(*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: 9TH DECEMBER 2014 **TIME: 2.30PM – 4.30PM**

INSTRUCTIONS:

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

MMUST observes ZERO tolerance to examination cheating

Question One

a. By use of relevant examples where possible define the following terms (4 marks)

i. Atomic number

ii. Isotopes

iii. Electrochemistry

iv. 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)

i. Titanium (Z= 22)

ii. Ca^{2+}(Z=20)

iii. Oxygen (Z=8)

iv. 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

$^{36}_{18}Ar$ (0.34%) $^{38}_{18}Ar$ (0.06%) $^{40}_{18}Ar$ (99.6%)

Question Two

a. (i) Distinguish between an electrolytic cell and a voltaic cell (2 marks).

(ii) Consider the following voltaic cell at 25°C: Zn(s) $|Zn^{2+}(aq)||Cu^{2+}(aq)|Cu(s)$.

{Reduction potentials: $Zn^{2+}(aq) + 2e^- \rightarrow Zn(s)$ (- 0.76 V),

$Cu^{2+}(aq) + 2e^- \rightarrow Cu(s)$ (+0.52 V)}.

a. Identify the anode and the cathode. (1 mark)

b. Write the half reactions that occur at each electrode (2 marks)

c. Write the balanced overall reaction. (1 mark)

d. Calculate the Ecell of this cell. (2 marks)

e. Sketch this cell. (3marks)

f. 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 cm^3 at 100 kPa and 25 ◦C. What volume will it occupy if the pressure is adjusted to 80 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 TW0 (2) blends of port-land cement (4 marks)

d. Give TWO (2) main uses of plaster of Paris in building construction. (2 marks)