

**MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**P.O. Box 972-60200 – Meru-Kenya.**

**Tel: 020-2069349, 061-2309217. 064-30320 Cell phone: +254 712524293, +254 789151411**

**Fax: 064-30321**

**Website:** [**www.must.ac.ke**](http://www.must.ac.ke) **Email:** **info@must.ac.ke**

**University Examinations 2015/2016**

THIRD YEAR, FIRST SEMESTER EXAMINATION FOR BACHELOR OF SCIENCE CHEMISTRY

**SCH 2310: ENVIRONMENTAL CHEMISTRY**

**DATE: NOVEMBER, 2015 TIME:** $2 $**HOURS**

**INSTRUCTIONS:** *Answer question* ***one*** *and any other* ***two*** *questions.*

**QUESTION ONE – (30 MARKS)**

1. (i) Identify at least two major gases present in the primeval atmosphere. (2 Marks)

(ii) By means of chemical equations, justify how water was formed early in the Earth’s history. (4 Marks)

1. Dinitrogen molecule absorbs energy whose wavelength is 126nm and it is split into compound atoms.
2. Write a photochemical equation to show how this process takes place.(2 Marks)
3. If Dinitrogen absorbs 1 mole of photons calculate the amount of energy absorbed for the process in (b) (i) above to take place. (4 Marks)

(h – 6.6 x $10^{-34}$Js, NA = 6.02 x $10^{23}mol^{-1}$) C = 3.0 x$ 10^{8}$m/s

1. Complete the table below by identifying the species represented by the letters A – K

 (10 Marks)

Ore Chemical formula Metal extracted Use of element

Hematite A B C

D Al2O3 E F,G,H

Zinc blende J K Galvanizing

1. Explain the difference between chemical oxygen demand (COD) and Biochemical Oxygen Demand (BOD). (4 Marks)
2. State two ways each to show how nitric oxide (NO) enters into the atmosphere;-
3. Naturally
4. Through anthropogenic activities (4 Marks)

**QUESTION TWO (20 MARKS)**

a) Briefly explain the objectives of the following processes which are applied in MEWASS water supplies treatment. (8 Marks)

1. Aeration
2. Treatment with alum
3. Filtration
4. Chlorination

b) (i) What is the ozone hole, and how is it created? (4 Marks)

 (ii) How does the ozone layer get depleted by hydrogen containing (HOx) species? You may use relevant chemical equations for your explanation. (4 Marks)

c) Why was it necessary for the international community to sign the Montreal protocol of 1987 and the Beijing updates of the same protocol in 1999? (4 Marks)

**QUESTION THREE (20 MARKS)**

a) (i) Explain the meaning of the term eutrophication? (2 Marks)

 (ii) State the chemical species which are responsible for enhancing eutrophication.

(2 Marks)

b) The process of extracting metals from their ores is known as metallurgy. Write chemical equations to represent the following metallurgical processes. (6 Marks)

1. Roasting of galena (Pbs)
2. Reduction of Cu2O(s)
3. Deposition of pure silver from an aqueous solution

c) Iron obtained from a blast furnace is known as pig ion. By use of chemical equations show the reactions that take place during the production of pig iron at the following stages during;-

1. Reduction of iron (III) Oxide
2. Slag formation (for one impurity only)
3. Impurity formation in the iron (one impurity only)

**QUESTION FOUR (20 MARKS)**

a) (i) Differentiate between classical (London) smog and photochemical (Los Angeles ) smog (2 Marks)

 (ii) Outline the conditions for photochemical smog formation to take place. (4 Marks)

(iii) Photochemical smog may be reduced by the use of catalytic converters fitted in the exhaust gas system of a motor vehicle. Show how a three way catalytic converter is used to mitigate the effects of the exhaust fumes of a motor vehicle. (5 Marks)

1. How are the particulate matter removed from the industrial smokestacks? (3 Marks)

b) Explain the meaning of the following;

(i) Pesticide (1 Mark)

(ii) Herbicide (1 Mark)

 DDT is a pesticide that has been lauded by WHO as having saved at least 25 million lives world wide.

(iii) Draw the molecular structure of DDT. (2 Marks)

(iv) DDT has been associated with some problems affecting the environment. Identify the problems associated with the use of DDT. (2 Marks)