UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
SEPTEMBER 2014 SESSION

SUBJECT CODE	:	**FRD20203**
SUBJECT TITLE	:	**REFRIGERANTS AND WATER TREATMENT**
LEVEL	:	**DIPLOMA**
TIME / DURATION	:	**3.30 PM – 5.30 PM** **(2 HOURS)**
DATE	:	**08 JANUARY 2015**

INSTRUCTIONS TO CANDIDATES

1. Please read the instructions given in the question paper CAREFULLY.

2. This question paper is printed on both sides of the paper.

3. Please write your answers on the answer booklet provided.

4. Answer should be written in blue or black ink except for sketching, graphic and illustration.

5. This question paper consists of TWO (2) sections. Section A and B. Answer all questions in Section A. For Section B, answer two(2) question only.

6. Answer all questions in English.

7. Periodic Table is Appended (RETURNABLE)

THERE ARE 6 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total: 60 marks)

INSTRUCTION: Answer ALL questions.

Please use the answer booklet provided.

Question 1

(a)   Define what is a refrigerant and 5 good properties of refrigerant.

(6 marks)

(b)   Explain about chemical reaction involved in ozone depletion potential process

(6 marks)

(c)   Explain 3 effects of Global Warming due to Air-Coditioning Industries.

(8 marks)

Question 2

(a)   Explain briefly the difference between recovery, recycle and reclaim of refrigerant

(5 marks)

 (b)   Explain procedure to do pump-down process in air-cond split unit

(7 marks)

(c)   List five (5) safety procedures during air-conditioning work

(3 marks)

(d)   **(NOTE: rewrite the below table and your answers in the answer sheet)**

Table: Q2(d): Several types of Refrigerants Specification and application

Refrigerant	Cylinder Color code	Application (Large / Domestic / Automobile / Frozen food)	Lubricants (Alkabenzine /Mineral Oil or POE)	Compressor type (centrigugal / Reciprocating / Rotary / Scroll)	Refrigeration Classification (CFC,HCFC or HFC)
R134a					
R404A					
R717					
R507					

(10 marks)

(e)   Fill in the Safety Group below (A1,A2,A3,B1,B2,B3):

(NOTE: rewrite the below table and your answers in the answer sheet)

Table: Q2 e): Safety group of Refrigerants Specification

	Lower Toxicity	Higher Toxicity
Higher Flammability		
Lower Flammability		
No Flame Propagation		

(5 marks)

Question 3

(a) Identify two(2) advantages and disadvantages of:

    (i)   Ammonia

    (ii)   Carbon Dioxide

    (iii) Sulfur Dioxide

(6 marks)

(b)Identify refrigerant nomenclature according to Du Pont system for following molecular structure :

    (i) CCl_2F_2

    (ii) $C_2Cl_2F_4$

    (iii)$CHClF_2$

    (iv)CF_3CH_3

(4 marks)

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SECTION B (Total: 40 marks)
INSTRUCTION: Answer TWO (2) questions only.

Question 4

Refer to Figure Q4.

(a)   What is the problem might be happening due to these arrangement. Explain your answer.

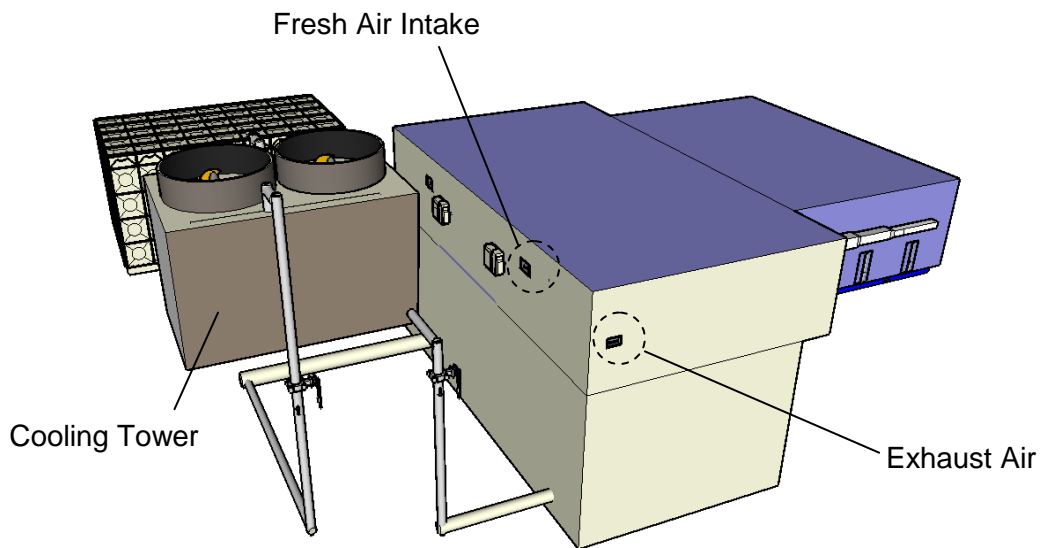(5 marks)

Fresh Air Intake

Cooling Tower

Exhaust Air

Figure Q4(a): HVAC system in Building

(b)   Problems produced by water fall into three categories. Explain these categories.

(10 marks)

(c)   Is scale control required in chilled water piping system?
       Explain your answer

(5 marks)

Question 5

Refer to Appendices attached.

Given:

A once-thru condenser:

Methyl orange alkalinity	=	115pm as $CaCO_3$
Calcium hardness	=	85 ppm as $CaCO_3$
Total solids	=	250 ppm
pH	=	8.0
Condensing water temperature	=	$115°F$

(Note: Plot and detach related chart and attached to your answer sheet)

(a)   Calculate the Langelier Saturation Index (I_s)

(5 marks)

(b)   Calculate the Scaling tendency and state the tendency of water

(5 marks)

(c)   Calculate the Ryznar Stability Index and state the tendency of water

(5 marks)

(d)   Explain corrosion control of water problems in HVAC water treatment

(5 marks)

Question 6

Refer to Appendices attached.

Given:

A once-thru condenser:

|		
Methyl orange alkalinity	=	90pm as $CaCO_3$
Calcium hardness	=	85 ppm as $CaCO_3$
Total solids	=	250 ppm
pH	=	7.5
Condensing water temperature	=	110°F

Determine the:

(a)   Calculate the Langelier Saturation Index (I_s)

(5 marks)

(b)   Calculate the Scaling tendency and state the tendency of water

(5 marks)

(c)   Calculate the Ryznar Stability Index and state the tendency of water

(5 marks)

(d)   Explain 3 effect of corrosion in air-conditioning system.

(5 marks)

END OF QUESTION

APPENDIX

APPENDIX1
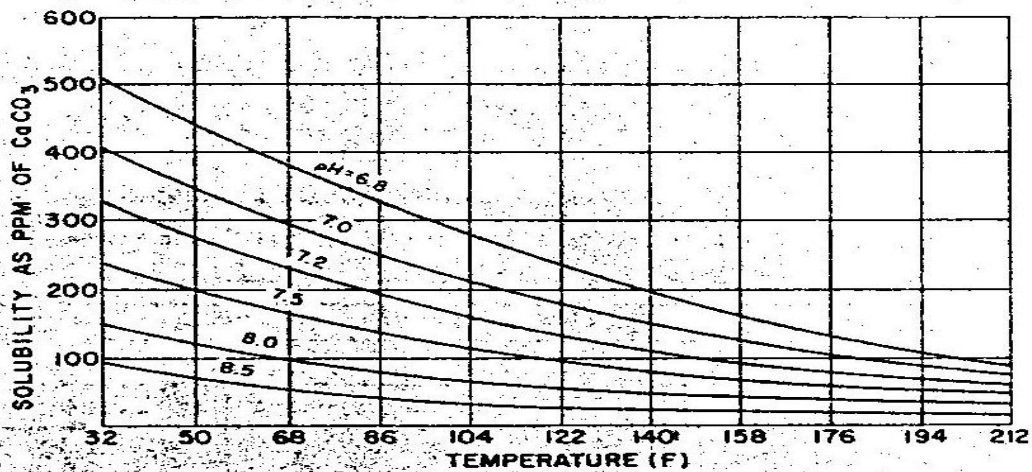
NOTE: pH values at approximately 73 F.

Chart 1: Solubility as ppm CaCo$_3$ vs. Temperature (°F)

Table 1: Prediction of Water Characteristics by Langelier Saturation Index

LANGELIER SATURATION INDEX	TENDENCY OF WATER
+2.0	scale-forming, and for practical purposes noncorrosive
+0.5	slightly corrosive and scale-forming
0.0	balanced, but pitting corrosion possible
−0.5	slightly corrosive and nonscale-forming
−2.0	serious corrosion

Table 2: Prediction of Water Characteristics by Ryznar Saturation Index

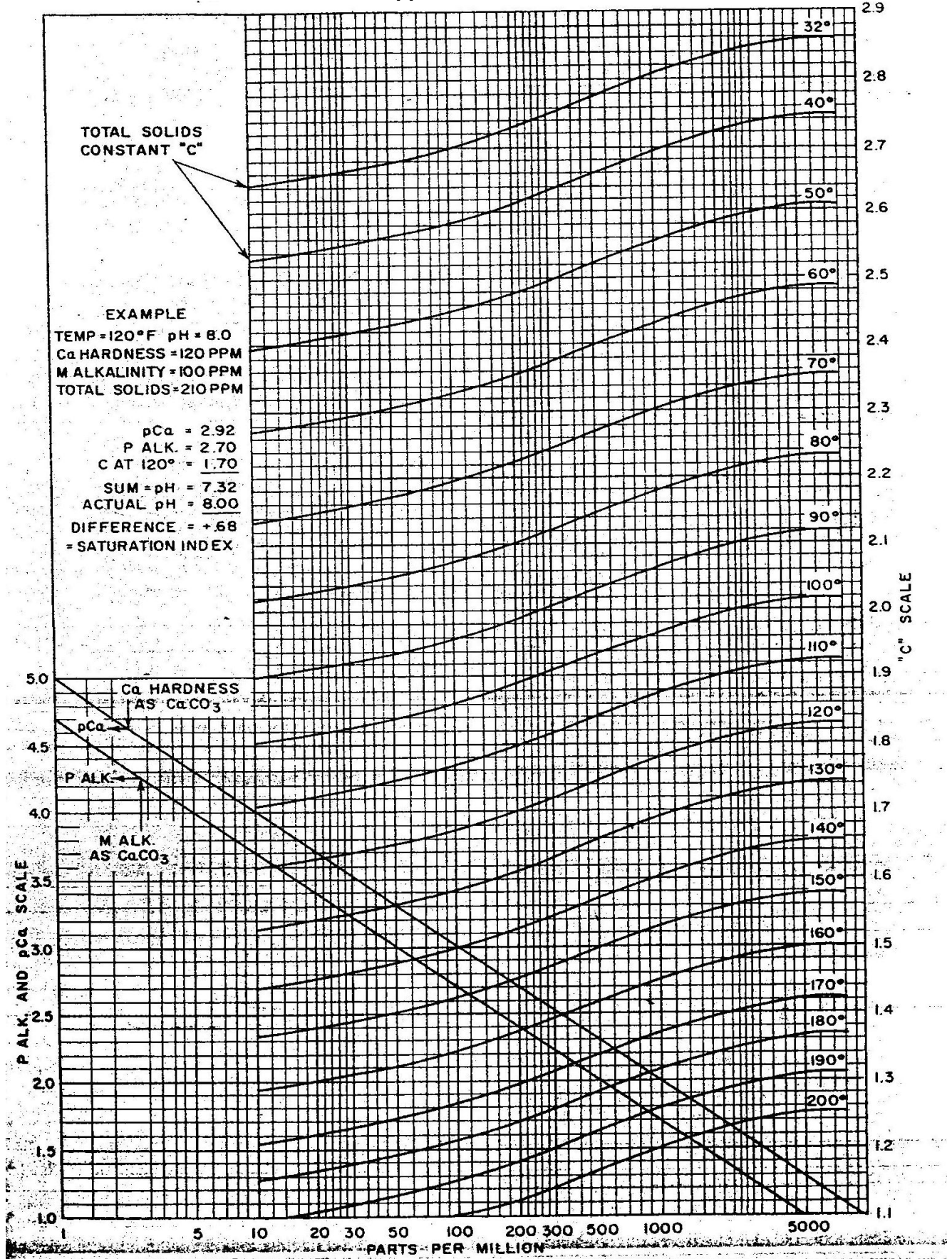| RYZNAR STABILITY INDEX	TENDENCY OF WATER
4.0 - 5.0	heavy scale
5.0 - 6.0	light scale
6.0 - 7.0	little scale or corrosion
7.0 - 7.5	corrosion significant
7.5 - 9.0	heavy corrosion
9.0 and higher	corrosion intolerable

Appendix2

Chart 2: Langelier Saturation Index
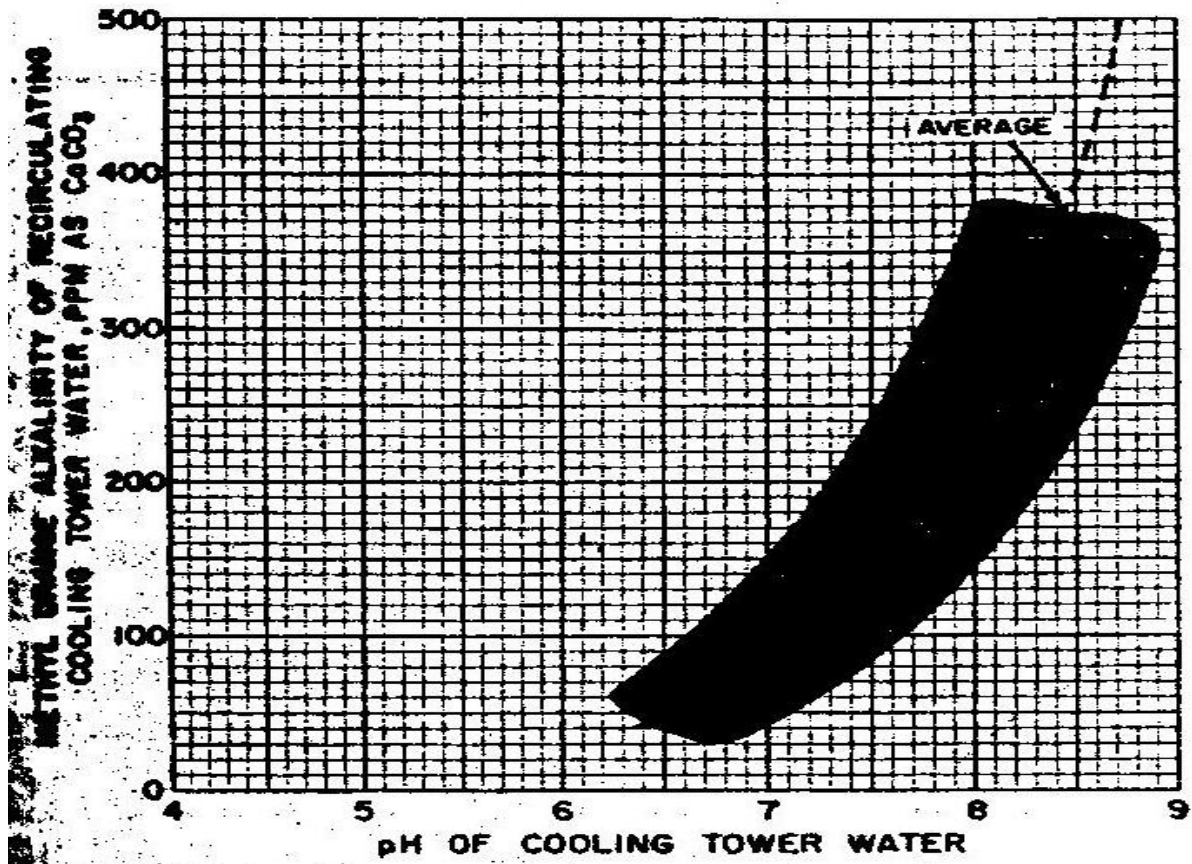
Appendix 3

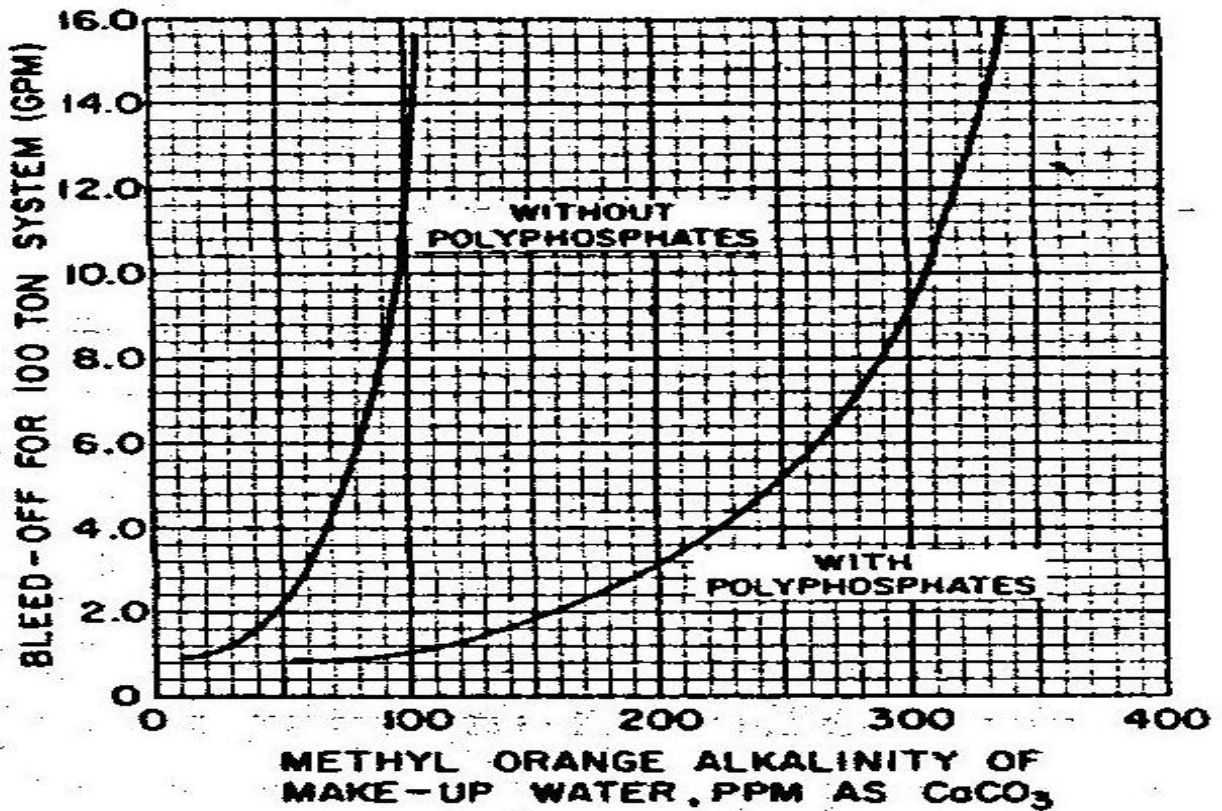**Chart 4: Expected pH of cooling Tower water**

Chart 4: Bleed-off Required to prevvent scale formation (100 Ton system)

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