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: JULY 2023	**PAPER:** THEORY
DURATION: 3 HOURS	**MARKS:** 120

SECOND 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

Write the name/formula of the following:

1.1	HBr	{2}
1.2	HNO_3	{2}
1.3	H_2SO_3	{2}
1.4	Potassium hydroxide	{2}

[8]

QUESTION 2

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

2.2   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}

2.3   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?   {4}

2.4   What is the mass of 0.30 moles $Mg(NO_3)_2$ {3}

[15]

QUESTION 3

3.1   A rock has a mass of 20.5 g and a volume of 15.05 cm3. What is its density?   {3}

3.2   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?   {3}

[6]

QUESTION 4

4.1   If a compound has an empirical formula of CH_2 and a molar mass of 84 g/mol, what is its molecular formula   {6}

4.2   A compound has an empirical formula of C_2H_5 and a molar mass of 58 g/mol. What is its molecular formula?   {6}

                                                                                                        [12]

QUESTION 5

5.1   Consider copper (II) bromide CuBr2, calculate the percentage of copper and bromide
                                                                                                        {6}

5.2   What mass of oxygen gas is required to completely react with 25.0 grams of iron to produce iron(III) oxide, Fe 2 O 3 according to the following balanced equation: $4Fe + 3O_2 \rightarrow 2Fe_2O_3$?   {5}

                                                                                                        [11]

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QUESTION 6
Balance the following equations
6.1 $Fe_2 (SO_4)_3 + KOH \rightarrow K_2SO_4 + Fe (OH)_3$ {2}
6.2 $Mg + N_2 \rightarrow Mg_3N_2$ {2}
6.3 $C_3H_8 + O_2 \rightarrow CO_2 + H_2O$ {2}
                                                                                                        [6]

QUESTION 7
Calculate the formula weight (FW) of the following substances.
7.1 CH_3COOH {2}

7.2 H_2SO_4 {2}

7.3   KMnO4   {2}
                                                                                                        [6]

QUESTION 8
Calculate the percentage composition of carbon in the following substances.
8.1 $C_{12}H_{22}O_{11}$ {5}

8.2 $C_5H_9NO_2$ {5}
                                                                                                        [10]

QUESTION 9

2 moles of propane react with 8 moles of oxygen gas in a combustion reaction in the following equation: $1C_3H_8 + 5O_2 \rightarrow 3CO_2 + 4H_2O$

9.1   What is the limiting reactant   {6}

9.2   How many moles of carbon dioxide are formed   {5}

9.3   How much of the excess reactant is left over?   {5}
                                                                                                                        [16]

QUESTION 10
10.1   Calculate the molarity of a solution prepared by dissolving 9.8 moles of solid NaOH in enough water to make 3.62 L of solution. What does your answer tell   you?
                                                                                                                        {6}

10.2   You dissolve 152.5 g of $CuCl_2$ in water to make a solution with a final volume of 2.25 L. What is its molarity?   {6}
                                                                                                                        [12]

QUESTION 11
30g of C_3H_8 burns in air to produce 70g of CO_2 using the following reaction $C_3H_8 + 5O_2 \rightarrow 3CO_2 +4H_2O$.

11.1   Calculate the theoretical yield   {7}

11.2   Calculate the percent yield   {3}
                                                                                                                        [10]

QUESTION 12
Draw the atomic structure of Sodium (Na). Please indicate the number of electrons, neutrons, and protons with their respective charges the element has.   [8]

Total Marks: 120

Periodic Table of the Elements

1 / 1IA / 1A																	18 / VIIIA / 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 32.066	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 83.789
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 223.020	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 [269]	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

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]

Legend:
- Alkali Metal
- Alkaline Earth
- Transition Metal
- Basic Metal
- Semimetal
- Nonmetal
- Halogen
- Noble Gas
- Lanthanide
- Actinide