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 ANIMAL SCIENCE DAIRY OPTION 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)   A solid
(iii)   A neutron
(iv)   Gas
(v)   An ionic compound
(vi)   Inorganic chemistry
(vii)   A liquid
(viii) An electron
(ix)   A proton
(x)   A shell

[20]

(b)   Calculate the percent elemental composition of calcite [$CaCO_3$] given the atomic masses of the following elements:

$Ca = 40.0800$ amu
$O = 15.9994$ 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 three [3] 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. <u>Show all calculations and do not round off your final answer.</u>

Isotope	Abundance (%)		Mass (amu)
$^{24}_{12}Mg$	77.89	→	23.985042
$^{25}_{12}Mg$	9.10	→	24.985837
$^{26}_{12}Mg$	13.01	→	25.982593

[10]

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

$$K = 39.0983 \text{ amu} \quad \text{(atomic mass)}$$
$$Al = 26.9815 \text{ amu} \quad \text{(atomic mass)}$$
$$Si_3 = 84.3566 \text{ g} \quad \text{(molecular mass)}$$
$$O_2 = 31.9988 \text{ g} \quad \text{(molecular mass)} \quad [5]$$

[25]

QUESTION 3

(a)   How many atoms of hematite [Fe_2O_3] are there if it has a mass of 20.01 grams, given the atomic masses of :

$$Fe = 55.647 \text{ amu}$$
$$O = 15.9994 \text{ amu and}$$
$$\text{Avogadro's number} = 6.022045 \times 10^{23} \text{ atoms per mole}$$

[10]

(b)   Briefly explain how you would practically make a 1 N H_2SO_4 from an 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)   A saturated hydrocarbon
(ii)   Hydrocarbon
(iii)   An alcohol
(iv)   An alkyne
(v)   An electrophile
(vi)   An ortho - directing group
(vii)   Protein
(viii) An alkene
(ix)   A phenol
(x)   An alkane   [20]

(b) Write the molecular formula of an alkane containing twelve [120] 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 eight [8] carbon atoms.
[1]

[25]

QUESTION 5

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

(i) $CH_3 - CH_2 - CH_2 - CH_2 - CH_2 - CH_3$
                        $CH_2 - CH_2 - CH_3$

(ii) $CH_3 - CH_2 - CH - CH_2 - CH_2 - CH_3$
                   $CH_2 - CH_2 - CH_2 - CH_3$