



**NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY**

**FACULTY OF HEALTH, NATURAL RESOURCES AND APPLIED SCIENCES
SCHOOL OF AGRICULTURE AND NATURAL RESOURCES SCIENCES
DEPARTMENT OF AGRICULTURAL SCIENCE AND AGRIBUSINESS**

QUALIFICATIONS: BACHELOR OF SCIENCE IN AGRICULTURE BACHELOR OF SCIENCE IN HORTICULTURE	
QUALIFICATIONS CODE: 07BAGA 07BHOR	LEVEL: NQF LEVEL 7
COURSE CODE: ICA511S	COURSE NAME: INTRODUCTION TO CHEMISTRY
DATE: JUNE 2025	SESSION: JUNE
DURATION: 3 HOURS	MARKS: 100

FIRST OPPORTUNITY EXAMINATION QUESTION PAPER	
EXAMINER:	MS. PAULINA NDINELAGO NAUPU
MODERATOR:	MRS. LUCIA TUYENI-KELAO KAFIDI

INSTRUCTIONS
<ol style="list-style-type: none">1. Answer all the questions.2. Write neatly and clearly.3. Mark all answers clearly with their respective question numbers.4. All written work MUST be done in blue or black ink.5. No books, notes and other additional aids are allowed.

PERMISSIBLE MATERIALS

1. Calculator
2. Examination paper
3. Examination script

**THIS MARKING SCHEME CONSISTS OF 3 PAGES
(Excluding This Front Page)**

QUESTION 1

Define the following terms.

- | | | |
|-----|---------------------|-----|
| 1.1 | Atoms | {2} |
| 1.2 | Conversion factor | |
| 1.2 | Element | {2} |
| 1.3 | Matter | {2} |
| 1.4 | Molecules | {2} |
| 1.5 | Compound | {2} |
| 1.6 | Homogeneous mixture | {2} |

[12]

QUESTION 2

- 2.1 State the four Dalton's theory and give an example of each theory. {8}
- 2.2 Fully describe the concept of an ionic bond. {5}
- 2.3 How are molarity and molality related in terms of concentration measurements? {3}
- 2.4 Explain Avogadro's number in detail, including its definition, significance in chemistry, and how it is used in calculations. Provide its numerical value {5}

[21]

QUESTION 3

- 3.1 Imagine you want to measure out 0.214 mL of benzene but lack the equipment to accurately measure such a small volume. You are, however, equipped with an analytical balance capable of measuring up to ± 0.0001 g. Looking at a reference table, you learn the density of benzene ($\rho = 0.8765$ g/mL). How many grams of benzene should you use? Use the calculation rules and give your final answer to the correct significant figure {5}
- 3.2 A cyclist is riding at a speed of 5 km/hr. To analyze their motion in a physics experiment, you need to express this speed in meters per second (m/s). Using the appropriate conversion factors, determine the cyclist's speed in m/s and round your final answer to one significant figure. {6}

[11]

QUESTION 4

- 4.1 A chemist measures 78.5 g of aluminum (Al). Calculate how many moles of aluminum are present. {4}
- 4.2 How many grams of calcium carbonate (CaCO_3) are present in 0.75 moles? {5}

- 4.3 A farmer adds 156 g of ammonium sulfate $((\text{NH}_4)_2\text{SO}_4)$ to the soil. Determine the number of ammonium sulfate molecules in the sample. {8}
- 4.4 A student dissolves 68.4 g of an unknown substance in water and determines that the solution contains 1.2 moles of the substance. Calculate the molar mass and suggest a possible identity based on common molar masses. {5}

[22]

QUESTION 5

- 5.1 Calculate the molarity of a solution made by dissolving 23.4 g of sodium sulfate (Na_2SO_4) in enough water to form 125 mL of solution. {9}
- 5.2 If a compound has an empirical formula of CH_2 and a molar mass of 84 g/mol, what is its molecular formula {5}

[14]

QUESTION 6

- 6.1 Calculate the percentage composition of carbon in these substances.
 $\text{C}_{12}\text{H}_{22}\text{O}_{11}$ and $\text{C}_5\text{H}_9\text{NO}_2$ {8}
- 6.2 2 moles of propane react with 8 moles of oxygen gas in a combustion reaction in the following equation: $1\text{C}_3\text{H}_8 + 5\text{O}_2 \rightarrow 3\text{CO}_2 + 4\text{H}_2\text{O}$. What is the limiting reactant {5}
- 6.3 30g of C_3H_8 burns in air to produce 70g of CO_2 using the following reaction $\text{C}_3\text{H}_8 + 5\text{O}_2 \rightarrow 3\text{CO}_2 + 4\text{H}_2\text{O}$. Calculate the theoretical and percentage yield. {4}
- 6.4 Calculate the percent yield {3}

[20]

Total Marks:

100

PERIODIC TABLE OF THE ELEMENTS

1																	18
1 H 1.00794																	2 He 4.00260
3 Li 6.941	4 Be 9.01218											5 B 10.81	6 C 12.011	7 N 14.0067	8 O 15.9994	9 F 18.9984	10 Ne 20.179
11 Na 22.9898	12 Mg 24.305											13 Al 26.9815	14 Si 28.0855	15 P 30.9738	16 S 32.06	17 Cl 35.453	18 Ar 39.948
19 K 39.0983	20 Ca 40.08	21 Sc 44.9559	22 Ti 47.88	23 V 50.9415	24 Cr 51.996	25 Mn 54.9380	26 Fe 55.847	27 Co 58.9332	28 Ni 58.69	29 Cu 63.546	30 Zn 65.38	31 Ga 69.72	32 Ge 72.59	33 As 74.9216	34 Se 78.96	35 Br 79.904	36 Kr 83.8
37 Rb 85.4678	38 Sr 87.62	39 Y 88.9059	40 Zr 91.22	41 Nb 92.9064	42 Mo 95.94	43 Tc (98)	44 Ru 101.07	45 Rh 102.906	46 Pd 106.42	47 Ag 107.868	48 Cd 112.41	49 In 114.82	50 Sn 118.69	51 Sb 121.75	52 Te 127.6	53 I 126.9	54 Xe 131.29
55 Cs 132.905	56 Ba 137.33	71 Lu 174.967	72 Hf 178.49	73 Ta 180.948	74 W 183.85	75 Re 186.207	76 Os 190.2	77 Ir 192.22	78 Pt 195.08	79 Au 196.967	80 Hg 200.59	81 Tl 204.383	82 Pb 207.2	83 Bi 208.908	84 Po (209)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra 226.025	103 Lr (260)	104 Rf (261)	105 Db (262)	106 Sg (263)	107 Bh (264)	108 Hs (265)	109 Mt (268)	110 Uun (269)	111 Uuu (272)	112 Uub (269)		114 Uuq		116 Uuh		118 Uuo

Lanthanides:

57 La 138.906	58 Ce 140.12	59 Pr 140.908	60 Nd 144.24	61 Pm (145)	62 Sm 150.36	63 Eu 151.96	64 Gd 157.25	65 Tb 158.925	66 Dy 162.50	67 Ho 161.930	68 Er 167.26	69 Tm 166.934	70 Yb 173.04
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Actinides:

89 Ac 227.028	90 Th 232.038	91 Pa 231.036	92 U 238.029	93 Np 237.048	94 Pu (244)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)
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