INTI
International College Penang

FINAL
Examination Paper

(COVER PAGE)

Session	:	**August 2018**
Programme	:	Foundation in Science (CFSI)
Course	:	**CHM1204 : CHEMISTRY 2**
Date of Examination	:	10 December 2018 (Monday)
Time	:	11:00AM – 1:00PM Reading Time : Nil
Duration	:	2 hours
Special Instructions	:	

This paper consists of **FIVE (5)** questions. Answer any **FOUR (4)** questions in the answer booklet provided. All questions carry equal marks.

Materials permitted :

Non-Programmable Calculator

Materials provided :

Periodic Table

Examiner(s)	:	**Ms. Lim Sze Theng**
Moderator	:	**Dr. Lim Gin Keat**

This paper consists of 12 printed pages, including the cover page.

INTI INTERNATIONAL COLLEGE PENANG
FOUNDATION IN SCIENCE (CFSI)
CHM1204: CHEMISTRY 1
FINAL EXAMINATION: AUG 2018 SESSION

Instructions: This paper consists of **FIVE (5)** questions. Answer any **FOUR (4)** questions in the answer booklet provided. All questions carry equal marks.

Question 1

(a) What is wrong with each of the following attempts to name a cycloalkane using IUPAC rules?

(i) Dimethylcyclohexane

(1 mark)

(ii) 3,4-dimethylcyclohexane

(1 mark)

(iii) 1-ethylcyclobutane

(1 mark)

(iv) 2-ethyl-1-methylcyclopentane

(1 mark)

(b) Draw line-angle structural formula for the following cycloalkanes.

(i) propylcyclobutane

(1 mark)

(ii) isopropylcyclobutane

(1 mark)

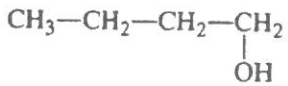
(iii) 1,1-dimethylcyclobutane

(1 mark)

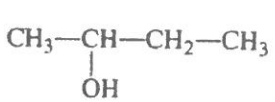
(iv) (1-methylethyl)cyclobutane

(1 mark)

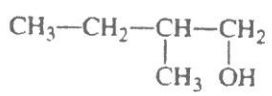
(c) Indicate whether an aldehyde or a ketone is produced when each of the following alcohols is oxidised.

(i) 

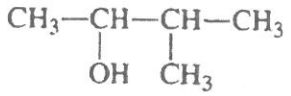
(1 mark)

(ii) 

(1 mark)

(iii) 

(1 mark)

(iv) 

(1 mark)

(d) Draw the structure of the aldehyde or ketone produced when each of the alcohols in 1 (c) is oxidised.

(4 marks)

(e) Draw a condensed structural formula that corresponds to each of the following carboxylic acids.

(i) 3,3-dimethylheptanoic acid

(1 mark)

(ii) 4-methylpentanoic acid

(1 mark)

(iii) 3-chloropropanoic acid

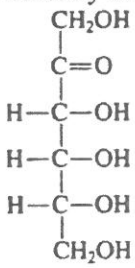
(1 mark)

(iv) Trichloroethanoic acid

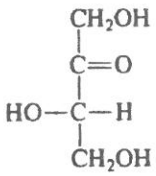
(1 mark)

(f) Classify each of the following monosaccharides as an aldose or a ketose.

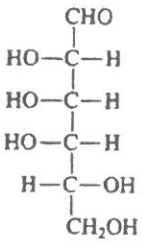
(i)



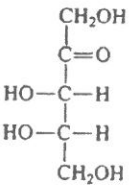
(ii)



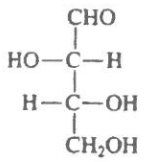
(iii)



(iv)



(v)



(5 marks)
(TOTAL: 25 MARKS)

Question 2

(a) For each molecule, indicate whether cis-trans isomers exist. If they do, draw the two isomers and label them as cis and trans.

(i) $CH_2=CH-CH_3$

(1 mark)

(ii) $CH_3-\underset{\displaystyle CH_3}{\overset{|}{C}}=CH-CH_3$

(1 mark)

(iii) hex-3-ene

(1 mark)

(iv) 4-methylpent-2-ene

(1 mark)

(b) The alcohol 2,2-dimethyl-1-butanol cannot be dehydrated. Explain why.

(1 mark)

(c) How many esters exist that are isomeric with 2-methylpropanoic acid? Give the IUPAC names for the esters that are isomeric with 2-methylpropanoic acid.

(5 marks)

(d) Classify each of the following fatty acids as saturated, monosaturated, or polysaturated.

(i) $CH_3-(CH_2)_{14}-COOH$

(1 mark)

(ii) $CH_3-(CH_2)_5-CH=CH-(CH_2)_7-COOH$

(1 mark)

(iii) 

(1 mark)

(iv) 

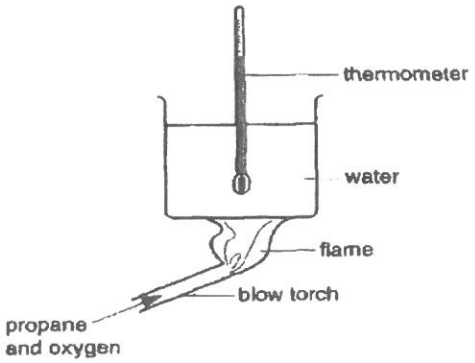
(1 mark)

(e) Draw the condensed structural formula for the fatty acid whose numerical shorthand designation is 18:2 ($\Delta^{9,12}$).

(3 marks)

(f) Propane, C_3H_8, is a gas at room temperature and pressure. It is used in blow torches to melt the bitumen needed to apply the felt and to flat roots.

(i) A blow torch was used to determine the enthalpy change of combustion of propane. The apparatus is shown below.



In the experiment, 200 g of water were used. The temperature of the water changed from 18.0 °C to 68.3 °C when 1.00 g of propane was burnt.

Calculate the energy produced in kJ. The specific heat capacity of water is 4.18 J g^{-1} K^{-1}.

(2 marks)

(ii) Calculate the number of moles of C_3H_8 burnt during the experiment.

(1 mark)

(iii) Deduce the enthalpy change of combustion, in kJ mol^{-1}, of C_3H_8.

(2 marks)

(iv) Values of enthalpy changes of combustion can be used to calculate enthalpy changes of formation.

The enthalpy change for the reaction in **equation 2.1** is the enthalpy change of formation of propane.

$$3\ C\ (s) + 4\ H_2\ (g) \rightarrow C_3H_8\ (g)$$ **equation 2.1**

The table below shows the enthalpy changes of combustion of carbon, hydrogen and propane.

	enthalpy change of combustion / kJ mol^{-1}
carbon	-394
hydrogen	-286
propane	-2219

Use these data to calculate the enthalpy change of formation of propane.

(3 marks)

(TOTAL: 25 MARKS)

Question 3

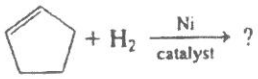
(a) Supply the structural formula of the product in each of the following alkene addition reactions.

(i) $CH_3—CH=CH—CH_3 + Cl_2 \rightarrow ?$

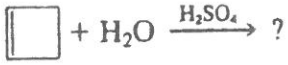
(1 mark)

(ii) $CH_3—CH_2—CH=CH_2 + HCl \rightarrow ?$

(1 mark)

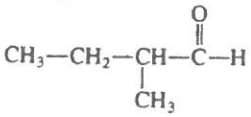
(iii) 

(1 mark)

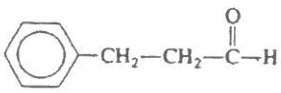
(iv) 

(1 mark)

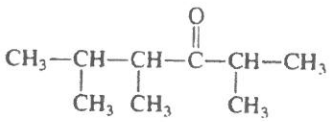
(b) Using IUPAC nomenclature, name each of the following carbonyl compounds.

(i) 

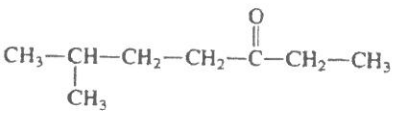
(1 mark)

(ii) 

(1 mark)

(iii) 

(1 mark)

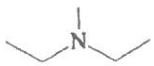
(iv) 

(1 mark)

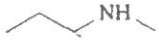
(c) Assign an IUPAC name to each of the following amines.

(i) 

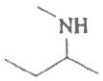
(1 mark)

(ii) 

(1 mark)

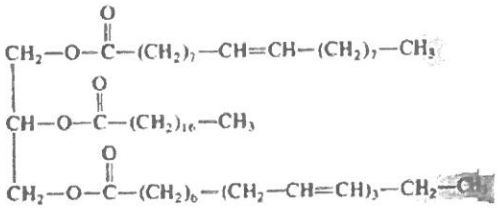
(iii) 

(1 mark)

(iv) 

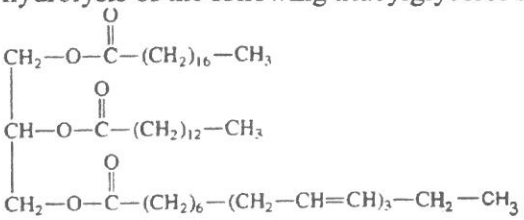
(1 mark)

(d) How many molecules of H_2 will react with one molecule of the following triacylglycerol?



(2 marks)

(e) Draw condensed structural formula for all products obtained from the complete hydrolysis of the following triacylglycerol under acidic conditions.



(4 marks)

(f) Give the type of amino acid R group that is involved in each of the following interactions that contribute to tertiary protein structure.

(i) Hydrophobic interaction
(ii) Hydrogen bond
(iii) Disulfide bond
(iv) Electrostatic interaction

(4 marks)

(g) How many different primary structures are possible for a four-amino-acid segment on a protein if there are

(i) no restrictions on the amino acids that can be present

(1 mark)

(ii) two each of different amino acids present

(1 mark)

(iii) the four amino acids must be different

(1 mark)

(TOTAL: 25 MARKS)

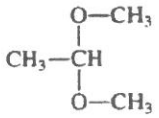
Question 4

(a) Give the IUPAC names for eight isomeric halogenated hydrocarbons that have the molecular formula $C_5H_{11}Cl$.

(8 marks)

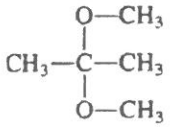
(b) Draw the structural formula of the aldehyde (or ketone) and the two alcohols produced when the following acetals undergo hydrolysis in acidic solution.

(i)



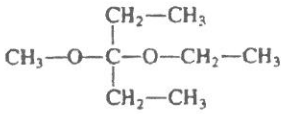
(2 marks)

(ii)



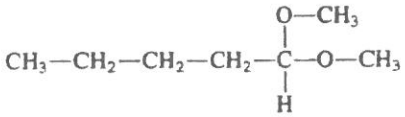
(2 marks)

(iii)



(2 marks)

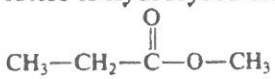
(iv)



(2 marks)

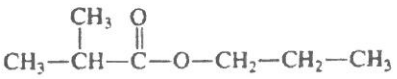
(c) Write the structural formulas of the reaction products when each of the following esters is hydrolysed under acidic condition.

(i)



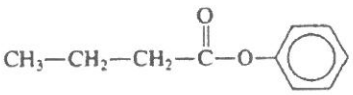
(1 mark)

(ii)



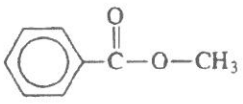
(1 mark)

(iii)



(1 mark)

(iv)



(1 mark)

(d) Indicate whether each of the following statements concerning secondary protein structure is true or false.

(i) Hydrogen bonds present in an α helix structure involve two adjacent amino acids.

(1 mark)

(ii) Both α helix and β pleated sheet structures can be present in the same protein.

(1 mark)

(iii) In a β pleated sheet structure, the hydrogen bonding is always between different protein chains.

(1 mark)

(iv) In an α helix, all of the amino acid R groups lie inside the helix.

(1 mark)

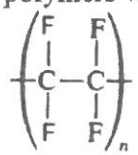
(v) In a β pleated sheet structure, the hydrogen bonds lie in the plane of the sheet.

(1 mark)

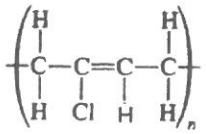
(TOTAL: 25 MARKS)

Question 5

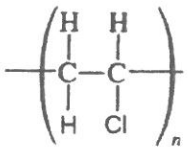
(a) Draw the structural formula of the monomer(s) from which each of the following polymers was made.

(i) 

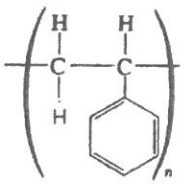
(2 marks)

(ii) 

(2 marks)

(iii) 

(2 marks)

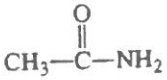
(iv) 

(2 marks)

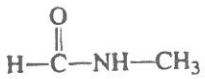
(b) Would you expect N-ethylacetamide or N,N-diethylacetamide to have the higher boiling point? Explain.

(2 marks)

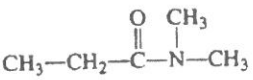
(c) What is the structure of the carboxylic acid needed to produce each of following amides via an amidification reaction?

(i) 

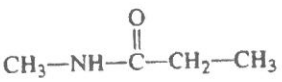
(1 mark)

(ii) 

(1 mark)

(iii) 

(1 mark)

(iv) 

(1 mark)

(d) Indicate whether each of the following statements describes a reversible competitive inhibitor, a reversible noncompetitive inhibitor, or an irreversible inhibitor. More than one answer may apply

(i) Both inhibitor and substrate bind at the active site on a random basis.

(1 mark)

(ii) The inhibitor effect cannot be reversed by the addition of more substrate.

(1 mark)

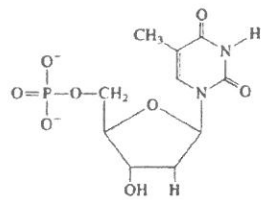
(iii) Inhibitor structure does not have to resemble substrate structure.

(1 mark)

(iv) The inhibitor and substrate can bind to the enzyme simultaneously.

(1 mark)

(e) Consider the following nucleotide?



(i) What is the name of the nucleotide?

(1 mark)

(ii) Would this nucleotide be found in both DNA and RNA, only in DNA, or only in RNA?

(1 mark)

(iii) What is the name for the type of bond that connects the phosphate and sugar subunits?

(1 mark)

(iv) What is the name for the type of bond that connects the sugar and base subunits?

(1 mark)

(f) The base content of a particular DNA molecule is 36% thymine. What is the percentage of each of the following bases in the molecule?

(i) Adenine

(ii) Guanine

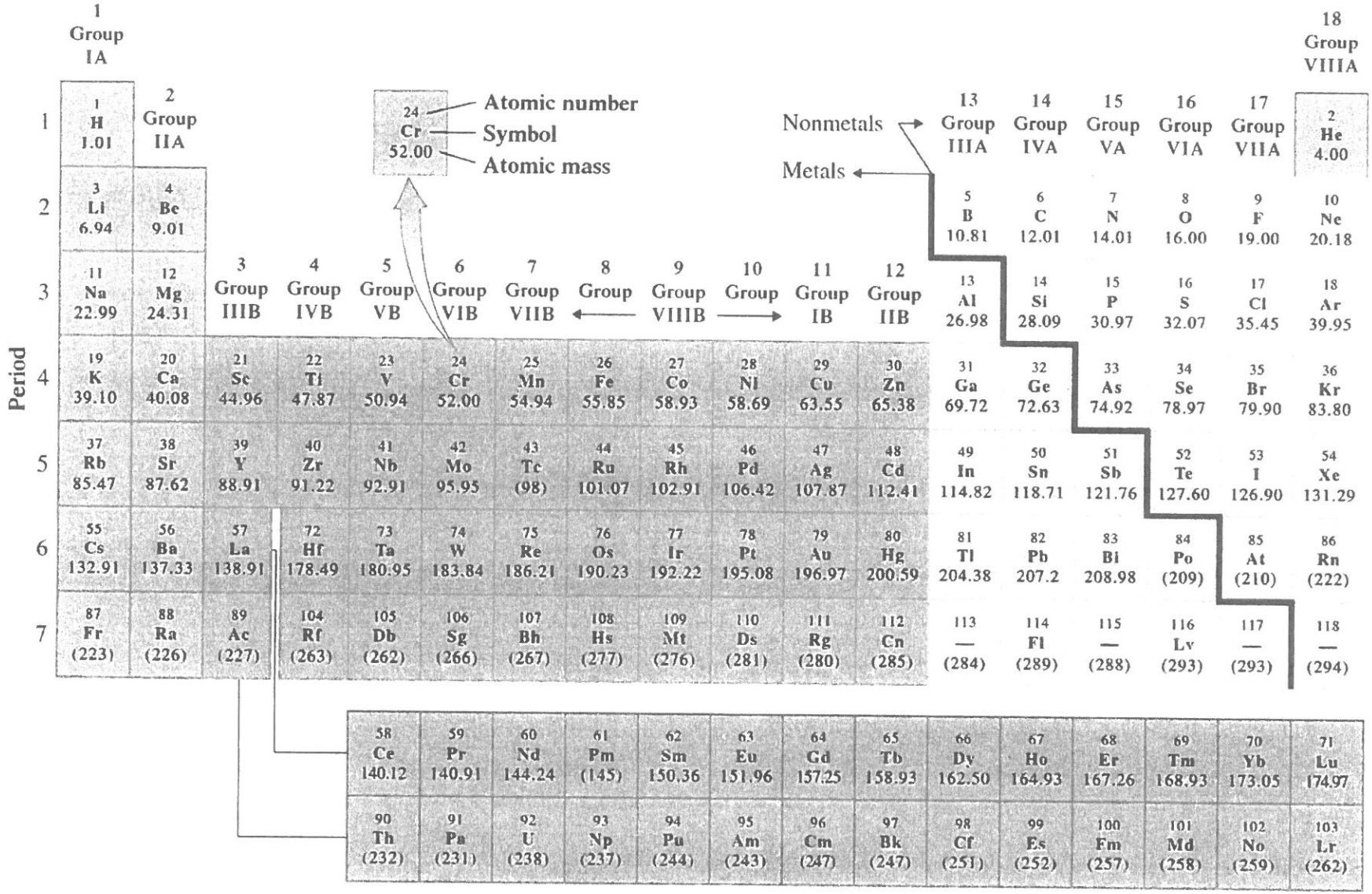
(iii) Cytosine

(3 marks)

(TOTAL: 25 MARKS)

--THE END--

CHM1204(F)/AUG2018/S.T.LIM


Atomic number
Symbol
Atomic mass
Nonmetals
Metals
Period
1 Group IA
2 Group IIA
3 Group IIIB
4 Group IVB
5 Group VB
6 Group VIB
7 Group VIIB
8 Group
9 Group VIIIB
10 Group
11 Group IB
12 Group IIB
13 Group IIIA
14 Group IVA
15 Group VA
16 Group VIA
17 Group VIIA
18 Group VIIIA
1 H 1.01
2 He 4.00
3 Li 6.94
4 Be 9.01
5 B 10.81
6 C 12.01
7 N 14.01
8 O 16.00
9 F 19.00
10 Ne 20.18
11 Na 22.99
12 Mg 24.31
13 Al 26.98
14 Si 28.09
15 P 30.97
16 S 32.07
17 Cl 35.45
18 Ar 39.95
19 K 39.10
20 Ca 40.08
21 Sc 44.96
22 Ti 47.87
23 V 50.94
24 Cr 52.00
25 Mn 54.94
26 Fe 55.85
27 Co 58.93
28 Ni 58.69
29 Cu 63.55
30 Zn 65.38
31 Ga 69.72
32 Ge 72.63
33 As 74.92
34 Se 78.97
35 Br 79.90
36 Kr 83.80
37 Rb 85.47
38 Sr 87.62
39 Y 88.91
40 Zr 91.22
41 Nb 92.91
42 Mo 95.95
43 Tc (98)
44 Ru 101.07
45 Rh 102.91
46 Pd 106.42
47 Ag 107.87
48 Cd 112.41
49 In 114.82
50 Sn 118.71
51 Sb 121.76
52 Te 127.60
53 I 126.90
54 Xe 131.29
55 Cs 132.91
56 Ba 137.33
57 La 138.91
72 Hf 178.49
73 Ta 180.95
74 W 183.84
75 Re 186.21
76 Os 190.23
77 Ir 192.22
78 Pt 195.08
79 Au 196.97
80 Hg 200.59
81 Tl 204.38
82 Pb 207.2
83 Bi 208.98
84 Po (209)
85 At (210)
86 Rn (222)
87 Fr (223)
88 Ra (226)
89 Ac (227)
104 Rf (263)
105 Db (262)
106 Sg (266)
107 Bh (267)
108 Hs (277)
109 Mt (276)
110 Ds (281)
111 Rg (280)
112 Cn (285)
113 — (284)
114 Fl (289)
115 — (288)
116 Lv (293)
117 — (293)
118 — (294)
58 Ce 140.12
59 Pr 140.91
60 Nd 144.24
61 Pm (145)
62 Sm 150.36
63 Eu 151.96
64 Gd 157.25
65 Tb 158.93
66 Dy 162.50
67 Ho 164.93
68 Er 167.26
69 Tm 168.93
70 Yb 173.05
71 Lu 174.97
90 Th (232)
91 Pa (231)
92 U (238)
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)