



KIBABII UNIVERSITY

**UNIVERSITY EXAMINATIONS
2021/2022 ACADEMIC YEAR**

**FIRST YEAR FIRST SEMESTER
SPECIAL/SUPPLEMENTARY EXAMINATIONS**

**FOR THE DEGREE OF BSC CHEMISTRY, BSC PHYSICS, BSC
RENEWABLE ENERGY AND BIOFUELS TECHNOLOGY, BSC
AGRICULTURE AND BIOTECHNOLOGY
(MARKING SCHEME)**

COURSE CODE: SCH 111

COURSE TITLE: INTRODUCTION TO INORGANIC CHEMISTRY

DATE: 22/07/2022

TIME: 8:00AM-10:00AM

INSTRUCTIONS TO CANDIDATES:

- Answer **Question ONE (Compulsory)** and any other **TWO (2)** questions
- Indicate answered questions on the front cover of your answer booklet
- Start each question on a new page and make sure the question's number is written on each page

TIME: 2 Hours

Constants: 1 mole = 6.02×10^{23} particles

This paper consists of 4 printed pages. Please Turn Over



KIBU observes ZERO tolerance to examination cheating

Question 1 [30 Marks]

- a. Explain the difference between an element and a molecule [4 Marks]
- b. Describe the significance of the following quantum numbers [4 Marks]
- Magnetic quantum number
 - Magnetic spin quantum number
- c. For $n=4$, describe the number of orbitals in each subshell [4 Marks]
- d. Describe the number of degenerate orbitals in the 5g sub shell [2 Mark]
- f. List the possible magnetic quantum numbers (m_l) for a 5g orbital [3 Marks]
- g. Using examples explain the difference between an ionic bond and a covalent bond [3 Marks]
- h. Using an alkane as an example, differentiate between empirical formulae and molecular formulae [4 Marks]
- i. Give the symbols of each atom below, including the atomic number and the mass number. [6 Marks]
- a magnesium atom with 12 neutrons
 - a magnesium atom 13 neutrons
 - a xenon atom with 77 neutrons

Question 2 [20 Marks]

- a. Describe covalent and ionic bonds giving an example for each [3 Marks]
- b. Determine the number of atoms and the mass of Molybdenum in 4.60×10^{-4} moles [5 Marks]
- c. Given that the formula for iron pyrosilicate is $\text{Fe}_3(\text{Si}_2\text{O}_7)$, determine
- The oxidation state of iron in the salt [2 Marks]
 - The formula for aluminum pyrosilicate [4 Marks]
- d. An alkane is composed of 83.7% carbon, determine the empirical and molecular formulae of the alkane. [6 Marks]

Question 3 [20 Marks]

- a. State the major conclusions of Dalton's atomic theory [8 Marks]
- b. Describe Rutherford's atomic model and state its major limitations [12 Marks]

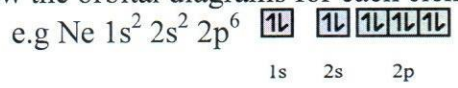
Question 4 [20 Marks]

- a. Describe the periodic table [2 Marks]
- b. Describe the trends in the periodic table [8 Marks]
- c. Complete the missing data in the table [10 Marks]

Isotope name	Atomic number	Mass number	Number of electrons
³⁺	81		78
²⁺			36
Mo ³⁻			
Rh ⁻			

Question 5 [20 Marks]

Draw the orbital diagrams for each element below



- a. Nb
- b. Ir
- c. Tl
- d. Xe
- e. P

PERIODIC TABLE OF THE ELEMENTS

1 H 1.008									2 He 4.00																																			
3 Li 6.94								9 F 19.00	10 Ne 20.18																																			
11 Na 22.99	12 Mg 24.30							17 Cl 35.45	18 Ar 39.95																																			
19 K 39.10	20 Ca 40.08	3 III B	4 IV B	5 V B	6 VI B	7 VII B	8 VIII B	9 IX	10 X	11 IB	12 IIB	13 III A	14 IV A	15 V A	16 VI A	17 VII A	18 VIII A																											
37 Rb 85.47	38 Sr 87.62	21 Sc 44.96	22 Ti 47.90	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.39	31 Ga 69.72	32 Ge 72.59	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80	54 Xe 131.29																										
55 Cs 132.91	56 Ba 137.33	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc (98)	44 Ru 101.1	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.75	52 Te 127.60	53 I 126.91	86 Rn (222)	85 At (210)	84 Po (209)	83 Bi 208.98	82 Pb 207.2	81 Tl 204.38	80 Hg 200.59	79 Au 196.97	78 Pt 195.08	77 Ir 192.22	76 Os 190.2	75 Re 186.21	74 W 183.85	73 Ta 180.95	72 Hf 178.49	71 La 138.91	70 *La 138.91	69 †Ac 227.03	68 Ra 226.02	67 Fr (223)	111 Rg (272)	110 Ds (271)	109 Mt (268)	108 Hs (277)	107 Bh (264)	106 Sg (266)	105 Db (262)	104 Rf (261)