



# KIBABII UNIVERSITY

**UNIVERSITY EXAMINATIONS  
2020/2021 ACADEMIC YEAR**

**THIRD YEAR FIRST SEMESTER  
SUPPLEMENTARY EXAMINATIONS**

**FOR THE DEGREE OF BACHELOR OF EDUCATION SCIENCE**

**COURSE CODE: SCH 311**

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

**DURATION: 2 HOURS**

**DATE: 10/01/2022**

**TIME: 8 – 10AM**

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## INSTRUCTIONS TO CANDIDATES

- Answer **QUESTION ONE** (Compulsory) and any other two (2) Questions.
- Indicate **answered questions** on the front cover.
- Start every question on a new page and make sure question's number is written on each page.

This paper consists of 3 printed pages. Please Turn Over



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### Question 1

- a) Compare the alkali metals and alkaline earth metals with respect to
- ionization enthalpy [2mks]
  - Solubility of hydroxides [2mks]
- b) Explain the structure of  $\text{BeCl}_2$  [3mks]
- c) Explain the anomalous behaviour of beryllium [4mks]
- d) Mention four Diagonal Relationship between Beryllium and Aluminium [4mks]
- e) Explain two reasons why Beryllium shows diagonal relationship with aluminium. [4mks]
- f) Discuss the pattern of variation in the oxidation states of
- B to Tl [2mks]
  - C to Pb. [2mks]
- g) Explain the following observations
- The mobilities of alkali metal ions in aqueous solutions are  $\text{Li}^+ < \text{Na}^+ < \text{K}^+ < \text{Rb}^+ < \text{Cs}^+$   
[2mks]
  - A solution of sodium carbonate is alkaline [2mks]
- h) State three Biological importances of Sodium. [3mks]

### Question 2.

- a) i) Describe the shapes of  $\text{BF}_3$  and  $\text{BH}_4^-$ . Assign the hybridisation of boron in these species. [4mks]
- ii) The B-F bond lengths in  $\text{BF}_3$  (130 pm) and  $\text{BH}_4^-$  (143 pm). Explain. [2mks]
- b) Write reactions to justify amphoteric nature of aluminium. [2mks]
- c) Explain the following [6mks]
- B-Cl bond has a dipole moment, but  $\text{BCl}_3$  molecule has zero dipole moment.
  - Aluminium trifluoride is insoluble in anhydrous HF but dissolves on addition of NaF.
  - There a phenomenal decrease in ionization enthalpy from carbon to silicon.
- d) Using equations explain what happens when; [6mks]

- i. Borax is heated strongly
- ii. Boric acid is added to water
- iii.  $\text{BF}_3$  is reacted with ammonia.

### Question 3.

- a) Account for the following: [8 mks]
- i. Bond angle in  $\text{NH}_4^+$  is higher than  $\text{NH}_3$ .
  - ii.  $\text{H}_2\text{S}$  has lower boiling point than  $\text{H}_2\text{O}$ .
  - iii. Fluorine does not exhibit any positive oxidation state.
  - iv.  $\text{HClO}_4$  is a stronger acid than  $\text{HClO}$ .
- b) What is the difference between the structure of  $\text{AlCl}_3$  and diborane? [4mks]
- c) Arrange the hydrides of group 16 in increasing order of their acidic character. Justify your answer. [2mks]
- d) Draw structure of the following [6mks]
- i.  $\text{XeOF}_4$ .
  - ii.  $\text{H}_3\text{PO}_2$
  - iii.  $\text{BrF}_3$

### Question 4.

- a) Give reasons: [10mks]
- i. Con.  $\text{HNO}_3$  can be transported in aluminium container.
  - ii. A mixture of dilute  $\text{NaOH}$  and aluminium pieces is used to open drain.
  - iii. Aluminium alloys are used to make aircraft body.
  - iv. Aluminium utensils should not be kept in water overnight.
  - v. Aluminium wire is used to make transmission cables.
- b) Describe the conditions and the steps involved in the manufacture of sulphuric acid by contact process. Write the necessary reactions. (No diagram is required) [6mks]
- c) Mention four major components of Portland cement. [4mks]

### Question 5

- a. Explain the following; [6mks]
- i.  $\text{H}_2\text{O}$  has higher bond angle than  $\text{H}_2\text{S}$