SUPPLEMENTARY 2010/2011

THE UNIVERSITY OF SWAZILAND

SUPPLEMENTARY EXAMINATION PAPER

PROGRAMMES: 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 SCIENCES EDUCATION YEAR 1
B.Sc. IN FOOD SCIENCE, NUTRITION AND TECHNOLOGY YEAR 1
B.Sc. IN CONSUMER SCIENCES YEAR 1
B.Sc. IN TEXTILE AND APPAREL DESIGN AND MANAGEMENT YEAR 1
B.Sc. IN AGRICULTURAL EDUCATION AND EXTENSION YEAR 1

COURSE CODE: CP 101

TITLE OF PAPER : INTRODUCTORY CHEMISTRY
SECTION 1 : INORGANIC CHEMISTRY
SECTION 2 : ORGANIC CHEMISTRY

TIME ALLOWED: TWO [2] HOURS

INSTRUCTION: 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 carries two [2] marks.

(i) An acid

(ii) An electron

(iii) A shell

(iv) An atom

(v) An isotope

(vi) A proton

(vii) A compound

(viii) A subshell

(ix) A molecular formula

(x) An endothermic reaction.

[20]

(b) Given the following information: Atomic masses : Mg = 24.305 amu; O_2 = 15.9994 amu; H_2 = 1.007 amu; Calculate the equivalent mass of magnesium hydroxide [$Mg(OH)_2$].

[5]

[25]

QUESTION 2

(a) Determine the atomic mass of magnesium given the following abundances and masses of its naturally occurring isotopes. Show all calculations and express your answer to five 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	25.982593

[15]

(b) Calculate the formula mass of the mineral Mascagnite [$(NH_4)_2SO_4$], given the atomic masses of the following elements. O = 15.9994 amu. N = 14.0067 amu. H = 1.007 amu. S = 32.06 amu. [10]

[25]

QUESTION 3

(a) Find the percent element composition of the mineral Celsian [$BaAl_2Si_2O_8$] by using the following information. Ba = 137.53 amu. Al = 26.9815 O = 15,9994 amu. Si = 28.00855 amu.

[15]

(b) By using the Product Rule, determine the pH values at the following concentrations.

(i) 0.001 M [5]

(ii) $2.0 * 10^{-2}$ M [5]

[25]

SECTION 2 : ORGANIC CHEMISTRY

QUESTION 4.

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

(i) An hydrocarbon

(ii) An alkene

(iii) An alkane

(iv) An alkyne

(v) A saturated hydrocarbon

(vi) An ether

(vii) An organohalogen

(viii) A phenol

(ix) A nucleophile

(x) An addition reaction.

[20]

(b) Determine the molecular formulae of the following statements:

(i) An alkane that has seven [7] carbon atoms.

(ii) An alkane that has six [6] hydrogen atoms.

(iii) An alkene that has six [6] carbon atoms.

(iv) An alkene that has a total of twenty four hydrogen [24] atoms

(v) A cycloalkane that has a total of 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) $CH_3 - \underset{\displaystyle CH_3 - CH - CH_2 - CH_2 - CH_2 - CH_3}{\overset{\displaystyle CH_2}{|}}$

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

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

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

(v) $CH_3 - C \equiv C - CH_2 - CH_2 - CH_3$

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

(vii) $CH_3 - CH_2 - CH_2 - \underset{\displaystyle OH}{\overset{\displaystyle CH_2}{|}}$

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

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

(x) $CH_3 - CH_2 - O - CH_2 - CH_2 - CH_3$ [20]

(b) The reaction between an unsymmetrical alkene and an unsymmetrical reagent like an hydrogen halide gives two products of different quantities. State a rule that specifies the route followed by the electrophile so that one product is favored. Include an equation to illustrate the rule [5]

[25]

QUESTION 6

(a) Write **condensed IUPEC structural** formulae for the following named compounds. Each answer carries two [2] marks.

(i) 2 - bromo - 2 - heptanol

(ii) 3 - methyl- 2 -pentyne

(iii) 3 - iodo- 4 - heptanol

(iv) 1 , 1 - dichloropethane

(v) Cyclohexane

[10]

(b) Either copy and complete the following equations or just provide the required answers only. Each answer carries three [3] marks.

(i) $CH_3 - \underset{\displaystyle CH_3}{\overset{}{CH}} - CH_2 - CH_3 + Cl_2 =$

(ii) $CH_4 + Cl_2 =$

(iii) $CH_4 + O_2 + \text{spark} =$

(iv) $CH_2 = CH_2 + Br_2 =$

(v) $CH_3 - \underset{\displaystyle CH_3}{\overset{\displaystyle CH_3}{C}} - OH + [O] =$

[15]

[25]