



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

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**COURSE CODE: SPB 9301**

**COURSE TITLE: Chemistry of the S - and P - Block Elements**

**EXAM VENUE:**

**STREAM: (BEd. Science)**

**DATE:**

**TIME:**

**EXAM SESSION:**

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**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  $\text{BF}_6^{3-}$  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 TWO questions

#### Question 2

- a) Explain briefly why hydration enthalpies of Group II ions are more negative than those of Group I (4 marks)
- b) Give balanced chemical equations for the following reactions:
- Decomposition of barium carbonate. (2 marks)
  - Reaction between sodium hydride and water. (2 marks)
  - Reaction between sodium peroxide and water. (2 marks)

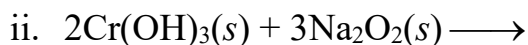
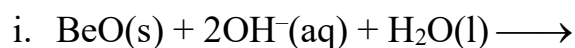
c) Give balanced chemical equations for the following reactions:

- (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)



### 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  $\text{H}_2(g)$  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. (6 marks)

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 less vigorous 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.) (3 marks)
- b) Hydrolysis of dimethyldichlorosilane,  $(\text{CH}_3)_2\text{SiCl}_2$  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 Thallium. (5 marks)

### Question 5

- a) Briefly describe sources and extraction of:
- Soda ash (4 marks)
  - Bauxite (4 marks)
  - Fluorspar (4 marks)
  - Nitrogen (4 marks)
  - Carbon dioxide (4 marks)

