1st SEMESTER: 2011/2012

UNIVERSITY OF SWAZILAND

FINAL EXAMINATION PAPER

PROGRAMME : B.Sc. IN AGRONOMY YEAR 1
B.Sc. IN HORTICULTURE YEAR 1
B.Sc. IN AGRICULTURAL ECONOMICS AND AGRIBUSINESS MANAGEMENT YEAR 1
B.Sc. IN AGRICULTURAL AND BIOSYSTEMS ENGINEERING YEAR 1
B.Sc. IN ANIMAL SCIENCE YEAR 1
B.Sc. IN CONSUMER SCIENCE YEAR 1
B.Sc. IN CONSUMER SCIENCE EDUCATION YEAR 1
B.Sc. IN FOOD SCIENCE, NUTRITION AND TECHNOLOGY YEAR 1
B.Sc. IN TEXTILE AND APPAREL DESIGN AND MANAGEMENT YEAR 1
B.Sc. IN AGRICULTURAL EDUCATION YEAR 1

COURSE CODE: CP 101

TITLE OF PAPER: INTRODUCTORY CHEMISTRY

SECTION:1 INORGANIC CHEMISTRY
SECTION:2 ORGANIC CHEMISTRY

TIME ALLOWED: TWO [2] HOURS

INSTRUCTIONS: ANSWER FOUR [4] QUESTIONS, TWO [2] QUESTIONS FROM EACH SECTION.

NOTE: THIS PAPER CONTAINS SEVEN [7] PAGES INCLUDING THE COVER PAGE.

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SECTION : 1 INORGANIC CHEMISTRY

QUESTION 1

(a) Define and/or give brief descriptions of the following terms and phrases. Each answer carries two [2] marks.

(i) Freezing point
(ii) An electron
(iii) A neutron
(iv) Gas
(v) An ionic compound
(vi) Inorganic chemistry
(vii) liquid
(viii) Exhothermic reaction
(ix) Proton
(x) A subshell

[20]

(b) Calculate the percent elemental composition of dolomite [$CaMg(CO_3)_2$] given the atomic masses of the following elements:

Ca = 40.0800	amu
O = 15.9994	amu
Mg = 24.305	amu
C = 12.305	amu

Your final answers should be expressed to two [2] decimal places. [5]

25]

QUESTION 2

(a) Determine the mass of two atoms of $^{238}_{92}U$ (Uranium) in grams given that the mass of the isotope is 238.050784 amu and that Avogadros' number is equal to 6.022045×10^{23} atoms per mole.
Show all calculations and express your final answer to four [4] decimal places.

[10]

(b) Calculate the atomic mass of magnesium given the abundances and masses of its naturally occurring isotopes. Show all calculations and do not round off your final answer.

Isotope	Abundance (%)		Mass (amu)
$^{24}_{12}Mg$	77.89	→	23.985042
$^{25}_{12}Mg$	10.10	→	24.985837
$^{26}_{12}Mg$	12.01	→	25.982593

[10]

(c) Calculate the formula mass of orthoclase feldspar [$KAlSi_3O_8$] by using the following information:

K = 39.0983 amu (atomic mass)
Al = 26.9815 amu (atomic mass)
Si_3 = 84.3566 g (molecular mass)
O_2 = 31.9988 g (molecular mass) [5]

[25]

QUESTION 3

(a) How many atoms of hematite [Fe_2O_3] are there if it has a mass of 12.01 grams, given the molecular masses of:

Fe_2 = 111.694 g
O_3 = 47.9983 g and
Avogadro's number = 6.022045 X 10^{23} atoms per mole

[10]

(b) Briefly explain how you would practically make a 1 N H_2SO_4 from a 8 M H_2SO_4 stock solution (using water as a solvent) in the laboratory. Clearly show your calculations. Atomic masses: H = 1.00794 amu. S = 32.06 amu. O = 15.9994 amu. [15]

[25]

SECTION 2 : ORGANIC CHEMISTRY

QUESTION 4

(a) Define or briefly describe the following terms and phrases. Use a structural formula where necessary . Each answer carries two [2] marks.

(i) Unsaturated hydrocarbon
(ii) Hydrocarbon
(iii) A phenol
(iv) An alkyne
(v) An electrophile
(vi) Meta directing group
(vii) Protein
(viii) An alkane
(ix) An alcohol
(x) An alkene [20]

(b) Write the molecular formula of an alkane containing eleven [11] carbon atoms

[2]

(c) Determine the molecular formula of an alkene that contains twenty four [24] hydrogen atoms

[2]

(d) What is the molecular formula of an alkyne that has Six [6] carbon atoms.

[1]

[25]

QUESTION 5

(a) Write the IUPAC names of the following compounds. Each answer carries two [2] marks.

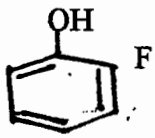
(i) $CH_3\text{-}CH_2\text{-}CH_2\text{-}CH_2\text{-}CH(CH_2\text{-}CH_3)\text{-}CH_3$

(ii) $CH_3\text{-}CH_2\text{-}CH(CH_2\text{-}CH_2\text{-}CH_3)\text{-}CH_2\text{-}CH_2\text{-}CH_2$

(iii) $CH_3\text{-}CH_2\text{-}\underset{\underset{I}{|}}{CH}\ -\ \underset{\underset{F}{|}}{CH}\text{-}CH_3$

(iv) $CH_3 - CH = \underset{\underset{CH_3}{|}}{C} - \underset{\underset{OH}{|}}{CH} - CH_2 - CH_3$

(v) $CH{\equiv}C - CH_2 - CH_3$

(vi) 

(vii) $CH_3 - CH = CH - \underset{\underset{I}{|}}{CH} - CH_3$

(viii) $CH_3 - CH_2 - CH_2 - \underset{\underset{O}{\|}}{C} - O - CH_3$

(ix) $CH_3 - CH_2 - \underset{\underset{O - CH_3}{|}}{CH} - CH_3$

(x) $CH_3 - \underset{\underset{O}{\|}}{C} - H$

[20]

(b) Write **condensed** IUPAC **structural** formulae for the following compounds. Each answer carries one [1] mark.

(i) 2 - chloro - 1 - heptanol
(ii) 2 - iodo - 4 - flouroheptane
(iii) Ethoxycyclohexene
(iv) 2 - pentyne
(v) Hexanone

[25]

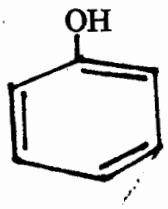
QUESTION 6

(a) Copy,complete and balance the following equations. Each answer carries one [1] mark.

(i) $CH_3 - CH_3 \quad + \quad F_2 \quad =$

(ii) $CH_2F_2 \quad + \quad F_2 \quad =$

(iii) + I_2 =

(iv)  + HNO_3 =

(v) $CH_3CH{=}CH_2$ + HCl =

(vi) $CH_2{=}CH_2$ + Br_2 =

(vii) $CH_2{=}CH_2$ + $3O_2$ =

(viii) $CH_3CH_2CH_2CH{=}CH_2$ + HBr =

(ix) $CH_3CH_2CH_2OH$ + HI =

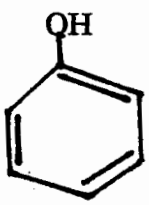
(x) $CH_3 - \underset{\underset{O}{\|}}{C} - CH_3$ + HCN =

(xi) CH_4 + $2O_2$ =

(xii) $R - \overset{\overset{R}{|}}{\underset{\underset{R}{|}}{C}} - OH$ + [O] =

(xiii) $CH_3 - CH_2\,OH$ + $3O_2$ =

(xiv) CH_4 + Cl_2 =

(xv)  + H_2SO_4 =

[15]

(b) Write correct condensed structural formulae of the incorrectly written condensed ones for the following compounds. Each answer carries two[2] marks.

(i) Propane ≠ CH_3-CH_3-CH_4

(ii) Propanal ≠ CH_3-CH_2-CH_2

(iii) Pentanol ≠ CH_3-CH_3-CH(=O)-CH(OH)-CH_2

(iv) Methoxypentene ≠ CH_3-O-CH_2-CH=CH-CH-CH_2

(v) Hexanone ≠ CH_3CH-CH_3-CH-C(=O)-CH_3

[10]

[25]