACADEMIC YEAR

FIRST YEAR FIRST SEMESTER EXAMINATION

For examiner's Use Only

**FOR THE DEGREE OF BACHELOR
OF EDUCATION (Sci)/B.Sc. (MIC)
SCHOOL: SCIENCE/ EDUCATION AND
SOCIAL SCIENCE**

**ALUPE UNIVERSITY COLLEGE
LIBRARY**

COURSE CODE: CHE 110

COURSE TITLE: BASIC CHEMISTRY I

DATE: 11th December, 2017 TIME: 9.00am-12.00pm

INSTRUCTION TO CANDIDATES: SEE INSIDE

Question	I.E	E.E
CAT		
EXAM		
TOTAL		

THIS PAPER CONSISTS OF 21 PRINTED PAGES

PLEASE TURN OVER

Insert the numbers of the questions you have answered in the order done

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Student Admission No.....Exam Card No.....Signature.....

INSTRUCTIONS TO CANDIDATES

1. Write your **Admission Number, Exam Card Number** and **Sign** in the spaces provided at the bottom of each page of the Examination Booklet. **DO NOT** write your name anywhere in this booklet.
2. Write on both sides of the pages.
3. All rough work must be done in the Answer sheets and crossed through.
4. If supplementary pages are used, they must be fastened all together at the end of this Booklet. Supplementary pages should be used only after all the leaves in the booklet have been exhausted.
5. It is a serious examination offence to cheat or to have unauthorized materials including **MOBILE PHONES** (whether on or off) in the examination venue.
6. In no circumstances must Answer Booklet used or unused, be removed from the examination room by a candidate.
7. The Booklet is for **Examination use only** in a designated examination room. Unauthorized possession of the Answer sheets by a student or any other person constitutes an examination irregularity calling for stiff disciplinary action.
8. Do not pluck any page from this Booklet. Any extra/unused answer sheets should be returned to the **Examination Office**.
9. Candidates who come to examination room 30 minutes late will not be allowed to sit for the exam.
10. Candidates will not be allowed to leave the exam room once the exam commences.
11. Candidates are advised that importance is attached by examiners to accuracy and clarity of expression.
12. Committing any form of irregularity is prohibited and shall attract severe disciplinary action in accordance with Alupe University College Examination Regulations.

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INSTRUCTION TO CANDIDATES

Answer **ALL** questions from section A and any **THREE** from section B.

Duration of the examination: 3 hours

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SECTION A (24 MARKS)**QUESTION ONE**

(Rb=37, Fe=26, Co=27, Na=11)

- a) What are the drawbacks of the Rutherford's atomic model? (2 mks)
- b) List the Bohrs postulates (3 mks)
- c) On what principles is the mechanical model of the atom based? (2 mks)
- d) State the Heisenberg's uncertainty principle. (1 mk)
- e) Describe the four quantum numbers. (4 mks)

QUESTION TWO

- a) Write the electronic configuration for Rb, Fe²⁺, Co and Na⁺. (2 mks)
- b) Explain why Helium has a smaller radius than Hydrogen atom? (2 mks)
- c) What is a chemical bond? (1 mk)
- d) Giving examples, discuss 3 different types of bonds. (3 mks)
- e) What are some of the properties of ionic compounds? (3 mks)
- f) What is a hydrogen bond? (1 mk)

SECTION B**QUESTION THREE**

- a) Highlight the properties of the coordinate covalent bond. (3 mks)
- b) With relevant examples, explain how polarity of bonds varies with electro negativities. (2 mks)
- c) Explain why water is liquid at room temperature while hydrogen sulphide is a gas at room temperature (3 mks)
- d) What is London force? (1 mk)
- e) Draw the Lewis structures of NaCl, HCN and NH₃. (3 mks)

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QUESTION FOUR

- a) What is the valence shell electron pair repulsion theory? (2 mk)
- b) Predict the shapes of CH_4 and NH_3 . (3 mks)
- c) In an experiment to determine the citric acid content in lemon juice, 25 ml of the juice was diluted to 250 ml using diluted water. 20 ml of the diluted solution neutralized 22.4 ml of 0.01 M NaOH. Determine the concentration of the citric acid in the lemon juice given that the molecular weight of citric acid is 192g. (5 mks)
- d) Permanganate ion (MnO_4^-) oxidizes Fe^{2+} to Fe^{3+} in acidic conditions and gets reduced to Mn^{2+} . Write a balanced redox equation for this reaction. (2 mks)

QUESTION FIVE

- a) Define oxidation and reduction in terms of oxygen, hydrogen and electrons gained or lost. (2 mks)
- b) Explain two applications of redox reactions. (2 mks)
- c) Define and give examples of state function. (2 mks)
- d) State the first law of thermodynamics. (1 mk)
- e) Show that $\Delta E = q_v$ at constant volume (V). (2 mk)
- f) Define heat of combustion and heat of neutralization. (2 mks)
- g) State Hess law. (1 mk)

QUESTION SIX

- a) A 23.1 L container of He gas has a pressure of 3.54 atm. The gas is transferred to a new container and the pressure in this container is 1.87 atm. What is the volume of the new container? (3 mks)
- b) Explain how the experiments of Boyle, Charles, and Avogadro led to the formulation of the perfect gas equation of state. (2 mks)
- c) Explain equilibrium constant? (1 mk)
- d) What is chemical equilibrium? (1 mk)
- e) For the reaction, $\text{CO} + 3\text{H}_2 \rightarrow \text{CH}_4 + \text{H}_2\text{O}$, calculate K_c from the following equilibrium concentrations: $[\text{CO}] = 0.0613 \text{ M}$; $[\text{H}_2] = 0.1839 \text{ M}$; $[\text{CH}_4] = 0.0387 \text{ M}$; $[\text{H}_2\text{O}] = 0.0387 \text{ M}$. (3 mks)
- f) Define and give examples of homogeneous and heterogeneous catalysts? (2 mks)

QUESTION SEVEN

- a) The solubility product of PbI_2 is $7.1 \times 10^{-9} \text{ mol}^3 \text{ L}^{-3}$. Calculate its solubility. (4 mks)
- b) Differentiate between zero order and first order reactions. (2 mks)
- c) A sample of air occupies 150 ml at 20°C . What volume will it occupy when the sample is immersed in a bath at 100°C supposing that it is free to expand against a constant pressure. (3 mks)
- d) Calculate the ratio of effusion (or diffusion) rates of molecules of H_2 and CO_2 from the given constants and at the same temperature and pressure ($M_{\text{H}_2}=2.02 \text{ g mol}^{-1}$, $M_{\text{CO}_2}=44.01 \text{ g mol}^{-1}$). (3 mks)

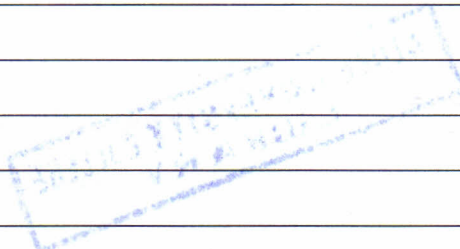


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