

THE PAPUA NEW GUINEA UNIVERSITY OF TECHNOLOGY

FIRST SEMESTER EXAMINATION

CH212 – APPLIED INORGANIC CHEMISTRY

FRIDAY 3rd JUNE 2022 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** overwrite.
9. Write your name and number clearly on the front page. **DO IT NOW.**

MARKING SCHEME: Total 50 marks

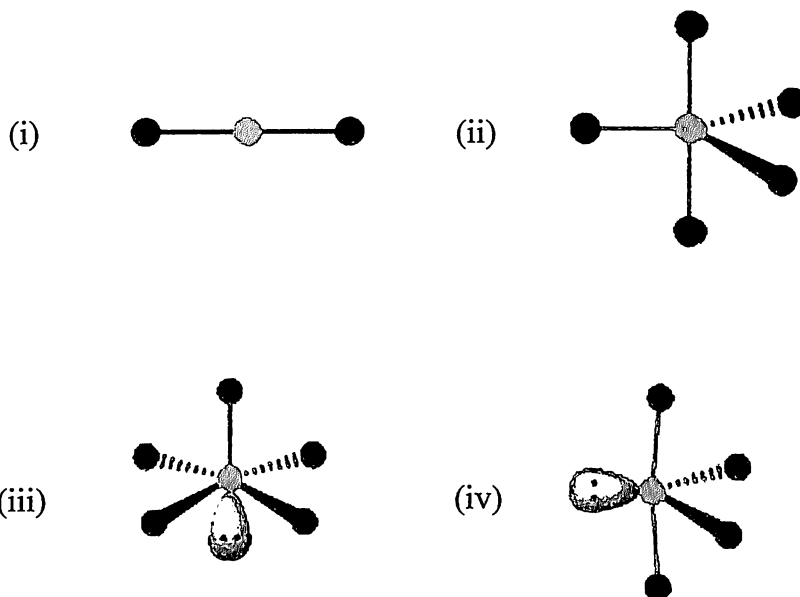
1. (a) Draw the resonance structure of nitrite ion.
- (b) Among these materials: diamond, liquid water, O₂, O₃, SO₂, O₄, CO, SO₃, red selenium, fullerene; pick the ones which are NOT considered as allotropes. Justify your choice.
- (c) Draw the structure of [K (18-crown-6)]⁺
- (d) Name any TWO factors that contribute to the existence of diagonal relationship in the periodic table.

(8 marks)

2. (a) What are interhalogen compounds? Give ANY one example and its preparation method.
- (b) Give any FOUR *similarities* between hydrogen and halogens.
- (c) Explain the structure of diborane and give insights into its bonding aspects.
- (d) Draw a simple diagram of graphene and explain its structure.
- (e) Describe the Hall's process for the purification of bauxite ore.
- (f) Calculate the spin only magnetic moment [$\mu_{(s.o)}$] for Cr²⁺ and Fe³⁺ ions.
- (g) Complete and balance the following equations (*may have more than one product*):
- (i) $V_2O_5 + F_2 \rightarrow$ _____
- (ii) _____ + H₂O \rightarrow HMnO₄
- (iii) $Fe_2O_3 + CO \rightarrow$ _____
- (iv) $CaCO_3 + SiO_2 \rightarrow$ _____
- (h) Starting from chromite (FeCr₂O₄), explain how chromium metal is extracted.

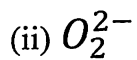
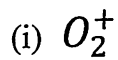
(32 marks)

3. (a) Write the geometry, steric number, and bond angle/s for the following structures:



[6 marks]

- (b) Draw a neat Molecular Orbital (MO) diagram for oxygen molecule. Using this diagram, calculate the bond order of the following molecular species:



[4 marks]

(Total = 10 marks)

DATA SHEET

1. The periodic table of elements

Periodic Table of the Elements

<http://chemistry.about.com>
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About Chemistry

1A																	8A						
1 H 1.00794																	2 He 4.002602						
3 Li 6.941	4 Be 9.012182																	5 B 10.811	6 C 12.0107	7 N 14.0067	8 O 15.9994	9 F 18.9984032	10 Ne 20.1797
11 Na 22.98976928	12 Mg 24.304																	13 Al 26.9815385	14 Si 28.0855	15 P 30.973762	16 S 32.065	17 Cl 35.453	18 Ar 39.948
19 K 39.0983	20 Ca 40.078	21 Sc 44.955912	22 Ti 47.88	23 V 50.9415	24 Cr 51.9961	25 Mn 54.938045	26 Fe 55.845	27 Co 58.933195	28 Ni 58.6934	29 Cu 63.546	30 Zn 65.39	31 Ga 69.723	32 Ge 72.64	33 As 74.92160	34 Se 78.96	35 Br 79.904	36 Kr 83.798						
37 Rb 85.4678	38 Sr 87.62	39 Y 88.90585	40 Zr 91.224	41 Nb 92.90638	42 Mo 95.96	43 Tc [98]	44 Ru 101.07	45 Rh 102.90550	46 Pd 106.42	47 Ag 107.8682	48 Cd 112.411	49 In 114.818	50 Sn 115.710	51 Sb 121.760	52 Te 127.60	53 I 126.90447	54 Xe 131.29						
55 Cs 132.905451	56 Ba 137.327	57-71 Lanthanides	72 Hf 178.49	73 Ta 180.94735	74 W 183.84	75 Re 186.207	76 Os 190.23	77 Ir 192.222	78 Pt 195.084	79 Au 196.966569	80 Hg 200.59	81 Tl 204.3833	82 Pb 207.2	83 Bi 208.98040	84 Po [209]	85 At [210]	86 Rn [222]						
87 Fr [223]	88 Ra [226]	89-103 Actinides	104 Rf [261]	105 Db [262]	106 Sg [263]	107 Bh [264]	108 Hs [265]	109 Mt [266]	110 Ds [267]	111 Rg [268]	112 Cn [269]	113 Uut [270]	114 Fl [271]	115 Uup [272]	116 Lv [273]	117 Uus [274]	118 Uuo [276]						
57 La 138.90547	58 Ce 140.116	59 Pr 140.90766	60 Nd 144.242	61 Pm [145]	62 Sm 150.36	63 Eu 151.964	64 Gd 157.25	65 Tb 158.92535	66 Dy 162.500	67 Ho 164.93032	68 Er 167.259	69 Tm 168.93421	70 Yb 173.0547	71 Lu 174.96706									
89 Ac [227]	90 Th 232.03772	91 Pa 231.03688	92 U 238.02891	93 Np [237]	94 Pu [244]	95 Am [243]	96 Cm [247]	97 Bk [247]	98 Cf [251]	99 Es [252]	100 Fm [257]	101 Md [258]	102 No [259]	103 Lr [262]									