

JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY SCHOOL OF BIOLOGICAL AND PHYSICAL SCIENCES UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF EDUCATION (SCIENCES) 2nd YEAR 2nd SEMESTER 2020/2022 ACADEMIC YEAR MAIN REGULAR

COURSE CODE: SPB 9301 COURSE TITLE: Chemistry of the S - and P - Block Elements EXAM VENUE: STREAM: (BEd. Science) DATE: TIME: EXAM SESSION:

INSTRUCTIONS:

1. Answer question 1 (Compulsory) in section A and ANY other 2 questions in

Section B.

- 2. Candidates are advised not to write on the question paper.
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room.
- 4. Some important information, formulas and the periodic table are found on the last page of this question paper

SECTION A

Question 1

a) Discuss the source of unique flame colors in Group I and II elements leading to their 'flame test' as a possible qualitative identification.

(6 marks)

- b) Briefly discuss oxidation of Group 1 elements. (6 marks)
- c) Briefly explain why Boron is unable to form BF_6^{3-} ion. (3 marks)
- d) Using the electronic configuration of S block elements, justify their placement into group I and II of the periodic table. (3 marks)
- e) Briefly explain why the ionic radius of Lithium Ion (0.06 nm) is less than half the atomic radius of Lithium atom (0.15)(3 marks)
- f) Select the member(s) of group 14 that (i) forms the most acidic dioxide, (ii) is commonly found in +2 oxidation state, (iii) used as semiconductor.
 (3 marks)
- g) Diamond is covalent, yet it has high melting point. Substantiate this statement. (3 marks)
- h) Explain in brief why the boiling point of Mg is lower than that of other members in Group II. (3 marks)

Section B. Answer any <u>TWO</u> questions

Question 2

a)	Explain briefly why hydration enthalpies of Group II ions are more						
	negat	(4 marks)					
b)	Give	reactions:					
	i.	Decomposition of barium carbonate.	(2 marks)				
	ii.	Reaction between sodium hydride and water.	(2 marks)				
	 111.	Reaction between sodium peroxide and water.	(2 marks)				

- c) Give balanced chemical equations for the following reactions:
 - (i) Decomposition of barium carbonate;
 - (ii) Reaction between sodium hydride and water;
 - (iii) Reaction between sodium peroxide and water

(6 marks)

Complete the following reactions

(4 marks)

- i. BeO(s) + 2OH⁻(aq) + H₂O(l) \longrightarrow
- ii. $2Cr(OH)_3(s) + 3Na_2O_2(s) \longrightarrow$

Question 3

- a) *p*-Block of the periodic table comprises of metals, non-metals and metalloids. By use of examples, discuss these classes of p block elements.
 (6 marks)
- b) All Group I and II metals react with H₂(g) to form metal hydrides.
 Illustrate the statement by giving 2 equations for each group.

(4 marks)

- c) Most of the S block elements react with oxygen at various temperatures to give oxides, peroxides and superoxide. Provide structural differences among the above oxides by drawing their Lewis structures.
- d) Provide balanced chemical equations for the reaction of group 1 and II elements with molecular chlorine. (4 marks)

Question 4

a) Briefly explain why the reaction of lithium with water is lessvigorous than those of sodium and potassium (2 marks)

- b) Suggest a reason why barium sulphate (VI) is insoluble in water while potassium sulphate (VI) is soluble in water although they have cations of similar sizes and the same anion. (The ionic radii of potassium ion and barium ion are 0.133 nm and 0.135 nm respectively.)
- b) Hydrolysis of dimethyldichlorosilane, (CH₃)₂SiCl₂ followed by condensation polymerisation yields straight chain polymers. Use structural formulas to demonstrate the above reaction. (5 marks)
- c) Briefly explain the formation of Zeolites. (5 marks)
- d) Describe the electronic arrangement of Boron, Aluminium, Gallium, Indium and Thalium. (5 marks)

Question 5

a) Briefly describe sources and extraction of:

i.	Soda ash	(4 marks)
ii.	Bauxite	(4 marks)
iii.	Fluorspar	(4 marks)
iv.	Nitrogen	(4 marks)
v.	Carbon dioxide	(4 marks)

18 2 4.00	10 Ne 20.18 18 39.95	36 Kr 83.80	54 Xe 131.30	86 Rn 222		71 Lu 174.97	103 Lr 262
17	9 F 17 C 35.45	35 Br 79.91	53 126.90	85 At 210		70 Yb 173.04	102 NO 259
16	8 16.00 16 32.06	34 Se 78.96	52 Te 127.60	84 PO 210		69 Tm 168.93	101 Md 258.10
15	7 N 14.01 15 30.97	33 AS 74.92	51 Sb 121.75	83 Bi 208.98		68 Er 167.26	100 Fm 257.10
14	6 12.01 14 Si 28.09	32 Ge 72.59	50 Sn 118.71	82 Pb 207.19		67 Ho 164.93	99 ES 252.09
13	5 B 10.81 13 A 26.98	31 Ga 69.72	49 In 114.82	81 TI 204.37		66 Dy 162.50	98 Cf 252.08
	12	30 Zn 65.41	48 Cd 112.40	80 Hg 200.59	112 Uub [285]	65 Tb 158.92	97 Bk 249.08
Z nass, A _r	5	29 Cu 63.54	47 Ag 107.87	79 Au 196.97	111 Rg [272]	64 Gd 157.25	96 Cm 244.07
number, symbol atomic r	10	28 Ni 58.69	46 Pd 106.42	78 Pt 195.08	110 DS [271]	63 Eu 151.96	95 Am 241.06
- Atomic - Element - Relative	ი	27 CO 58.93	45 Rh 102.91	77 Ir 192.22	109 Mt [268]	62 Sm 150.35	94 Pu 239.05
• • •	00	26 Fe 55.85	44 Ru 101.07	76 OS 190.23	108 HS [277]	61 Pm 146.92	93 Np 237.05
- T	2	25 Mn 54.94	43 TC 98.91	75 Re 186.21	107 Bh [264]	60 Nd 144.24	92 U 238.03
1.0	و	24 Cr 52.01	42 Mo 95.94	74 V 183.85	106 Sg [266]	59 Pr 140.91	91 Pa 231.04
	'n	23 V 50.94	41 Nb 92.91	73 Ta 180.95	105 Db [262]	58 Ce 140.12	90 Th 232.04
	4	22 Ti 47.90	40 Zr 91.22	72 Hf 178.49	104 Rf [261]	57 La 138.91	89 AC 227.03
	m	21 SC 44.96	39 X 88.91	La-Lu	Ac-Lr		
2	4 Be 9.01 12 Mg	20 Ca 40.08	38 Sr 87.62	56 Ba 137.34	88 Ra 226.03	anoids	loids
- H	3 Li 6.94 11 Na 22.99	19 K 39.10	37 Rb 85.47	55 CS 132.91	87 Fr 223	Lant	Actin

Periodic table