



UNIVERSITY OF SWAZILAND
Faculty of Health Sciences
Department of Environmental Health Science

BACHELOR OF NURSING SCIENCE
RESIT EXAMINATION PAPER 2018

TITLE OF PAPER : ORGANIC CHEMISTRY AND BIOCHEMISTRY
FOR NURSES

COURSE CODE : GNS 112

DURATION : 2 HOURS

MARKS : 100

INSTRUCTIONS :

- : READ THE QUESTIONS & INSTRUCTIONS CAREFULLY
- : ANSWER ANY FOUR QUESTIONS
- : EACH QUESTION CARRIES 25 MARKS.
- : WRITE NEATLY & CLEARLY
- : NO PAPER SHOULD BE BROUGHT INTO OR OUT OF THE EXAMINATION ROOM.
- : BEGIN EACH QUESTION ON A SEPARATE SHEET OF PAPER.

DO NOT OPEN THIS QUESTION PAPER UNTIL PERMISSION IS GRANTED BY THE INVIGILATOR.

QUESTION ONE

a) The following compounds have been named incorrectly. Draw structures for the compounds and give the correct IUPAC names for each.

- i) 1,2 dichlorohexan-5-ol
- ii) 2 diethyl octan-7-al

[12 Marks]

b) Draw the structures of all isomers with the molecular formula C_3H_9N . Give IUPAC names for each isomer.

[9 Marks]

c) Formaldehyde, a commonly used biological tissue preservative has the molecular formula CH_2O . Draw the molecular structure and give the functional group/s found in formaldehyde.

[4 Marks]

QUESTION TWO

a. Account for the following facts;

- (i) Chloro-ethane is more reactive than ethane [3 Marks]
- (ii) Fatty acids have polar and non-polar ends. [3 Marks]
- (iii) Tertiary alkyl halides only under S_N1 type of substitution reaction.

[4 Marks]

b. Draw structures of the compounds described below and give all possible IUPAC name/s for each structure

- (i) A three carbon aliphatic chain with an alcohol functionality on each carbon.
- (ii) A straight chain of eight carbons with two methyl groups on the second carbon, an *isopropyl* group on the fourth carbon and a carbonyl group on the eighth carbon.
- (iii) A four carbon chain with a chloro on the third carbon and a methoxy group on the fourth carbon.

[3 × 5 Marks]

QUESTION THREE

- a. _____ is the ability of carbon to form long chains with itself therefore creating millions of organic compounds. [3 Marks]
- b. Organic compounds contain heteroatoms such as C, N, O, S, P and _____ [3 Marks]
- c. Ethene contains only _____ hybridised carbons. [3 Marks]
- d. Compare E1 and E2 reactions and state the factors that affect these reactions. [10 Marks]
- e. Compare the activation energies required for a secondary and a tertiary alkyl halide to undergo S_N1 reaction. Justify your answer. [6 Marks]

QUESTION FOUR

- a. Explain what is meant by the term 'anticoagulant' and give three examples of anticoagulants [6 Marks]
- b. What is the difference between blood serum and blood plasma [4 Marks]
- c. Steroids are a class of biomolecules made up of three six-membered carbon rings and one five-membered ring with an aliphatic chain attached on the five carbon ring. Give three examples of steroids and give the function of each example. [6 Marks]
- d. Explain how antioxidant enzymes function and give three examples of antioxidant enzymes. (use chemical equations in your answer) [9 Marks]

QUESTION FIVE

- a. Match the terms on column 1 with the suitable terms on column 2. Explain how the terms relate.

	Column 1	Column 2
(i)	Stereochemical inversion	E2 reaction
(ii)	Delocalization of positive charge	Aldehydes
(iii)	Terminal functional group	Tertiary carbocation
(iv)	Requires β hydrogen	Chloroethane
(v)	High activation energy	E1
(vi)	Requires strong base	S _N 2

[18 Marks]

- b. Explain how temperature, nature of substrate and pH affects the activity of enzymes in biological systems.

[7 Marks]

General data and fundamental constants

Quantity	Symbol	Value
Speed of light	c	$2.997\ 924\ 58 \times 10^8 \text{ m s}^{-1}$
Elementary charge	e	$1.602\ 177 \times 10^{-19} \text{ C}$
Faraday constant	$F = N_A e$	$9.6485 \times 10^4 \text{ C mol}^{-1}$
Boltzmann constant	k	$1.380\ 66 \times 10^{-23} \text{ J K}^{-1}$
Gas constant	$R = N_A k$	$8.314\ 51 \text{ J K}^{-1} \text{ mol}^{-1}$ $8.205\ 78 \times 10^{-3} \text{ dm}^3 \text{ atm K}^{-1} \text{ mol}^{-1}$ $6.2364 \times 10 \text{ L Torr K}^{-1} \text{ mol}^{-1}$
Planck constant	h	$6.626\ 08 \times 10^{-34} \text{ J s}$
	$\hbar = h/2\pi$	$1.054\ 57 \times 10^{-34} \text{ J s}$
Avogadro constant	N_A	$6.022\ 14 \times 10^{23} \text{ mol}^{-1}$
Atomic mass unit	u	$1.660\ 54 \times 10^{-27} \text{ Kg}$
Mass		
electron	m_e	$9.109\ 39 \times 10^{-31} \text{ Kg}$
proton	m_p	$1.672\ 62 \times 10^{-27} \text{ Kg}$
neutron	m_n	$1.674\ 93 \times 10^{-27} \text{ Kg}$
Vacuum permittivity	$\epsilon_0 = 1/c^2 \mu_0$	$8.854\ 19 \times 10^{-12} \text{ J}^{-1} \text{ C}^2 \text{ m}^{-1}$
	$4\pi\epsilon_0$	$1.112\ 65 \times 10^{-10} \text{ J}^{-1} \text{ C}^2 \text{ m}^{-1}$
Vacuum permeability	μ_0	$4\pi \times 10^{-7} \text{ J s}^2 \text{ C}^{-2} \text{ m}^{-1}$ $4\pi \times 10^{-7} \text{ T}^2 \text{ J}^{-1} \text{ m}^3$
Magneton		
Bohr	$\mu_B = e\hbar/2m_e$	$9.274\ 02 \times 10^{-24} \text{ J T}^{-1}$
nuclear	$\mu_N = e\hbar/2m_p$	$5.050\ 79 \times 10^{-27} \text{ J T}^{-1}$
g value	g_e	2.002 32
Bohr radius	$a_0 = 4\pi\epsilon_0 \hbar^2 / m_e e^2$	$5.291\ 77 \times 10^{-11} \text{ m}$
Fine-structure constant	$\alpha = \mu_0 e^2 c / 2\hbar$	$7.297\ 35 \times 10^{-3}$
Rydberg constant	$R_\infty = m_e e^4 / 8\hbar^3 c e_0^2$	$1.097\ 37 \times 10^7 \text{ m}^{-1}$
Standard acceleration of free fall	g	$9.806\ 65 \text{ m s}^{-2}$
Gravitational constant	G	$6.672\ 59 \times 10^{-11} \text{ N m}^2 \text{ Kg}^{-2}$

Conversion factors

1 cal	=	4.184 joules (J)	1 erg	=	$1 \times 10^{-7} \text{ J}$
1 eV	=	$1.602\ 2 \times 10^{-19} \text{ J}$	1 eV/molecule	=	$96\ 485 \text{ kJ mol}^{-1}$

Prefixes	f	p	n	μ	m	c	d	k	M	G
	femto	pico	nano	micro	milli	centi	deci	kilo	mega	giga
	10^{-15}	10^{-12}	10^{-9}	10^{-6}	10^{-3}	10^{-2}	10^{-1}	10^3	10^6	10^9

PERIODIC TABLE OF ELEMENTS

GROUPS

PERIODS	GROUPS																		
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	
	IA	IIA	IIIB	IVB	VB	VIB	VIIIB	VIIIB	VIIIB	IB	IIB	IIIB	IIIA	IVA	VA	VIA	VIIA	VIIIA	
1	1.008 H																	4.003 He	
2	6.941 Li 3	9.012 Be 4											10.811 B 5	12.011 C 6	14.007 N 7	15.999 O 8	18.998 F 9	20.180 Ne 10	
3	22.990 Na 11	24.305 Mg 12										26.982 Al 13	28.086 Si 14	30.974 P 15	32.06 S 16	35.453 Cl 17	39.948 Ar 18		
4	39.098 K 19	40.078 Ca 20	44.956 Sc 21	47.88 Ti 22	50.942 V 23	51.996 Cr 24	54.938 Mn 25	55.847 Fe 26	58.933 Co 27	58.69 Ni 28	63.546 Cu 29	65.39 Zn 30	69.723 Ga 31	72.61 Ge 32	74.922 As 33	78.96 Se 34	79.904 Br 35	83.80 Kr 36	
5	85.468 Rb 37	87.62 Sr 38	88.906 Y 39	91.224 Zr 40	92.906 Nb 41	95.94 Mo 42	98.907 Tc 43	101.07 Ru 44	102.91 Rh 45	106.42 Pd 46	107.87 Ag 47	112.41 Cd 48	114.82 In 49	118.71 Sn 50	121.75 Sb 51	127.60 Te 52	126.90 I 53	131.29 Xe 54	
6	132.91 Cs 55	137.33 Ba 56	138.91 *La 57	178.49 Hf 72	180.95 Ta 73	183.85 W 74	186.21 Re 75	190.2 Os 76	192.22 Ir 77	195.08 Pt 78	196.97 Au 79	200.59 Hg 80	204.38 Tl 81	207.2 Pb 82	208.98 Bi 83	(209) Po 84	(210) At 85	(222) Rn 86	
7	223 Fr 87	226.03 Ra 88	(227) **Ac 89	(261) Rf 104	(262) Ha 105	(263) Unh 106	(262) Uns 107	(265) Uno 108	(266) Une 109	(267) Uun 110									

Atomic mass →
Symbol →
Atomic No. →

TRANSITION ELEMENTS

140.12 Ce 58	140.91 Pr 59	144.24 Nd 60	150.36 Sm 62	(145) Pm 61	151.96 Eu 63	157.25 Gd 64	158.93 Tb 65	162.50 Dy 66	164.93 Ho 67	167.26 Er 68	168.93 Tm 69	173.04 Yb 70	174.97 Lu 71
232.04 Th 90	231.04 Pa 91	238.03 U 92	(244) Pu 94	237.05 Np 93	(243) Am 95	(247) Cm 96	(247) Bk 97	(251) Cf 98	(252) Es 99	(257) Fm 100	(258) Md 101	(259) No 102	(260) Lr 103

* Lanthanide Series

** Actinide Series

() Indicates the mass number of the isotopes with the longest half-life.