FEDERAL UNIVERSITY OF TECHNOLOGY OWERRI
School of Agriculture and Agricultural Technology
Department of Soil Science and Technology
Harmattan semester Examinations 2015/2016

AGR 205: AGRICULTURAL CHEMISTRY
CREDIT UNIT: 3 UNITS
TIME: 3 HOURS
Instruction: Attempt any five questions

1(a) State the difference between
(i) Atoms and isotopes (ii) Atomic number and Atomic mass (iii) Orbitals and Energy levels (iv) Electron configuration and Electronegativity

(b) A neutral atom in the 4th energy level has 10 neutrons. Determine (i) Maximum number of electrons (ii)Number of protons (iii) Atomic number (iv) mass number (v) Electron configuration and Electronegativity

2(ai)What is an ion and outline the characteristic features (ii)With structures only differentiate triple from coordinate covalent bond (iii)Polar is polar covalent bond and state condition of its existence (iv) State the conditions (polar, non-polar, ionic and covalent) of these compounds: NaCl, HBr , MgO and H_2 if the electronegativity values are Na=0.9, Cl=3.0, H=2.1, Br=2.8, Mg=1.2, and O=3.5.

(bi) State factors that affect rates of chemical reactions and hence the rate constant of the following reactions

$5NO_2(g) \longrightarrow 2NO(g) + O_2(g)$

$CH_4(g) + O_2 \longrightarrow CO_2(g) + 2H_2O(g)$

(ii) Determine the Keq of $2NO(g) + O_2 \rightleftharpoons 2NO_2(g)$ if $[NO_2]$ =6.5 M, [NO]=2.1M and $[O_2]$ =1.3 M

(iii) Concentration of H+ and $C_2H_3O_2$ for the dissociation of 0.05M acetic acid solution at 25°C if Ka = 1.8 x10^{-5}

3(a)What do you understand by the term oxidation-reduction reaction

(b) Given a reaction $Cr_2O^{2-}{}_7(aq) + Fe^{2+}(aq) \longrightarrow Cr^{3+}(aq) + Fe^{3+}(aq)$ indicate the oxidation and reduction halfs of the reaction

(c) State any four applications of oxidation and reduction in biochemical and industrial manufacturing process

(d) Balance the following redox equation for an acidic reaction: $CrO^{2-}{}_7(aq) + HNO_2(aq) \longrightarrow Cr^{3+}(aq) + NO_3(aq)$

4 Write short note on the following
(a) Atomic structure (b) chemical bonding of atoms (c) Atomic radius (d)Ionization energy (e)Electron affinity

5(a) What is an alcohol and explain its solubility in relation to the hydrophobic and hydrophilic properties

(b)Write the IUPAC names and structural formulae of the following compounds

(i)$CH_3CBr_2CH_2CH_2CHCH_2OH$

(ii)$CH_3CH{=}CHCH_2CHCH_3$

(iii)$CH_3CH_2\text{-}C{\equiv}C\text{-}CH_2CHCH_2CH_3$

(iv) 2,6- dimethyl-3-heptene

(v) 2 Buten-1, 4-diol

(c)Explain five industrial uses of phenol.

6(a) What are hydrocarbons and using appropriate examples distinguish saturated from unsaturated hydrocarbons

(b)With requisite examples, explain the term isomerism.

(c)Define the term phenols and show three possible reactions of phenol with metals or organic compounds

Note: At wt of Al = 27, H = 1, Ca = 40, Mg = 24, Na = 23 and K = 39

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SCHOOL OF AGRICULTURE AND AGRICULTURAL TECHNOLOGY
DEPARTMENT OF SOIL SCIENCE AND TECHNOLOGY

2018/2019 Harmattan Semester EXAMINATION
Course code: AGR 205
Course Title: AGRICULTURAL CHEMISTRY
Time: 2hrs, 30mins
Instruction: Answer four (4) questions. All questions carry equal marks

Question 1a. Define oxidation and reduction reaction in terms of electron transfer using appropriate chemical equation
1b. Differentiate between thermodynamics and kinetics with respect to reaction rate
1c. What is tyndall effect?

2a. (i) Define chemical bond (ii) State the octet rule (iii) explain these terms: **Electrovalent** or **ionic bonding and covalent bonding**
2b. Complete the following equation involving alkaline metals and alkaline earth metals

(i) $2Na_{(s)} + 2H_2O_{(l)} \longrightarrow ?$ (ii) $2K_{(s)} + 2H_2O_{(l)} \longrightarrow ?$

(iii) $Mg_{(s)} + H_2O_{(g)} \longrightarrow ?$ (iv) $Ca_{(s)} + H_2O_{(l)} \longrightarrow ?$

3a. Give the correct IUPAC names of the following organic compounds

(i) $CH_3CH_2-C\equiv C-CH_2-CH-CH_2CH_3$ (with CH_3 on the CH)

(ii) $CH_3CH=CHCH_2CHCH_3$ (with CH_3 on the CH)

(iii) $CH_3-CH_2-CH-CH_2-CH_3$ (with CH_3 on the CH)

3b. Write the structural formula of the following compounds
(i) 2,2,3,3-tetramethyl butane (ii) 2,6-dimethyl-3-heptene
3c. Show reaction of two molecules of Bromine with (i) Alkyne (ii) Alkane

4a. Write the structures of the following (i) methyl-ethanoate (ii) Isopropyl butanoate (iii) 3,4,4 trimethyl pentanoic acids
4b. Draw the functional group of the following (i) Amides (ii) Carboxylic acids (iii) Esters

5a. Carefully describe the basic differences between an Aldehyde and a ketone.
5b. With appropriate diagram, briefly define the term "Bromination". What is the end product of this reaction?

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2019/2020 Harmattan Semester EXAMINATION
Course code: AGR 205
Course Title: AGRICULTURAL CHEMISTRY
Time: 2hrs, 30mins DATE OF EXAM: 12/03/21
Instruction: Answer question one (1) and any other four (4) questions

1a. Assuming the concentration of H^+ of a soil sample is $6.5x10^{-5}$, Calculate the pH the soil. (Take $\log 6.5 = 0.813$; $\log 5 = 0.699$)
1b. What is the difference between thermodynamics and kinetics
1c. In the formation of Fe from Fe (iii) oxide as shown below;

$$Fe_2O_3(s) + 3C(s) \longrightarrow 3Fe(s) + 3CO_2(g)$$

Name the oxidizing and reducing agent in the above equation

2a. State five factors thatinfluence reaction rate
2b. Explain the following terms with examples (i) Sol (ii) Emusion (iii) Aerosol
2c. What is tyndall effect?

3(a). What are hydrocarbons? Using requisite illustrations distinguish between saturated from unsaturated hydrocarbons
3b. Define the term isomerism and with relevant examples explain geometrical isomerism.
Write the structural formulae for the following compounds: (i). 2,2dimethyl butane (ii). 5-Methyl-2-hexene (iii) 6- Methyl-3-Octyne (iv) 2,6-dimethyl-3-heptene.

4(a) The simplest aliphatic ketone has the common name of ----------
(b) A ketone in which the carbonyl group is attached to a benzene ring is named a ---------
(c) Name five (5) common names of aldehydes that are derived from the names of the corresponding carboxylic acids by replacing 'ic" acid with structures.
(d). Aldehydes are compounds of the general formula ---------
(e) Both Aldehydes and Ketones contain the carbonyl group ---------- and are often referred to collectively as ----------
(f) State the structures of Aldehydes and ketones

5a. Define acid and base according to the following scientists with suitable equation (i) Arrhenius (ii) Gilbert Lewis
5b.Explain how acid sulphate soils affect environmental values

6a. State the modern periodic law
6b. Define atomic number
6c Complete the following equations involving alkaline metals and alkaline earth metals

(i) $2Na(s) + H_2O(l) \longrightarrow$? (ii) $K_2O(s) + H_2O(l) \longrightarrow$? (iii) $2NaNO_3(s) \xrightarrow{\text{heated}}$?

(iv) $Mg(s) + H_2O(l) \longrightarrow$? (v) $Ca(NO_3)_2(s) \xrightarrow{\text{heated}}$? (vi) $Mg(CO_3)_2(s) \xrightarrow{\text{heated}}$?