



# KIBABII UNIVERSITY

**UNIVERSITY EXAMINATIONS  
2022/2023 ACADEMIC YEAR**

**FIRST YEAR FIRST SEMESTER  
MAIN EXAMINATIONS**

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

**COURSE CODE:** SCH 111

**COURSE TITLE:** INTRODUCTION TO INORGANIC CHEMISTRY

**DATE:** 14/12/2022

**TIME:** 2:00-4:00PM

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## 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 =  $6.02 \times 10^{23}$  particles

This paper consists of 4 printed pages. Please Turn Over

### Question 1 [30 Marks]

- i. Describe the law of conservation of mass [2 Marks]
- ii. Define an atom [2 Marks]
- iii. Describe subatomic particles and their properties [3 Marks]
- iv. Explain the difference between an element and a molecule [4 Marks]
- v. Name two *p*-block elements which are gases excluding noble gases or a halogens. [4 Marks]
- vi. Describe electrovalent bonds [2 Marks]
- vii. Explain the difference between a dative bond and a covalent bond [2 Marks]
- viii. Discuss the significance of each quantum number [4 Marks]
- ix. Describe three characteristics of electromagnetic radiation [6 Marks]
- x. How many degenerate orbitals are found in the 5g subshell? [1 Mark]

### Question 2 [20 Marks]

Describe the following atomic theories indicating their postulates and limitations

- i. Thompson's theory [6 Marks]
- ii. Rutherford's theory [6 Marks]
- iii. Dalton's atomic theory [8 Marks]

### Question 3 [20 Marks]

- i. Discuss the three basic rules or principles that govern the distribution of electrons in orbitals [6 Marks]
- ii. Using examples, explain why all transition elements are d-block elements but all d-block elements are not transition elements. [5 Marks]
- iii. Give the symbols of each atom below, including the atomic number and the mass number. [4 Marks]
  - a. tin atom with 69 neutrons
  - b. silver atom with 62 neutrons
- iv. Identify the isotope of Chromium with the same number of neutrons as Zn-65 [5 Marks]

**Question 4 [20 Marks]**

- i. Describe the basis for arrangement of elements in the periodic table [6 Marks]
- ii. Oganesson (Og) is a synthetic element with atomic number 118 describe the period and group to which it belongs [4 Marks]
- iii. Consider the elements of groups 14, 15 and 16 based on their positions in the periodic table, classify them as either metals, non metals or metalloids [8 Marks]
- iv. Name the groups that comprise the 's' block of elements. [2 Marks]

**Question 5 [20 Marks]**

- i. Following Lewis theory show the formation of a nitrogen molecule [6 Marks]
- ii. Discuss the basic postulates of VSEPR theory [6 Marks]
- iii. Discuss hybridization [4 Marks]
- iv. Determine the number of atoms and the mass of Molybdenum in  $4.60 \times 10^{-4}$  moles [4 Marks]

# PERIODIC TABLE OF THE ELEMENTS

1 IA												13 IIIA	14 IVA	15 VA
1 <b>H</b> 1.008	2 IIA											5 <b>B</b> 10.81	6 <b>C</b> 12.01	7 <b>N</b> 14.01
3 <b>Li</b> 6.94	4 <b>Be</b> 9.01											13 <b>Al</b> 26.98	14 <b>Si</b> 28.09	15 <b>P</b> 30.97
11 <b>Na</b> 22.99	12 <b>Mg</b> 24.30	3 IIIB	4 IVB	5 VB	6 VIB	7 VIIB	8 VIII	9 VIII	10 VIII	11 IB	12 IIB	13 <b>Al</b> 26.98	14 <b>Si</b> 28.09	15 <b>P</b> 30.97
19 <b>K</b> 39.10	20 <b>Ca</b> 40.08	21 <b>Sc</b> 44.96	22 <b>Ti</b> 47.90	23 <b>V</b> 50.94	24 <b>Cr</b> 52.00	25 <b>Mn</b> 54.94	26 <b>Fe</b> 55.85	27 <b>Co</b> 58.93	28 <b>Ni</b> 58.69	29 <b>Cu</b> 63.55	30 <b>Zn</b> 65.39	31 <b>Ga</b> 69.72	32 <b>Ge</b> 72.59	33 <b>As</b> 74.92
37 <b>Rb</b> 85.47	38 <b>Sr</b> 87.62	39 <b>Y</b> 88.91	40 <b>Zr</b> 91.22	41 <b>Nb</b> 92.91	42 <b>Mo</b> 95.94	43 <b>Tc</b> (98)	44 <b>Ru</b> 101.1	45 <b>Rh</b> 102.91	46 <b>Pd</b> 106.42	47 <b>Ag</b> 107.87	48 <b>Cd</b> 112.41	49 <b>In</b> 114.82	50 <b>Sn</b> 118.71	51 <b>Sb</b> 121.76
55 <b>Cs</b> 132.91	56 <b>Ba</b> 137.33	57 <b>*La</b> 138.91	72 <b>Hf</b> 178.49	73 <b>Ta</b> 180.95	74 <b>W</b> 183.85	75 <b>Re</b> 186.21	76 <b>Os</b> 190.2	77 <b>Ir</b> 192.2	78 <b>Pt</b> 195.08	79 <b>Au</b> 196.97	80 <b>Hg</b> 200.59	81 <b>Tl</b> 204.38	82 <b>Pb</b> 207.2	83 <b>Bi</b> 208.98
87 <b>Fr</b> (223)	88 <b>Ra</b> 226.02	89 <b>*Ac</b> 227.03	104 <b>Rf</b> (261)	105 <b>Db</b> (262)	106 <b>Sg</b> (266)	107 <b>Bh</b> (264)	108 <b>Hs</b> (277)	109 <b>Mt</b> (268)	110 <b>Ds</b> (271)	111 <b>Rg</b> (272)				