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University Examinations 2013/2014

FIRST YEAR, FIRST SEMESTER EXAMINATIONS FOR CERTIFICATE IN AGRICULTURE AND FIRST YEAR, FIRST SEMESTER EXAMINATION FOR DIPLOMA IN AGRICULTURAL EDUCATION AND EXTENSION

CHE 0100: CHEMISTRY

DATE: DECEMBER 2013

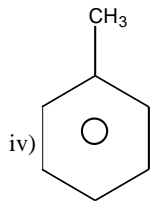
TIME: 1½ HOURS

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

- Speed of light $c = 2.99792 \times 10^8 \text{ms}^{-1}$
- Plancks constant, $h = 6.6262 \times 10^{-34} \text{Js}^{-1}$
- Avogadros constant, $L = 6.023 \times 10^{23}$

QUESTION ONE (30 MARKS)

- Distinguish between mole and molarity. (2 Marks)
- Define the term acid according to Lewis Theory. (2 Marks)
- Outline four basic assumptions made by Bohr on the structure of the atoms. (4 Marks)
- What is meant by the term functional groups as used in organic chemistry? (2 Marks)
- Name the following organic compounds (4 Marks)
 - $\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$
 - $$\begin{array}{c} \text{HO}-\text{CH}_2\text{CHCH}_2-\text{OH} \\ | \\ \text{OH} \end{array}$$
 - $\text{CH}_3\text{CH}_2\text{CH}_2\text{CCH}$



- f) Ionization energy increases from Mg to Al. Explain. (2 Marks)
- g) Define the term electronegativity. (2 Marks)
- h) Calculate the pH of 0.02M H_3PO_4 acid. (4 Marks)
- i) What are isomers? (2 Marks)
- j) The solubility of sodium chloride in water is $7.0 \times 10^{-2} \text{ moles dm}^{-3}$ at 25°C . Calculate the solubility product. (4 Marks)
- k) What are redox reactions? (2 Marks)
- l) State two uses of ethene gas. (2 Marks)

QUESTION TWO (15 MARKS)

- a) Using *s, p, d* notations, write the electronic configuration for the following elements. (6 Marks)
- Boron (atomic number, 5)
 - Fluorine (atomic number, 9)
 - Potassium (atomic number, 19)
 - Iron (atomic number, 26)
 - Copper (atomic number, 29)
 - Chromium (atomic number, 24)
- b) Discuss briefly the Aufbau Principle. (6 Marks)
- c) State three uses of magnesium. (3 Marks)

QUESTION THREE (15 MARKS)

- a) Define the term buffer solution. (2 Marks)
- b) Distinguish between hard and soft acids. (2 Marks)
- c) Explain the properties of the four quantum numbers. (8 Marks)
- d) State three uses of ethanol. (3 Marks)

QUESTION FOUR (15 MARKS)

- a) What is a stoichiometric equation? (2 Marks)
- b) Balance and stabilize the following ionic equation using half-equation method. (7 Marks)
- $$\text{MnO}_4^-(\text{aq}) + \text{Br}^-(\text{aq}) \rightarrow \text{Mn}^{2+}(\text{aq}) + \text{Br}_2(\text{g})$$
- c) Assign the oxidation numbers for the elements in bold. (6 Marks)
- Cl** O_3^-
 - S** O_3^{2-}

- iii. Mn_2O_7
- iv. OsO_4
- v. CO_3^{2-}
- vi. HNO_3

QUESTION FIVE (20 MARKS)

- a) What are the P^H values for the following solutions
- i. $1.0 \times 10^{-3} \text{ moldm}^{-3} HCl$ (3 Marks)
 - ii. $2.3 \times 10^{-2} \text{ moldm}^{-3} H_2SO_4$ (3 Marks)
 - iii. $1.4 \times 10^{-3} \text{ moldm}^{-3} HX$ which is only 50% dissociated. (4 Marks)
(given that K_a of $HX = 2.4 \times 10^2$)
- b) Distinguish between oxidation and reduction in terms of electrons. (2 Marks)
- c) State three basic assumptions made by Dalton on atomic theory. (3 Marks)