



**NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY**

**FACULTY OF HEALTH, NATURAL RESOURCES AND APPLIED SCIENCES
SCHOOL OF AGRICULTURE AND NATURAL RESOURCES SCIENCES
DEPARTMENT OF AGRICULTURAL SCIENCES 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
SESSION: JUNE 2023	PAPER: THEORY
DURATION: 3 HOURS	MARKS: 120

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

QUESTION 1

- 1.1 What is the difference between precision and accuracy in measurement? {2}
- 1.2 What is the difference between a significant figure and a non-significant figure? {2}
- 1.3 What is the difference between a pure substance and a mixture? {2}
- [6]**

QUESTION 2

- 2.1 Differentiate between a homogeneous mixture and a heterogeneous mixture. {2}
- 2.2 What is the difference between a physical change and a chemical change? {2}
- 2.3 What is an ionic bond and what charges does it form? {2}
- 2.4 What is the relationship between molarity and molality? {2}
- [8]**

QUESTION 3

- 3.1 What is the molarity of a solution that contains 0.25 moles of glucose dissolved in 500 mL of water? {5}
- 3.2 How many milliliters of a 1.5 M solution of hydrochloric acid are needed to prepare 500mL of a 0.25 M solution? {6}
- [11]**

QUESTION 4

- 4.1 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. {6}
- 4.2 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, $\text{HCl} + \text{NaOH} \rightarrow \text{NaCl} + \text{H}_2\text{O}$, what is the molarity of the hydrochloric acid solution? {6}
- [12]**

QUESTION 5

Magnesium has three isotopes with mass numbers 24, 25, and 26.

- 5.1 Write the complete chemical symbol for each {3}
- 5.1 How many neutrons are in an atom of each isotope? {3}
- 5.3 Draw the ionic bond between magnesium and bromide. Clearly show how electron are transferred/shared/lost and the resulting ions {8}
- [14]

QUESTION 6

Provide the empirical formula of the following compounds.

- 6.1 C_4H_8 [8]
- 6.2 C_3N_{12}
- 6.3 $C_5H_{10}O_5$
- 6.4 P_3N_5

QUESTION 7

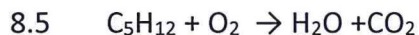
For each of the following identify it as either ionic or molecular compound. For ionic, indicate the charges of each element. [12]

- 7.1 H_2O
- 7.2 $MgCl_2$
- 7.3 CO_2
- 7.4 Fe_2O_3
- 7.5 $Sr(OH)_2$
- 7.6 $C_6H_{12}O_6$

QUESTION 8

Indicate the type of each of the following chemical reactions [5]

- 8.1 $2Na + Cl_2 \rightarrow 2NaCl$
- 8.2 $H_2CO_3 \rightarrow H_2O + CO_2$
- 8.3 $2KCl \rightarrow 2K + Cl_2$
- 8.4 $S + O_2 \rightarrow SO_2$



QUESTION 9

Name the formula of each of the following acids [6]

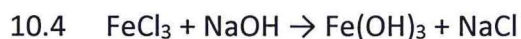
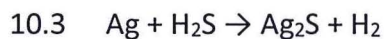
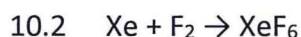
9.1 Hydrosulfuric acid

9.2 Iron (III) hydroxide

9.3 Hydrophosphoric acid

QUESTION 10

Balance the following chemical equations [8]



QUESTION 11

Consider the following equation: $2H_2S + 3O_2 \rightarrow 2SO_2 + 2H_2O$

11.1 How many moles of O_2 are needed to combine with 8.4 moles of H_2S {5}

11.2 Starting with 9.2 moles of O_2 ,

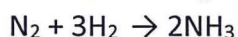
11.2.1 How many moles of H_2S will you need? {5}

11.2.2 How many moles of SO_2 will you get? {5}

[15]

QUESTION 12

3.2 moles of N_2 reacts with 5.4 moles H_2 in the following chemical reaction:



12.1 What is the limiting reactant {5}

12.2 How many moles of ammonia are formed {5}

12.3 How much of the excess reactant in moles is left over? {5}

[15]

Total Marks: 120

Periodic Table of the Elements

1 11A 1A																	18 VIII A 8A
1 H Hydrogen 1.008	2 IIA 2A											13 IIIA 3A	14 IVA 4A	15 VA 5A	16 VIA 6A	17 VIIA 7A	2 He Helium 4.003
3 Li Lithium 6.941	4 Be Beryllium 9.012											5 B Boron 10.811	6 C Carbon 12.011	7 N Nitrogen 14.007	8 O Oxygen 15.999	9 F Fluorine 18.998	10 Ne Neon 20.180
11 Na Sodium 22.99	12 Mg Magnesium 24.305	3 IIIB 3B	4 IVB 4B	5 VB 5B	6 VIB 6B	7 VIIB 7B	8 VIII 8	9 VIII 8	10 VIII 8	11 IB 1B	12 IIB 2B	13 Al Aluminum 26.982	14 Si Silicon 28.086	15 P Phosphorus 30.974	16 S Sulfur 32.065	17 Cl Chlorine 35.453	18 Ar Argon 39.948
19 K Potassium 39.098	20 Ca Calcium 40.078	21 Sc Scandium 44.956	22 Ti Titanium 47.867	23 V Vanadium 50.942	24 Cr Chromium 51.996	25 Mn Manganese 54.938	26 Fe Iron 55.845	27 Co Cobalt 58.933	28 Ni Nickel 58.693	29 Cu Copper 63.546	30 Zn Zinc 65.38	31 Ga Gallium 69.723	32 Ge Germanium 72.631	33 As Arsenic 74.922	34 Se Selenium 78.971	35 Br Bromine 79.904	36 Kr Krypton 83.799
37 Rb Rubidium 85.468	38 Sr Strontium 87.62	39 Y Yttrium 88.906	40 Zr Zirconium 91.224	41 Nb Niobium 92.906	42 Mo Molybdenum 95.95	43 Tc Technetium 98.907	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.906	46 Pd Palladium 106.42	47 Ag Silver 107.868	48 Cd Cadmium 112.414	49 In Indium 114.818	50 Sn Tin 118.711	51 Sb Antimony 121.760	52 Te Tellurium 127.6	53 I Iodine 126.904	54 Xe Xenon 131.294
55 Cs Cesium 132.905	56 Ba Barium 137.328	57-71	72 Hf Hafnium 178.49	73 Ta Tantalum 180.948	74 W Tungsten 183.84	75 Re Rhenium 186.207	76 Os Osmium 190.23	77 Ir Iridium 192.217	78 Pt Platinum 195.085	79 Au Gold 196.967	80 Hg Mercury 200.592	81 Tl Thallium 204.383	82 Pb Lead 207.2	83 Bi Bismuth 208.980	84 Po Polonium [208.982]	85 At Astatine 209.987	86 Rn Radon 222.018
87 Fr Francium 223.029	88 Ra Radium 226.025	89-103	104 Rf Rutherfordium [261]	105 Db Dubnium [262]	106 Sg Seaborgium [266]	107 Bh Bohrium [264]	108 Hs Hassium [289]	109 Mt Meitnerium [278]	110 Ds Darmstadtium [281]	111 Rg Roentgenium [280]	112 Cn Copernicium [285]	113 Nh Nihonium [286]	114 Fl Flerovium [289]	115 Mc Moscovium [288]	116 Lv Livermorium [293]	117 Ts Tennessine [294]	118 Og Oganesson [294]

Lanthanide Series

57 La Lanthanum 138.905	58 Ce Cerium 140.116	59 Pr Praseodymium 140.908	60 Nd Neodymium 144.243	61 Pm Promethium 144.913	62 Sm Samarium 150.36	63 Eu Europium 151.964	64 Gd Gadolinium 157.25	65 Tb Terbium 158.925	66 Dy Dysprosium 162.500	67 Ho Holmium 164.930	68 Er Erbium 167.259	69 Tm Thulium 168.934	70 Yb Ytterbium 173.055	71 Lu Lutetium 174.967
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Actinide Series

89 Ac Actinium 227.028	90 Th Thorium 232.038	91 Pa Protactinium 231.036	92 U Uranium 238.029	93 Np Neptunium 237.048	94 Pu Plutonium 244.064	95 Am Americium 243.061	96 Cm Curium 247.070	97 Bk Berkelium 247.070	98 Cf Californium 251.080	99 Es Einsteinium [254]	100 Fm Fermium 257.095	101 Md Mendelevium 258.1	102 No Nobelium 259.101	103 Lr Lawrencium [262]
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Alkali Metal	Alkaline Earth	Transition Metal	Basic Metal	Semimetal	Nonmetal	Halogen	Noble Gas	Lanthanide	Actinide
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