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University Examinations 2016/2017

SECOND YEAR, FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE PHYSICAL, BIOLOGICAL, BIOCHEMISTRY AND BACHELOR OF EDUCATION SCIENCE

SCH 3200: COMPARATIVE STUDY OF S- AND P BLOCK ELEMENTS

DATE: December, 2016 **TIME: 2 HOURS**

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

QUESTION ONE - (30 MARKS)

a) Hydrogen has a very rich chemistry, despite its simplicity. Discuss the following;
   (i) Isotopes of hydrogen (3 Marks)
   (ii) Industrial preparation of hydrogen (3 Marks)
   (iii) Uses of hydrogen (3 Marks)

b) Account for the decrease in first ionization energy between phosphorous (P) and sulphur (S). (2 Marks)

c) Cyanide ion (CN^-) and carbon monoxide (CO) are isoelectronic and both are poisonous;
   (i) Define the term isoelectronic (1 Mark)
   (ii) Explain their toxicity (3 Marks)
   (iii) State their differences in coordination chemistry (2 Marks)

d) State three anomalous behaviour of Boron (B) compared to the other elements in group III A. (4 Marks)

e) CCl_4 is unreactive to water, while $SiCl_4$ is rapidly hydrolysed. Explain. (4 Marks)

f) Li_2CO_3 is used in medicine as therapeutic drug. Using chemical equations show two ways in which Li_2CO_3 can be prepared in the laboratory. (2 Marks)

g) Describe how Grignard reagent is prepared. (3 Marks)

QUESTION TWO (20 MARKS)

a) Predict the probable products of the following reactions, and write the balanced chemical equations;

(i) BF_3 and excess NaF in acidic aqueous solution. (3 Marks)

(ii) BCl_3 and excess NaCl in acidic aqueous solution (3 Marks)

b) (i) What are interhalogens? (1 Mark)

(ii) Give an example of neutral and cationic interhalogen. (2 Marks)

c) Distinguish between Electronegativity and electron affinity. (2 Marks)

d) Explain the meaning of the following terms;

(i) Nanotubes (2 Marks)

(ii) Megatubes (2 Marks)

e) Compare the reducing abilities in group I and II elements. (3 Marks)

f) Explain the observation; that F – F bond is very weak. (2 Marks)

QUESTION THREE (20 MARKS)

a) Give a brief account of the Chemistry and uses of Nitrogen Oxides and Oxy ions.(8 Marks)

b) Explain the following observations. (4 Marks)

(i) The boiling point of hydride of oxygen is higher than of sulphur.

(ii) Nitrogen is considered inactive.

c) Fluorine and Oxygen show some diagonal relationship. Give four similarities in both elements and their compounds. (4 Marks)

d) The tendency for Oxygen and Sulphur to catenate increases as the atomic size increases.

(i) Explain the tem catonation (1 Mark)

(ii) Account for the increase in catenation down the group. (3 Marks)

QUESTION FOUR (20 MARKS)

a) Chemistry of Lithium resembles that of Magnesium and differ from other group 1 elements. Illustrate this with suitable examples. (6 Marks)

b) (i) What are hydrides? (1 Mark)

(ii) Classify the following hydrides and discuss their physical properties C_5H,H_f H_{15}, PH_3 B_2H_6 and NH_3 (4 Marks)

(iii) For the molecular compounds in b(ii) above specify the sub classification electron-deficient, electron-precise and electron rich. (2 Marks)

c) What are allotropes? Name three allotropes of phosphorous. (4 Marks)

d) By means of balanced chemical equation and a statement of conditions describe a suitable synthesis of Xenon difluoride. (3 Marks)