



*(University of Choice)*

**MASINDE MULIRO UNIVERSITY OF  
SCIENCE AND TECHNOLOGY  
(MMUST)**

**Main campus**

**UNIVERSITY SUPPLEMENTARY EXAMINATIONS**

**2021/2022 ACADEMIC YEAR**

**FORTH YEAR FIRST SEMESTER EXAMINATIONS**

**FOR THE DEGREE**

**OF**

**BACHELOR OF SCIENCE AND EDUCATION (SCIENCE)**

**COURSE CODE: SCH 210**

**COURSE TITLE: COMPARATIVE CHEMISTRY OF S AND P BLOCK ELEMENTS**

**DATE: 25<sup>th</sup> July, 2022**

**TIME: 8 – 10 a.m**

---

**INSTRUCTIONS TO CANDIDATES**

- Answer all the Questions
- Attached find periodic table

TIME: 2 Hours

**MMUST observes ZERO tolerance to examination cheating**

This Paper Consists of 4 Printed Pages. Please Turn Over. ▶

### QUESTION ONE (16 MARKS)

Comment on the following statements

- (i) The first ionization energy of lithium is lower than that of boron but higher than that of sodium. (4 marks)
- (ii) Carbon and silicon are tetravalent, but Ge, Sn and Pb show divalency (4 marks)
- (iii) Ga has higher ionization energy than Al (4 marks)
- (iv) Group II elements form more complexes than group I, and among the group II beryllium forms more complexes (mainly tetrahedral) than the rest of the group members. (4 marks)

### QUESTION TWO (19 MARKS)

- (a) (i) Explain the term "diagonal relationship". Give examples (3 marks)
  - (ii) Aluminium hydroxide is amphoteric and dissolves in both acids and bases, write a balanced equation for the reactions and explain what happens when the product of the reaction with base is acidified (use hydrochloric acid and sodium hydroxide) (4 marks)
- (b) Nitric acid is of immense industrial importance. It is synthesized by the Ostwald. Write all equations involved in the process (7 marks)
- (c) Oxygen reacts with practically all elements in the periodic table, except lighter noble gases, to form oxides. Oxides may be classified as: normal oxides, peroxides, sub oxides and super oxides. Briefly differentiate between the four oxides (5 marks).

### QUESTION THREE (18 MARKS)

- a) The elements in the long form of the periodic table have been classified into four blocks, name them, what is the basis of their classification? Describe briefly their location in the periodic table and unique properties. (8 marks)
- b) Write the order of thermal stability of hydrides of group 16 elements. (4 marks)
- c) What are electron deficient compounds? Are  $\text{SiCl}_4$  and  $\text{BCl}_3$  electron deficient species? (6 marks)

**QUESTION FOUR (17 MARKS)**

a) Give one method for industrial preparation and one for laboratory preparation of CO and CO<sub>2</sub> each. (4 marks)

b) Explain the following

- i. Poisonous nature of Carbon Monoxide (3 marks).
- ii. Excess CO<sub>2</sub> responsible for global warming (3 marks)

c) i. Why is N<sub>2</sub> less reactive at room temperature? (1 mark)

ii. Write the equation and mention the conditions required to maximize the yield of ammonia in Haber's process. (6 marks)

MAIN-GROUP ELEMENTS

# Periodic Table of the Elements

MAIN-GROUP ELEMENTS

MAIN-GROUP ELEMENTS		TRANSITION ELEMENTS																MAIN-GROUP ELEMENTS						
1A (1)																		8A (18)						
1	1 H 1.008																	2	2 He 4.003					
2	3 Li 6.941	4 Be 9.012																	5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
3	11 Na 22.99	12 Mg 24.31	3B (3)	4B (4)	5B (5)	6B (6)	7B (7)	8B (8) (9) (10)			1B (11)	2B (12)	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95						
4	19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.88	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 72.61	33 As 74.92	34 Se 78.96	35 Br 79.90	36 Kr 83.80						
5	37 Rb 85.47	38 Sr 87.62	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 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3						
6	55 Cs 132.9	56 Ba 137.3	57 La 138.9	72 Hf 178.5	73 Ta 180.9	74 W 183.9	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (209)	85 At (210)	86 Rn (222)						
7	87 Fr (223)	88 Ra (226)	89 Ac (227)	104 Rf (261)	105 Db (262)	106 Sg (266)	107 Bh (262)	108 Hs (265)	109 Mt (266)	110 (269)	111 (272)	112 (277)	As of mid-1999, elements 110 through 112 have not yet been named											

INNER TRANSITION ELEMENTS

6	Lanthanides	58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm (145)	62 Sm 150.4	63 Eu 152.0	64 Gd 157.3	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0
7	Actinides	90 Th 232.0	91 Pa (231)	92 U 238.0	93 Np (237)	94 Pu (242)	95 Am (243)	96 Cm (247)	97 Bk (247)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (260)