CHUKA  **UNIVERSITY**

UNIVERSITY EXAMINATION
RESIT/SUPPLEMENTARY / SPECIAL EXAMINATIONS
EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE

CHEM 212: COMPARATIVE STUDY OF S- AND P-BLOCK ELEMENTS

STREAMS: **TIME: 2 HOURS**

DAY/DATE: TUESDAY 02/11/2021 **11.30 A.M - 1.30 P.M.**

INSTRUCTIONS:

- **Answer all questions**

QUESTION ONE (30 MARKS)

a) Define diagonal relationship (2 marks)

b) Give three similarities between lithium and magnesium (3 marks)

c) Give two anomalous behavior of lithium as compared to other alkali metals (2 marks)

d) Complete and balance the following reactions (3 marks)

i) $Li + O_2 \longrightarrow A$

ii) $Na + O_2 \longrightarrow B$

iii) $K + O_2 \longrightarrow C$

e) Explain the behavior of alkali metals in liquid ammonia and comment on their colour and magnetism on being left standing (3 marks)

f) Define ionization energy and give three factors affecting ionization energy (2 marks)

g) Give two reasons for the inertness of noble gases (2 marks)

h) Explain why fluorine exhibit only $^{-}1$ oxidation states whereas other halogens exhibit variable oxidation states (3 marks)

i) Write the short hand notation electronic configuration of the following elements (5 marks)

I) Na [11]

II) Ca [20]

III) Se[21]

IV) Cr[25]

V) Cu[29]

j) Using an equation define the effective nuclear nuclear charge (5 marks)

QUESTION TWO (20 MARKS)

a) Briefly explain the following properties with respect to alkaline earth metals (6 marks)

i) Atomic and ionic radii

ii) Ionization enthalpies

iii) Hydration enthalpies

b) Explain briefly two anomalous behavior of Beryllium (2 marks)

c) Using an equation give the two parts of the wave function and explain the two parts briefly (3 marks)

d) i) Define a radial distribution function (2 marks)

ii) Plot the radial distribution function of a 1s and a 2s orbital (3 marks)

e) Find the number of nodes in a 4s and 4p orbital (1 marks)

f) Calculate the shielding constant and effective nuclear charge experienced by an electron in the valence p electron and 3d orbital in bromine (3 marks)

QUESTION THREE (20 MARKS)

a) Give two reasons why fluorine is a stronger oxidizing agent than chlorine (2 marks)

b) Using suitable equations prove that PH_3 is basic in nature (2 marks)

c) Using suitable equations give two laboratory methods for preparation of dioxygen (4 marks)

d) Write short notes on the following:

i) White phosphorous (2 marks)

ii) Red phosphorous (2 marks)

iii) Black phosphorous (2 marks)

e) Explain why nitric acid is a stronger acid than H_3PO_3 (2 marks)

f) Give two methods for laboratory preparation of ammonia using an equation (2 marks)

g) Explain why graphite is a better electrical conductor than diamond and why its conductivity depends on direction (2 marks)

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