



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF PURE & APPLIED SCIENCES

UNIVERSITY EXAMINATION FOR:

BTAC 15

ACH 4201 : S AND P BLOCK ELEMENTS

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2016

TIME: 2 HOURS

DATE: Pick Date Dec 2016

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of **FIVE** questions. Attempt question ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

Question ONE

(a) Explain briefly the following observations;

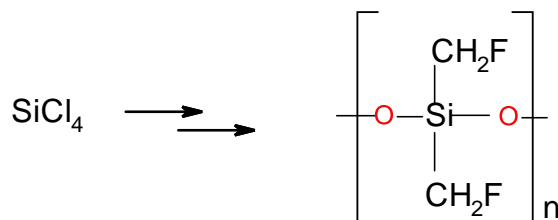
- i. Be has greater tendency of forming covalent compounds unlike the rest of the members [2marks]
- ii. S and p block elements are poor complexing agents compared to members of transition elements. [2marks]
- iii. Salts of group 3 in solution are acidic, they turn blue litmus paper red [2marks]
- iv. KNO_3 is thermally more stable than $\text{Ca}(\text{NO}_3)_2$ [2marks]

(b) Study the information in the table below and use it to answer the questions that follow.

<u>Compound</u>	<u>Molecular weight</u>	<u>Boiling point in ($^{\circ}\text{C}$)</u>
H_2O	18	100
H_2S	34	-62
H_2Se	81	-42
H_2Te	130	-2

Explain the variation in boiling point of the hydrides of group VI elements in above table [3marks]

(c) (i) Starting with SiCl_4 , illustrate using equations how the structure below can be prepared [4marks]



- (ii) State two uses of the structure in Q(c) (i) above [2marks]
- (d) Explain why down the group 3 members, the oxidation state (+1) become more stable than oxidation state (+III). [3marks]
- (e) Using examples, suggest four reasons as to why hydrogen should be treated in its own group [4marks]
- (f) Starting with $\text{Na}[\text{BH}_4]$, explain how H_3BO_3 is prepared [3marks]
- (g) Using examples state three ways in which CN^- resembles; chloride, bromide and iodide ions [3marks]

Question TWO

- (a) (i) Give a detailed account on how one can ascertain the presence of Al metal from its chief ore [bauxite] sample [5marks]
- (ii) By using equations explain how Al metal can be recovered from its ore [9marks]
- (iii) State three economic importance of Al metal [3marks]
- (b) Using examples, state 3 diagonal relationships between Al and Be [3marks]

Question THREE

- (a) Explain how each of the following compounds is prepared
- (i) Cl_2O
- (ii) ClO_2 [3marks]
- (b) State one use for each of the chemicals in Q3(a) above [2marks]
- (c) Explain why the strength of the oxoacids in group 7 decrease in the order; $\text{HClO}_4 > \text{HClO}_3 > \text{HClO}_2 > \text{HClO}$ [3marks]
- (d) Apart from cyanide ion, state 3 other examples of pseudo halides ions [3marks]
- (e) Explain the meaning of the term 'hydrogen gap' [2marks]
- (f) Using examples where applicable, differentiate between ionic hydrides and covalent hydrides [7marks]

Question FOUR

- (a) Write down stoichiometric equations for the reaction between;
- i. Beryllium carbide and water
- ii. Calcium carbide and water [2marks]
- (b) Define the term 'glass' [1mark]
- (c) Explain why the following steps are taken in account during glass processing
- i. Addition of metallic oxides to silicates [2marks]
- ii. Addition of PbO [2marks]
- iii. Addition of B and Al [2marks]

- iv. Addition of NaNO_3 and As_2O_3 [2marks]
- (d) Explain why, pentahalides of nitrogen don't exist but for the other members they exist [3marks]
- (e) Using valence bond theory (V.B.T), explain why the aqueous chemistry of lithium ions is restricted to tetrahedral while for aluminium ions can go up to octahedral structure. [6marks]

Question FIVE

- (a) State and write the formula of the chief constituent of Portland cement [2marks]
- (b) Based on chemical composition explain briefly how each of the following brands of cement are made
- Portland cement
 - High alumina cement
- (c) State the difference between inorganic benzene and benzene [2marks]
- (d) Explain why trimethylamine is a Lewis base, but trisilylamine is not [3marks]
- (e) Explain the differences between permanent and temporary hardness of water [3marks]
- (f) Explain how water hardness can be removed [4marks]

Appendix

Periodic Table of the Elements

1 H Hydrogen 1.008																	2 He Helium 4.003
3 Li Lithium 6.941	4 Be Beryllium 9.012											5 B Boron 10.811	6 C Carbon 12.011	7 N Nitrogen 14.007	8 O Oxygen 15.999	9 F Fluorine 18.998	10 Ne Neon 20.180
11 Na Sodium 22.990	12 Mg Magnesium 24.305											13 Al Aluminum 26.982	14 Si Silicon 28.086	15 P Phosphorus 30.974	16 S Sulfur 32.066	17 Cl Chlorine 35.453	18 Ar Argon 39.948
19 K Potassium 39.098	20 Ca Calcium 40.078	21 Sc Scandium 44.956	22 Ti Titanium 47.867	23 V Vanadium 50.942	24 Cr Chromium 51.996	25 Mn Manganese 54.938	26 Fe Iron 55.845	27 Co Cobalt 58.933	28 Ni Nickel 58.693	29 Cu Copper 63.546	30 Zn Zinc 65.38	31 Ga Gallium 69.723	32 Ge Germanium 72.631	33 As Arsenic 74.922	34 Se Selenium 78.971	35 Br Bromine 79.904	36 Kr Krypton 84.798
37 Rb Rubidium 84.468	38 Sr Strontium 87.62	39 Y Yttrium 88.906	40 Zr Zirconium 91.224	41 Nb Niobium 92.906	42 Mo Molybdenum 95.95	43 Tc Technetium 98.907	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.905	46 Pd Palladium 106.42	47 Ag Silver 107.868	48 Cd Cadmium 112.414	49 In Indium 114.818	50 Sn Tin 118.711	51 Sb Antimony 121.760	52 Te Tellurium 127.6	53 I Iodine 126.904	54 Xe Xenon 131.294
55 Cs Cesium 132.905	56 Ba Barium 137.328	57-71 Lanthanides	72 Hf Hafnium 178.49	73 Ta Tantalum 180.948	74 W Tungsten 183.84	75 Re Rhenium 186.207	76 Os Osmium 190.23	77 Ir Iridium 192.217	78 Pt Platinum 195.085	79 Au Gold 196.967	80 Hg Mercury 200.592	81 Tl Thallium 204.383	82 Pb Lead 207.2	83 Bi Bismuth 208.980	84 Po Polonium [209]	85 At Astatine [209]	86 Rn Radon 222.018
87 Fr Francium 223.020	88 Ra Radium 226.025	89-103 Actinides	104 Rf Rutherfordium [261]	105 Db Dubnium [262]	106 Sg Seaborgium [266]	107 Bh Bohrium [264]	108 Hs Hassium [269]	109 Mt Meitnerium [268]	110 Ds Darmstadtium [269]	111 Rg Roentgenium [272]	112 Cn Copernicium [277]	113 Uut Ununtrium unknown	114 Fl Flerovium [289]	115 Uup Ununpentium unknown	116 Lv Livermorium [293]	117 Uus Ununseptium unknown	118 Uuo Ununoctium unknown
57 La Lanthanum 138.905	58 Ce Cerium 140.116	59 Pr Praseodymium 140.908	60 Nd Neodymium 144.243	61 Pm Promethium 144.913	62 Sm Samarium 150.36	63 Eu Europium 151.964	64 Gd Gadolinium 157.25	65 Tb Terbium 158.925	66 Dy Dysprosium 162.500	67 Ho Holmium 164.930	68 Er Erbium 167.259	69 Tm Thulium 168.934	70 Yb Ytterbium 173.055	71 Lu Lutetium 174.967			
89 Ac Actinium 227.028	90 Th Thorium 232.038	91 Pa Protactinium 231.036	92 U Uranium 238.029	93 Np Neptunium 237.048	94 Pu Plutonium 244.064	95 Am Americium 243.061	96 Cm Curium 247.070	97 Bk Berkelium 247.070	98 Cf Californium 251.083	99 Es Einsteinium [254]	100 Fm Fermium 257.095	101 Md Mendelevium 258.1	102 No Nobelium 259.101	103 Lr Lawrencium [262]			

Alkali Metal

Alkaline Earth

Transition Metal

Basic Metal

Semimetal

Nonmetal

Halogen

Noble Gas

Lanthanide

Actinide

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