QUESTION PAPER

THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

FIRST SEMESTER EXAMINATION

CH212 – APPLIED INORGANIC CHEMISTRY

THURSDAY 10th JUNE 2021 12:50 PM

TIME ALLOWED: 2 HOURS

INFORMATION FOR CANDIDATES:

- 1. You will have 10 minutes to read the question paper. You **MUST NOT** begin writing in the answer book during this time.
- 2. ANSWER ALL QUESTIONS.
- 3. All answers MUST be written on the answer book provided
- 4. Calculators are permitted in the examination room. Lecture notes, notebooks plain papers and textbooks are **NOT** allowed.
- 5. Mobile phones are not allowed. SWITCH OFF THE MOBILE PHONES.
- 6. Show all workings and calculations in the answer book.
- 7. DRAW the STRUCTURES clear and visible.
- 8. **DO NOT** over write.
- 9. Write your name and number clearly on the front page. DO IT NOW.

MARKING SCHEME: Total 50 marks

- 1. (a) Draw the structure of [Na (15-crown-5)]⁺
 - (b) Amongst Gallium, Indium and Thallium, which one possesses the most stable +1 oxidation state and Why?
 - (c) Suggest any TWO properties of saline hydrides.
 - (d) What are interhalogen compounds? Give ONE example.

(8 marks)

- 2. (a) Calculate the spin only magnetic moment $[\mu(s.o)]$ for V^{2+} and Co^{3+} ions.
 - (b) Explain Down's process for the extraction of sodium.
 - (c) What are feldspars and how are they classified?
 - (d) Draw a simple diagram of graphene and explain its structure.
 - (e) Explain the KROLL process for the extraction of Titanium metal.
 - (f) Give any FOUR similarities between hydrogen and alkali metals.
 - (g) Complete the following equations (may have more than one product) and balance them:

(i)
$$\text{Li}_3\text{N} + \text{H}_2 \rightarrow$$

(ii) _____ +
$$F_2 \rightarrow O_2 + VF_5$$

(iii)
$$CaC_2 + H_2O \rightarrow$$

(iv)
$$\longrightarrow$$
 Fe + CO₂

(h) Starting from chromite (FeCr₂O₄), explain how chromium metal is extracted.

(32 marks)

3. (a) What do you mean by 'diagonal relationship' in the periodic table? Give ONE example. What are the factors that contribute to the existence of diagonal relationship?

- (b) Draw a neat Molecular Orbital (MO) diagram for nitrogen molecule. Using this diagram, calculate the bond order of the following:
 - (i) N_2^{2+}
 - (ii) N_2^-

(10 marks)

DATA SHEET

1. The periodic table of elements

	Periodic Table of the Elements																		
1A														http://chemistry.about.com					
1	l												©2012 Todd Helmenstine						
I н I														About Chemistry					
1 00794	2A						ЗА	4A	5A	6A	7A	4 002602							
3	4	1					5	6	7	8	9	10							
Li	Be						В	С	N	0	F	Ne							
6 94 1	9 012182						10 811	12 0107	14 0067	15 9994	18 9994032	20 1797							
11	12	1										13	14	15	16	17	18		
Na	Mg											Al	Si	Р	S	CI	Ar		
22 989769	24 3050	3B	4B	5B	6B	7B		— 8B —		1B	2B	26 98 15386	28 0855	30 973762	3.2 065	35 453	39 948		
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36		
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr		
39 0983	40 078	44 955912	47 857	50 94 15	51 9961	54'938045	55 845	58 933 195	58 6934	63.546	65.38	69.723	72 64	74 92160	78 96	79 904	83 798		
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54		
Rb	Sr	Υ	Zr	Nb	Mo	Тс	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	1	Xe		
95 4678	87 62	88 90585	91 224	92 90638	95 98	[98]	101 07	102 90550	106 42	107 8682	112 411	114 818	118 710	121 760	127 60	126 90447	131 293		
55	56	57-71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86		
Cs	Ba		Hf	Ta	w	Re	Os	lr	Pt	Au	Hg	TI	Pb	Bi	Po	At	Rn		
132 9054519	137 327	Lanthanides	178 49	180 94788	183 84	186 207	190 23	192 217	195 084	196 966569	200 59	204 3833	207.2	208 98040	[209]	[210]	[222]		
87	88	89-103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118		
Fr	Ra		Rf	Db	Sg	Bh	Hs	₩t	Ds	Rg	Cn	Uut	FI	Uup	Lv	Uus	Uuo		
[223]	[226]	Actiredes	[267]	[268]	[271]	[272]	[270]	[276]	[281]	[280]	[285]	[284]	[289]	[268]	[293]	[294]	[294]		
					10011								COVID-BING-						
			57	58	59	60	61	62	63	64	65	66	67	68	69	70	71		
			La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu		
			138 90547	140 116	140 90765	144 242	[145]	150 36	151 984	157 25	158 92535	162 500	164 93032	167 259	168 93421	173 054	174 9558		
			69	90	91	92	93	94	95	96	97	98	99	100	101	102	103		
			Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr		
			[227]	232 03806	231 03588	238 02891	[237]	[244]	[243]	[247]	[247]	[251]	(252)	[257]	{258}	[259]	[262]		