1st SEMESTER 2013/2014

THE UNIVERSITY OF SWAZILAND

FINAL EXAMINATION PAPER

PROGRAMMES: B.Sc. IN AGRICULTURAL AND BIOSYSTEMS ENGINEERING YEAR 1
B.Sc. IN AGRICULTURAL ECONOMICS AND AGRIBUSINESS MANAGEMENT YEAR 1
B.Sc. IN AGRICULTURAL EDUCATION AND EXTENSION YEAR 1
B.Sc. IN AGRONOMY YEAR 1
B.Sc. IN ANIMAL SCIENCE DAIRY OPTION YEAR 1
B.Sc. IN ANIMAL SCIENCE YEAR 1
B.Sc. IN CONSUMER SCIENCES YEAR 1
B.Sc. IN CONSUMER SCIENCES EDUCATION YEAR 1
B.Sc. IN FOOD SCIENCE, NUTRITION AND TECHNOLOGY YEAR 1
B.Sc. IN HORTICULTURE YEAR 1
B.Sc. IN TEXTILE AND APPAREL DESIGN AND MANAGEMENT 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 WITH TWO [2] QUESTIONS FROM EACH SECTION

NOTE: THIS PAPER CONTAINS SIX [6] PAGES INCLUDING THE COVER PAGE

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SECTION: 1 INORGANIC CHEMISTRY

QUESTION 1

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

i) A subshell
ii) An atom
iii) An electron
iv) A strong acid
v) An acid
vi) An isotope
vii) A proton
viii) A mixture
ix) An endothermic reaction
x) Inorganic chemistry

[20]

(b) Calculate the equivalent mass of Magnesium hydroxide [$Mg(OH)_2$] given the following information: Mg = 24.305 amu; O = 15.9994 amu ; H = 1.007 amu.

[5]

[25]

QUESTION 2

(a) Use the product rule to calculate the pH values of the following concentrations:

i) 0.001M [5]

ii) $1 * 10^{-2}$ M [5]

(b) Calculate the percent element composition of the mineral mascagnite [$(NH_4)_2SO_4$] given the atomic masses of the following elements. N =14.0067 amu; H = 1.007 amu; S = 32.06 amu; O = 15.9994 amu. [15]

[25]

QUESTION 3

(a) Find the formula mass of the mineral celsian [$BaAl_2Si_2O_8$] given the following information. Ba = 137.53 amu; Al = 26.9815 amu; Si = 28.00855 amu; O = 15.9994 amu

[10]

(b) Calculate the atomic mass of magnesium [Mg] given the masses and the abundances of its naturally occurring isotopes below. All calculations should be shown and the final answer given to five [5] decimal places.

ISOTOPE	ABUNDANCES (%)	MASSES (AMU)
$^{24}_{12}Mg$	78.99	23.985042
$^{25}_{12}Mg$	10.00	24.985837
$^{26}_{12}Mg$	11.01	25.982598

[15]

[25]

SECTION 2 : ORGANIC CHEMISTRY

QUESTION 4

(a) Give brief descriptions of the following terms and phrases. Include a structural formula where possible. Each answer carries two [2] marks.

(i) An alkane

(ii) An alkyne

(iii) An alkene

(iv) A saturated hydrocarbon

(v) An hydrocarbon

(vi) An ether

(vii) An electrophile

(viii) A phenol

(ix) Halogenation

(x) An alcohol

[20]

(b) Use the correct formula to determine the molecular formulae of the following statements.

(i) An alkane that has eight [8] carbon atoms

(ii) An alkane that has twelve [12] hydrogen atoms

(iii) An alkene that has eight [8] carbon atoms

(iv) An alkane that has twenty four hydrogen atoms

(v) A cycloalkane that has six *[6]* carbon atoms.

[5]

[25]

QUESTION 5

(a) Give the **IUPEC** names to each of the following compounds. Each answer carries two [2] marks

(i) $CH_3 - \underset{\displaystyle CH_3 - CH_2 - CH_3}{\underset{|}{CH}}$

(ii) $CH_3 - CH_2 - \underset{\displaystyle CH_2 - CH_2 - CH_2 - CH_2 - CH_3}{\underset{|}{CH}} - CH_3$

(iii) $CH_3 - \underset{\displaystyle CH_3 - CH_2}{\underset{|}{CH}} - CH_2 - \underset{\displaystyle CH_2 - CH_3}{\underset{|}{CH}} - CH_2 - CH_2 - CH_3$

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

(v) $CH_3 - CH_2 - CH = CH - CH_2 - CH = CH - CH_3$

(vi) $CH_3 - CH_2 - CH_2 - CH_2 - CH_2 - CH_2 - OH$

(vii) $CH_3 - CH_2 - \underset{\displaystyle Br}{\underset{|}{CH}} - \underset{\displaystyle Cl}{\underset{|}{CH}} - CH_3$

(viii) $CH_3 - CH_2 - \underset{\displaystyle OH}{\underset{|}{CH}} - CH_2 - CH_3$

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

(x) $CH_3 - CH_2 - O - CH_2 - CH_2 - CH_3$

[20]

(a) The reaction between an unsymmetrical alkene and an unsymmetrical reagent such as an hydrogen halide gives two products of different quantities. State a rule which indicates the route that is followed by the electrophile in order to favor one of the products. Include an equation in order to illustrate the rule.

[5]

[25]

QUESTION 6

(a) Write **condensed IUPAC structural formulae** for each of the following named compounds. Each answer carries two [2] markes.

(i) 3 - Chloro - 2- octanol

(ii) 2 - methyl - 3 - hexane

(iii) 2 - bromo - 3 - heptane

(iv) 2,2 - dibromohexane

(v) Cyclopentane

[10]

(b) Copy and complete the following equations or only supply the required half equation. Each answer carries three [3] marks.

(i) $CH_3 - CH_2 - CH_3 + Cl_2$ =

(ii) $CH_4 + F_2$ =

(iii) $CH_2 = CH_2 + I_2$ =

(iv) $CH_4 + O_2$ =

(v) $CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle |}{CH}} - CH_2 - CH_3 + Br_2$ =

[15]

[25]