

INSTRUCTIONS: Answer question **one** and any other two questions

QUESTION ONE

- a) Explain the following observations
- Caesium has a covalent radius of 245 pm while Lithium has a covalent radius of 123 pm. (2mks)
 - Rubidium ion has an ionic radius of 148 pm while rubidium atom has a covalent radius of 216 pm (2mks)
 - Sodium is soft and low density while magnesium is hard and high density (2mks)
 - H₂O has a bond angle of 104.5° while H₂S has a bond angle of 92°. (2mks)
 - Lithium ion (Li⁺) conducts electricity least as compared to potassium ion (K⁺) yet lithium ion has an ionic radius of 60 pm while potassium ion has a radius of 133 pm (2mks)
- b) What do you understand by 'diagonal relationship of elements'? Give two pairs of elements which show diagonal relationship. *beryllium and aluminium* (4mks)
- c) List three ways in which lithium differs from other elements. *-small size* (3mks)
- d) Draw the structure of the following: (3mks)
- tetrafluoroberyllium ion [BeF₄]⁻
 - BeCl₂
 - Be₂Cl₄
- e) Give the products of reacting calcium carbide with water. Identify the carbide present in this calcium carbide (3mks)
- f) Organometallic compounds of group II elements are important in synthesis of alcohols from ketones or aldehydes. What name is given to organomagnesium compounds? Explain briefly how these compounds are prepared. (4mks)
- g) Define the term inert pair effect. Explain why Thallium forms Tl₂O and not Tl₂O₃. (3mks)

QUESTION TWO

- a) Suggest possible reasons for the following observations
- The relative strength of boron halides, BX₃, as Lewis acids is in the order of BBr₃ > BCl₃ > BF₃ (3mks)
 - The coordination number of nitrogen is limited to four while the elements in the group may be extended to five or six (2mks)
 - The first ionization enthalpy of boron and aluminium in kJmol⁻¹ are as follows: B(800) and Al(578) (2mks)
 - Aluminum chloride is used as a Lewis acid in Friedel-Craft alkylation reactions while magnesium chloride is not. (3mks)
 - Group III elements have smaller atomic radius than s-block elements, however the atomic radius of Gallium is 135 pm while that of aluminium is 143 pm. (3mks)
 - B-F bond in BF₃ is shorter than the sum of covalent radius of boron (80 pm) and F (72 pm) (4mks)
- b) Sodium borohydride is an important reducing agent in organic chemistry. Explain how it is prepared from sodium hydride. Equations required. (3mks)

b) Briefly explain the importance of the computed rates (7 mks)

QUESTION FIVE

A County Director of education has appointed a principal to lead a school whose performance is among the lowest in the district. The director informs the principal that the first goal upon taking over leadership of the school must be to improve student achievement as measured by standardized test scores, as well as achievements in co-curricular dimensions.

- (a) Outline strategies the principal should adopt towards realizing the goal' (7 marks)
- (b) Highlight some of the challenges the principal is expected to face in implementing strategies for better performance (8 marks)

QUESTION SIX

- (a) Discuss the importance of micro- project planning in education (7 mks)
- (b) Discuss challenges faced during implementation of educational plans in Kenyan Universities (8 marks)