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: 7**
COURSE CODE: ICA511S	**COURSE NAME:** INTRODUCTION TO CHEMISTRY
DATE: JUNE 2024	**PAPER:** 1
DURATION: 3 HOURS	**MARKS:** 100

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

INSTRUCTIONS

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 QUESTION PAPER CONSISTS OF 4 PAGES
(Excluding This Front Page)

QUESTION 1

Define the following terms

1.1 Atoms {2}

1.2 Element {2}

1.3 Matter {1}

1.4 Molecules {1}

1.5 Compound {1}

1.6 Homogenous mixture {1}

[8]

QUESTION 2

2.1 What is the difference between a physical change and a chemical change? {4}

2.2 What is an ionic bond and what charges does it form? {3}

2.3 What is the relationship between molarity and molality? {3}

[10]

QUESTION 3

3.1 Imagine that a chemist wants to measure out 0.214 mL of benzene, but lacks the equipment to accurately measure such a small volume. The chemist, however, is equipped with an analytical balance capable of measuring up to ±0.0001g. Looking at a reference table, the chemist learns the density of benzene (ρ=0.8765g/mL). How many grams of benzene should the chemist use? {4}

3.2 A rock has a mass of 20.5 g and a volume of 15.05 cm3. What is its density? {4}

3.3 A rock has a density of 18.3 g/cm^3. If you have a rock bar with a volume of 43.9 cm^3, what is its mass? {4}

[12]

QUESTION 4

4.1 What is the molarity of a solution that contains 0.25 moles of glucose dissolved in 500 mL of water? {4}

4.2 How many milliliters of a 1.5 M solution of hydrochloric acid are needed to prepare 500mL of a 0.25 M solution? {4}

4.3 How many mL of 2.0M H_2SO_4 are needed to make 400mL of 0.11M H_2SO_4. {4}

4.4 24.6 mL of a 0.50M monoprotic acid solution was titrated with a 0.18M NaOH solution What is the volume of NaOH that should be added to the solution in order to reach the equivalence point? {4}

4.5 Suppose you want to prepare 250 mL of 0.100 M $CuSO_4$ solution by diluting a 1.00 M $CuSO_4$ stock solution. What volume of $CuSO_4$ do you need? {3}

4.6 What is the mass of 0.30 moles $Mg(NO_3)_2$ {4}

[23]

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 A 25.00 mL sample of a hydrochloric acid solution of unknown concentration was titrated with 0.100 M sodium hydroxide solution. It took 37.55 mL of the sodium hydroxide solution to reach the endpoint.
Using this equation, HCl + NaOH → NaCl + H2O, what is the molarity of the hydrochloric acid solution? {9}

[18]

QUESTION 6

6.1 If a compound has an empirical formula of CH_2 and a molar mass of 84 g/mol, what is its molecular formula {5}

6.2 A compound has an empirical formula of C_2H_5 and a molar mass of 58 g/mol. What is its molecular formula? {5}

[10]

QUESTION 7

Balance the following chemical equations

7.1 $C + SO_2 \rightarrow CS_2 + CO$ [2]

7.2 $Xe + F_2 \rightarrow XeF_6$ [2]

7.3 $Ag + H_2S \rightarrow Ag_2S + H_2$ [2]

7.4 $FeCl_3 + NaOH \rightarrow Fe(OH)_3 + NaCl$ [2]

[8]

QUESTION 8

3.2 moles of N_2 reacts with 5.4 moles H_2 in the following chemical reaction:
$N_2 + 3H_2 \rightarrow 2NH_3$

8.1 What is the limiting reactant {5}

8.2 How many moles of ammonia are formed {2}

8.3 How much of the excess reactant in moles is left over? {4}

[11]

Total Marks: **100**

PERIODIC TABLE OF THE ELEMENTS

1																	18
1 **H** 1.00794	2											13	14	15	16	17	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	3	4	5	6	7	8	9	10	11	12	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

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)