WOMEN'S UNIVERSITY IN AFRICA

Addressing gender disparity and fostering equity in University Education

FACULTY OF AGRICULTURAL SCIENCES

BACHELOR OF SCIENCE HONOURS DEGREE IN INTEGRATED ENVIRONMENTAL MANAGEMENT

MAIN PAPER

IEM: **ENVIRONMENTAL CHEMISTRY**

INTAKE: **FIRST YEAR FIRST SEMESTER**

DATE: **JANUARY 2021** **TIME:**

INSTRUCTIONS TO CANDIDATES
Answer any **four** questions.

Question 1

a) Explain the common properties of group 1 and 2 elements. [15]

b) Identify the physical and chemical properties of transition elements which differ from main group elements. [10]

Question 2

a. State the general assumptions in the ideal gas law. [4]

b. State the Kinetic Molecular Theory for an ideal gas. [6]

c. A 5.0 L cylinder contains oxygen gas at 20.0°C and 735 mm Hg. Calculate the mass(g) of oxygen in the cylinder. [5]

d. A gas has a % composition by mass of 85.7% carbon and 14.3% hydrogen. At STP the density of the gas is 2.50 g/L. Deduce the molecular formula of the gas. [10]

Question 3

a) State the chemical reactions that take place in the sulfur cycle. [5]

b) Using balanced chemical equations, describe the following in the nitrogen cycle:

i. Ammonification. [5]

ii. Nitrification; and [5]

iii. Fixation. [5]

iv. Nitrate reduction and denitrification. [5]

Question 4

Using examples compare ionic, metallic, covalent network and molecular crystalline solids under the following:

a) Form of unit particles. [5]

b) Forces between particles. [7]

c) Properties.

Question 5

a) Identify the four major types of soil colloids. [8]

b) Outline the general properties of soil colloids. [17]

Question 6

Discuss the factors that affect the rate of a chemical reactions in the environment. [25]

Periodic Table of the Elements

I	II											III	IV	V	VI	VII	VIII
hydrogen **1** **H** 1.00794																	helium **2** **He** 4.002602
lithium **3** **Li** 6.941	beryllium **4** **Be** 9.012182											boron **5** **B** 10.811	Carbon **6** **C** 12.0107	nitrogen **7** **N** 14.00674	oxygen **8** **O** 15.9994	fluorine **9** **F** 18.9984	neon **10** **Ne** 20.1797
sodium **11** **Na** 22.98977	magnesium **12** **Mg** 24.3050											aluminium **13** **Al** 26.981538	silicon **14** **Si** 28.0855	phosphorus **15** **P** 30.97376	sulphur **16** **S** 32.065	chlorine **17** **Cl** 35.453	argon **18** **Ar** 39.984
potassium **19** **K** 39.0983	calcium **20** **Ca** 40.078	scandium **21** **Sc** 44.95591	titanium **22** **Ti** 47.867	vanadium **23** **V** 50.9415	chromium **24** **Cr** 51.9961	manganese **25** **Mn** 54.93805	Iron **26** **Fe** 55.845	cobalt **27** **Co** 58.9332	nickel **28** **Ni** 58.6934	copper **29** **Cu** 63.546	zinc **30** **Zn** 65.409	gallium **31** **Ga** 69.723	germanium **32** **Ge** 72.64	arsenic **33** **As** 74.9216	selenium **34** **Se** 78.96	bromine **35** **Br** 79.904	krypton **36** **Kr** 83.798
rubidium **37** **Rb** 85.4678	strontium **38** **Sr** 87.62	yttrium **39** **Y** 88.90585	zirconium **40** **Zr** 91.225	niobium **41** **Nb** 92.90638	molybdenum **42** **Mo** 95.94	technetium **43** **Tc** [98]	ruthenium **44** **Ru** 101.07	rhodium **45** **Rh** 102.9055	palladium **46** **Pd** 106.42	silver **47** **Ag** 107.8682	cadmium **48** **Cd** 112.411	indium **49** **In** 114.818	tin **50** **Sn** 118.710	antimony **51** **Sb** 121.760	tellurium **52** **Te** 127.60	iodine **53** **I** 126.9045	xenon **54** **Xe** 131.293
caesium **55** **Cs** 132.90545	barium **56** **Ba** 137.327	lutetium **71** **Lu** 174.967	hafnium **72** **Hf** 178.49	tantalum **73** **Ta** 180.9479	tungsten **74** **W** 183.84	rhenium **75** **Re** 186.207	Osmium **76** **Os** 190.23	iridium **77** **Ir** 192.217	platinum **78** **Pt** 195.078	gold **79** **Au** 196.96655	mercury **80** **Hg** 200.59	thallium **81** **Tl** 204.3833	lead **82** **Pb** 207.2	bismuth **83** **Bi** 208.980	polonium **84** **Po** [209]	astatine **85** **At** [210]	radon **86** **Rn** [222]
francium **87** **Fr** [223]	radium **88** **Ra** [226]	lawrencium **103** **Lr** [262]	rutherfordium **104** **Rf** [261]	dubnium **105** **Db** [262]	seaborgium **106** **Sg** [266]	bohrium **107** **Bh** [264]	hassium **108** **Hs** [269]	meitnerium **109** **Mt** [268]	darmstadtium **110** **Ds** [271]	roentgenium **111** **Rg** [272]	ununbium **112** **Uub** [285]		ununquadium **114** **Uuq** [289]				

key: element name **atomic number** **symbol** atomic weight

lanthanum **57** **La** 138.9055	cerium **58** **Ce** 140.116	praseodymium **59** **Pr** 140.90765	neodymium **60** **Nd** 144.24	promethium **61** **Pm** [145]	samarium **62** **Sm** 150.36	europium **63** **Eu** 151.964	gadolinium **64** **Gd** 157.25	terbium **65** **Tb** 158.9253	dysprosium **66** **Dy** 162.50	holmium **67** **Ho** 164.930	erbium **68** **Er** 167.259	thulium **69** **Tm** 168.934	ytterbium **70** **Yb** 173.04
actinium **89** **Ac** [227]	thorium **90** **Th** 232.038	protactinium **91** **Pa** 231.0359	uranium **92** **U** 238.0289	neptunium **93** **Np** [237]	plutonium **94** **Pu** [244]	americium **95** **Am** [243]	curium **96** **Cm** [247]	berkelium **97** **Bk** [247]	californium **98** **Cf** [251]	einsteinium **99** **Es** [252]	fermium **100** **Fm** [257]	mendelevium **101** **Md** [258]	nobelium **102** **No** [259]