



# MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

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## University Examinations 2013/2014

FIRST YEAR, FIRST SEMESTER EXAMINATIONS FOR DIPLOMA IN AGRICULTURE  
AND  
FIRST YEAR, FIRST SEMESTER EXAMINATIONS FOR CERTIFICATE IN  
AGRICULTURE

### CHE 0100: CHEMISTRY

DATE: APRIL 2014

TIME: 1 ½ HOURS

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

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#### Useful Constants

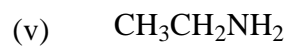
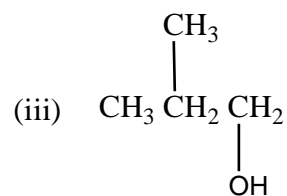
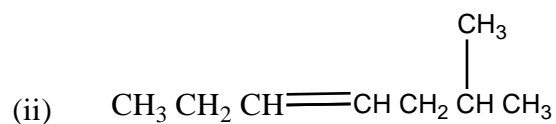
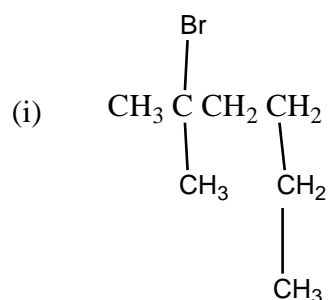
Speed of light in Vacuum,  $3.0 \times 10^8 \text{ m/s}$

Planck's constant,  $6.6262 \times 10^{-34} \text{ Js}$

#### QUESTION ONE – (30 MARKS)

- (a) Define the following terms: (6 Marks)
- Isotope
  - Buffer solution
  - Stoichimetic equation
- (b) Using s,p,d notation, write the electronic configuration for the following atoms. (4 Marks)
- Oxygen (atomic number, 8)
  - Sodium (atomic number, 11)
  - Phosphorous (atomic number 15)
  - Chromium (atomic number, 24)
- (c) Calculate the number of moles present in 4.1g of magnesium hydroxide . ( $Mg = 24, O = 16$  and  $H = 1$ ). (2 Marks)

- (d) State four basic assumptions made in the Dalton's theory. (4 Marks)
- (e) Calculate the  $P^H$  of 0.1M  $H_2SO_4$  solution. (3 Marks)
- (f) What is meant by the term acid according to Lewis Theory? (2 Marks)
- (g) Write the IUPAC names of the following organic compounds. (5 Marks)



- (h) What are P-block elements? (2 Marks)  
(i) State two agricultural uses of calcium oxide. (2 Marks)

**QUESTION TWO – (15 MARKS)**

- (a) Draw the shapes of the following orbitals. (4 Marks)  
(i) 1S – orbital  
(ii) 2P<sub>y</sub> – orbital
- (b) Distinguish between a weak and a strong acid. (4 Marks)
- (c) Explain the following observations  
(i) Melting point of Aluminium is higher than that of Magnesium. (2 Marks)  
(ii) Propane has a higher melting and boiling points than Ethane. (2 Marks)  
(iii) Ethanol is soluble in water. (2 Marks)  
(iv) Ionization energy of sodium is higher than that of Potassium. (1 Mark)

**QUESTION THREE – (15 MARKS)**

- (a) Calculate the  $P^{OH}$  of 0.2M Magnesium hydroxide. (3 Marks)  
(b) Distinguish between electronegativity and electron affinity. (4 Marks)  
(c) A certain electromagnetic radiation absorbs at a wavelength of  $2.0 \times 10^{-4}m$ . Calculate its  
(i) Wave number,  $\lambda^{-1}$  (2 Marks)  
(ii) Frequency in  $H_z$  (3 Marks)  
(iii) Energy in KJ (3 Marks)

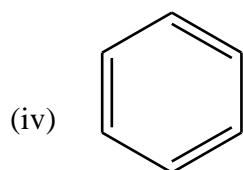
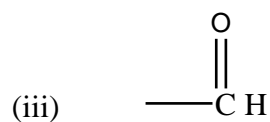
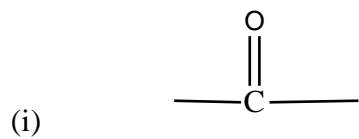
**QUESTION FOUR – (15 MARKS)**

- (a) State four assumptions made in the Bohr atomic model. (4 Marks)  
(b) What is a redox reaction. (1 Mark)  
(c) State four common uses of ethane gas. (4 Marks)  
(d) Discuss any three quantum numbers outlining their significance. (6 Marks)

**QUESTION FIVE – (15 MARKS)**

- (a) What is a functional group. (2 Marks)

(b) Name the functional group represented by the following structures and give an example in each. (8 Marks)



(c) What is a base according to Arrhenius theory. (1 Mark)

(d) Calcium hydroxide is sparingly soluble in water. Write its

(i) Ionic equation in water. (2 Marks)

(ii) Expression for solubility product. (2 Marks)