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University Examinations 2012/2013

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

CHE 0100: CHEMISTRY

DATE: AUGUST 2012 **TIME: 1½HOURS**

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

QUESTION ONE – (30 MARKS)

a) Write the electronic configuration of the following elements using the inert gas core notation. (4 Marks)
   i. Magnesium (mg)(12)
   ii. Fluorine (f) (9)
   iii. Phosphorous (p) (15)
   iv. Borun (B) (5)

b) State four postulates of Dalton's particle theory. (4 Marks)

c) State problems with Dalton's Atomic Theory. (3 Marks)

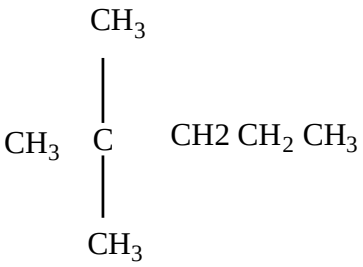
d) Differentiate between oxidation and reduction reactions. (2 Marks)

e) 420g of a compound of iron with sulphur only contained 224g of sulphur. Calculate the emphirical formula of this compound. (3 Marks)

f) State which reactant is oxidized in each of the following reactions and in each case give a reason. (4 Marks)
   i. $2H_2S + SO_2 \longrightarrow 2H_2O + 3S$
   ii. $2FeCl_2 + Cl_2 \longrightarrow 2FeCl_3$
   iii. $SO_2 + H_2O + NaClO \longrightarrow NaCl + H_2SO_4$
   iv. $2K + 2H_2O \longrightarrow 2KOH + H_2$

g) Name the following compounds using the IUPAC system . (4 Marks)

i)



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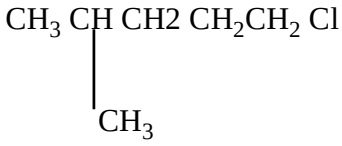

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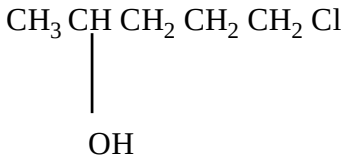

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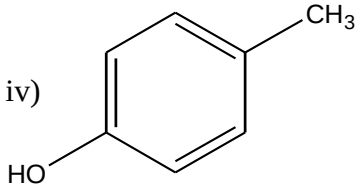

h) i) What are the structural isomers. (1 Mark)
ii) An organic compound has molecular formula $C_5H_{11}Cl$. Write and give names of all possible structural isomers of this compound. (5 Marks)

QUESTION TWO (15 MARKS)

a) Define a buffer solution. (1 Mark)
b) What characteristics properties do buffered solution possess? (2 Marks)
c) Differentiate between a strong acid and a weak acid. (2 Marks)
d) Calculate $[H^+]$ or $[OH]^-$ as required for each of the following solutions at 25°C and state whether the solution is neutral, acidic or basic. (4 Marks)

i. 1.0×10^{-5}M OH^-

ii. 10.0M H^+

e) Calculate the PH value for each of the following solutions at 25°C . (4 Marks)

i. A solution in which $[H^+] = 1.0 \times 10^{-9}$M

ii. A solution in which $[OH]^- = 1.0 \times 10^{-6}$M

f) Calculate the PH and POH for each of the following solution at 25°C. (2 Marks)

i. 1.0×10^{-3}M OH^-

QUESTION THREE (15 MARKS)

a) Write the balanced equation describing the reaction for dissolving each of the following solid in water. Also write the Ksp expression for each solid. (6 Marks)

i. $PbCl_{2\ (s)}$

ii. $Ag_2CrO_{4(s)}$

iii. $Bi_2S_{3(s)}$

b) The Ksp value for solid $AgI_{(s)}$ is 1.5×10^{-6} at $25°C$. Calculate the solubility of AgI in water at $25°C$. (4 Marks)

c) Copper (I) bromide, CuBr has a measured solubility of $2.0 \times 10^{-4} mol/L$ at $25°C$. That is, when excess $CuBr_{(s)}$ is placed in 1.0L of water we can determine that 2.0×10^{-4} mole of the solid dissolves to produce a saturated solution. Calculate the solid Ksp value. (5 Marks)

QUESTION FOUR (15 MARKS)

a) Complete the equation to show the product of the following reactions. (10 Marks)

i) $CH_3+Cl_2 \xrightarrow{hv}$

ii) $CH_2 \!=\!= CH_2+H_2O \xrightarrow[\text{Catalyst}]{\text{Acid}}$

iii) $CH_3OH+H_3C-\overset{\overset{O}{\|}}{C}-OH \xrightarrow[\text{warm}]{\text{conc. } H_2SO_4}$

iv) $CH_3CH_2OH+2[O] \xrightarrow{H_2SO_4}$

v) $CH_3CH_2OH \xrightarrow{KMnO_4\ (aq)}$

b) Give the structure of the following compounds (5 Marks)
   i. 2,2 – dimethyl butane
   ii. Enthyl amine
   iii. 2,3 – diethyl benzene
   iv. 2 – bromo hexanol
   v. 1 – bromo, 3 – chloro benzene

QUESTION FIVE (15 MARKS)

a) Briefly explain why
   i. The sizes of atoms decrease from the left to the right across any given period in the periodic table of elements. (3 Marks)
   ii. The sizes of atoms increases on desconding any group in the periodic table of elements. (2 Marks)

b) Differentiate between 1^{st} ionization energy and 2^{nd} ionization energy using magnesium as an example. (2 Marks)

c) Briefly explain how the first ionization potential would change from lithium to calcium. (2 Marks)

d) Identify the factors that influence the magnitude on the ionization potential. (4 Marks)

e) Differentiate between covalent bond and ionic bond. (2 Marks)