



*(University of Choice)*

**MASINDE MULIRO UNIVERSITY OF  
SCIENCE AND TECHNOLOGY  
(MMUST)**

**MAIN CAMPUS**

**UNIVERSITY EXAMINATIONS  
2014/2015 ACADEMIC YEAR**

**FIRST YEAR FIRST SEMESTER EXAMINATIONS**

**FOR THE DIPLOMA  
IN  
CIVIL AND STRUCTURAL ENGINEERING**

**COURSE CODE: DCE 053**

**COURSE TITLE: CHEMISTRY**

**DATE: 9<sup>TH</sup> DECEMBER 2014**

**TIME: 2.30PM – 4.30PM**

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**INSTRUCTIONS:**

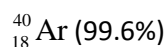
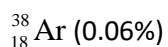
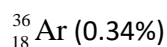
1. Answer **ALL** the Questions
2. Examination duration is **3 Hours**

MMUST observes **ZERO** tolerance to examination cheating

This Paper Consists of 3 Printed Pages. Please Turn Over.

**Question One**

- a. By use of relevant examples where possible define the following terms (4 marks)
- Atomic number
  - Isotopes
  - Electrochemistry
  - Relative Atomic Mass
- b. (i) Briefly discuss the Dalton's Atomic theory (3 marks)
- (iii) Give the electronic configurations of the following elements and ions (4 marks)
- Titanium (Z= 22)
  - $\text{Ca}^{2+}$  (Z=20)
  - Oxygen (Z=8)
  - Vanadium (Z=23)
- c. (i). State any FOUR (4) differences between metals and non-metals (4 marks)
- (ii) Give any THREE (3) examples of Metalloids (3 marks)
- d. Determine the relative atomic mass of the following element whose isotopic compositions occur in the proportions given: (2 marks)
- a. Argon

**Question Two**

- a. (i) Distinguish between an electrolytic cell and a voltaic cell (2 marks).
- (ii) Consider the following voltaic cell at 25°C:  $\text{Zn(s)} | \text{Zn}^{2+}(\text{aq}) || \text{Cu}^{2+}(\text{aq}) | \text{Cu(s)}$ .
- {Reduction potentials:  $\text{Zn}^{2+}(\text{aq}) + 2\text{e}^- \rightarrow \text{Zn(s)}$  (- 0.76 V),  
 $\text{Cu}^{2+}(\text{aq}) + 2\text{e}^- \rightarrow \text{Cu(s)}$  (+0.52 V)}.
- Identify the anode and the cathode. (1 mark)
  - Write the half reactions that occur at each electrode (2 marks)
  - Write the balanced overall reaction. (1 mark)
  - Calculate the Ecell of this cell. (2 marks)
  - Sketch this cell. (3marks)
  - what is the work of the salt bridge in this cell ( 1 marks)
- b. Give any THREE (3) applications of electrolysis. (3 marks)
- c. State any TWO (2) disadvantages of lead acid accumulators (2 marks)

- d. (i) Define the term allotropy. (1 mark)
- (ii) Diamond and graphite are two allotropes of carbon: graphite conducts electric current while diamond is a non-conductor. Explain (2marks)

**Question Three**

- a. (i) State any 3 postulates of the kinetic theory of gases (3 marks)
- (ii) A sample of helium occupies a volume of  $160 \text{ cm}^3$  at  $100 \text{ kPa}$  and  $25 \text{ }^\circ\text{C}$ . What volume will it occupy if the pressure is adjusted to  $80 \text{ kPa}$  and if the temperature remains unchanged? (2 marks).
- b. (i) Define corrosion (1 mark)
- (ii) Discuss any three types of corrosion that occur on structural material (6 marks)
- c. With relevant examples distinguish between primary and secondary fuels (3 marks)

**Question Four**

- a. State any THREE (3) properties of a good lubricant (3 marks)
- b. Prevention of dampness in a building is achieved by using a suitable damp proofing material. Give any TWO (2) properties of a good damp proofing material. (2 marks).
- c. (i) Explain briefly the manufacture of Portland cement from limestone (4 marks)
- (ii) . Discuss any TWO (2) blends of port-land cement (4 marks)
- d. Give TWO (2) main uses of plaster of Paris in building construction. (2 marks)