



1ST SEM. 2006/2007

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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 LAND AND WATER MANAGEMENT YEAR 1
B.Sc. IN ANIMAL SCIENCE YEAR 1
B.Sc. IN HOME ECONOMICS YEAR 1
B.Sc. IN HOME ECONOMICS 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 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) Solid
 - (v) An ionic compound
 - (vi) Inorganic chemistry
 - (vii) liquid
 - (viii) Endothermic reaction
 - (ix) A strong acid
 - (x) A shell

[20]

- (b) Calculate the percent elemental composition of dolomite [$\text{CaMg}(\text{CO}_3)_2$] 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 $^{238}_{92}\text{U}$ (Uranium) in grams given that the mass of the isotope is 238.050784 amu and that Avogadro's 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.

<u>Isotope</u>	<u>Abundance (%)</u>		<u>Mass (amu)</u>
${}_{12}^{24}\text{Mg}$	77.89	→	23.985042
${}_{12}^{25}\text{Mg}$	10.10	→	24.985837
${}_{12}^{26}\text{Mg}$	12.00	→	25.982593

[10]

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

$$\begin{aligned} \text{K} &= 39.0983 \text{ amu} \quad (\text{atomic mass}) \\ \text{Al} &= 26.9815 \text{ amu} \quad (\text{atomic mass}) \\ \text{Si}_3 &= 84.3566 \text{ g} \quad (\text{molecular mass}) \\ \text{O}_8 &= 31.9988 \text{ g} \quad (\text{molecular mass}) \end{aligned} \quad \begin{array}{l} [5] \\ [25] \end{array}$$

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:

$$\begin{aligned} \text{Fe}_2 &= 111.694 \text{ g} \\ \text{O}_3 &= 47.9983 \text{ g and} \\ \text{Avogadro's number} &= 6.022045 \times 10^{23} \text{ atoms per mole} \end{aligned}$$

[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) Essential amino acids
- (v) An electrophile
- (vi) Para 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.

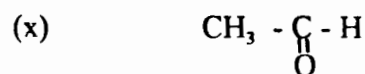
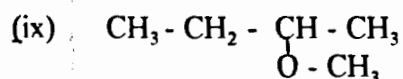
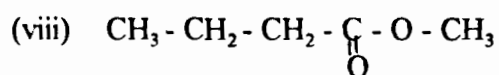
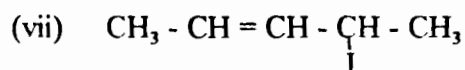
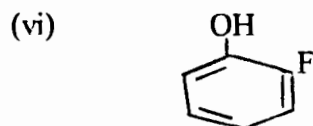
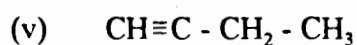
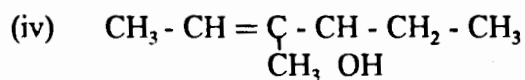
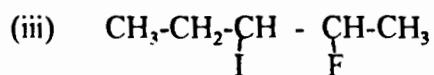
[1]

[25]

QUESTION 5

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

- (i) $\text{CH}_3\text{-CH}_2\text{-CH}_2\text{-CH}_2\text{-CH-CH}_3$
- (ii) $\text{CH}_2\text{-CH}_3$
- (iii) $\text{CH}_3\text{-CH}_2\text{-CH-CH}_2\text{-CH}_2\text{-CH}_2$
 $\text{CH}_2\text{-CH}_2\text{-CH}_3$



[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 - heptinal

(iii) Ethoxycyclohexene

(iv) 2 - pentyne

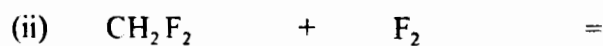
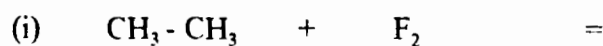
(v) Hexanone

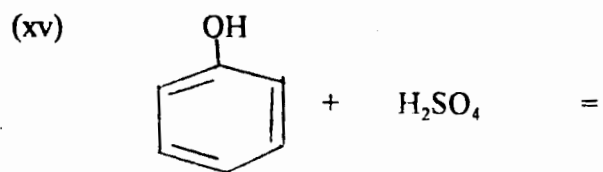
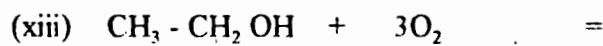
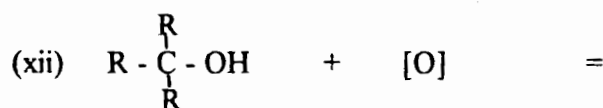
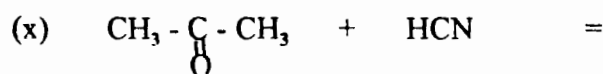
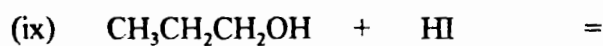
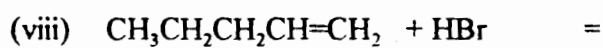
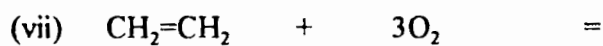
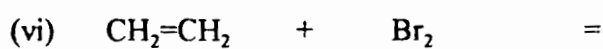
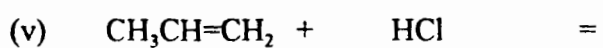
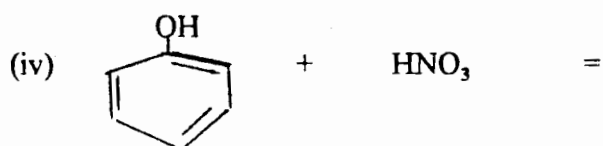
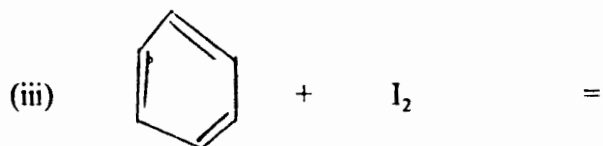
(vi)

[25]

QUESTION 6

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





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

(i) Propane \neq $\text{CH}_3\text{-CH}_3\text{-CH}_4$

(ii) Propanal \neq $\text{CH}_3\text{-CH}_2\text{-CH}_2$

(iii) Pentanol \neq $\text{CH}_3\text{-CH}_3\text{-}\overset{\text{O}}{\text{C}}\text{-CH-CH}_2$
OH

(iv) Methoxypentene \neq $\text{CH}_3\text{-O-CH}_2\text{-CH=CH-CH-CH}_2$

(v) Hexanone \neq $\text{CH}_3\text{CH-CH}_3\text{-CH-C-CH}_3$
O

[10]

[25]