UNIVERSITY OF SWAZILAND

FINAL EXAMINATION PAPER

PROGRAM	:	BACHELOR OF SCIENCE IN FOOD SCIENCE, NUTRITION AND TECHNOLOGY YEAR II
COURSE CODE	:	FSNT 205
TITLE OF PAPER	:	PRINCIPLES OF FOOD ENGINEERING
TIME ALLOWED	:	TWO (2) HOURS
INSTRUCTIONS	:	ANSWER QUESTION ONE (1) AND ANY OTHER TWO (2) QUESTIONS.

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QUESTION 1 [COMPULSORY]

(a) In a laboratory experiment it was found that heating a suspension of spores at 120 for 100 seconds results in 8-log reduction of the spores. To achieve the same reduction at 110° C, 125 seconds are needed. Calculate the decimal reduction time at the two temperatures and the z value. **(15 Marks)**

(b) Milk used for yoghurt with 8% solid not fat is flowing through a pipe at a rate of 40 kg/min. To adjust for the required solids, skim milk powder is added. At what rate would the skim milk powder be added to provide 22% solids milks for yoghurt production? **(10 Marks)**

(c) Air with 20°C dry bulb temperature and 8 g water/kg dry air at 1 atm was heated to 50°C dry bulb temperature. The heated air passes through a dryer, picking up moisture adiabatically there, and leaves the dryer at 30°C. Show the process on a psychrometric chart and determine the properties of the heated air and the air leaving the dryer. **(15 Marks)**

[TOTAL MARKS = 40]

QUESTION 2

(a) Explain the following: **(20 Marks)**

i. Lethal rate
ii. Coefficient of performance (C.O.P.)
iii. Psychrometrics
iv. Z-value
v. Dew point temperature

(b) Explain four performance characteristics of a refrigerant. **(10 Marks)**

[TOTAL MARKS = 30]

QUESTION 3

(a) Explain the growth stages of micro-organisms. **(12 Marks)**

(b) Discuss the temperature dependence of D-value. Support your discussion with graph. **(10 Marks)**

(c) Identify and briefly explain the energy components in a system. **(8 Marks)**

[TOTAL MARKS = 30]

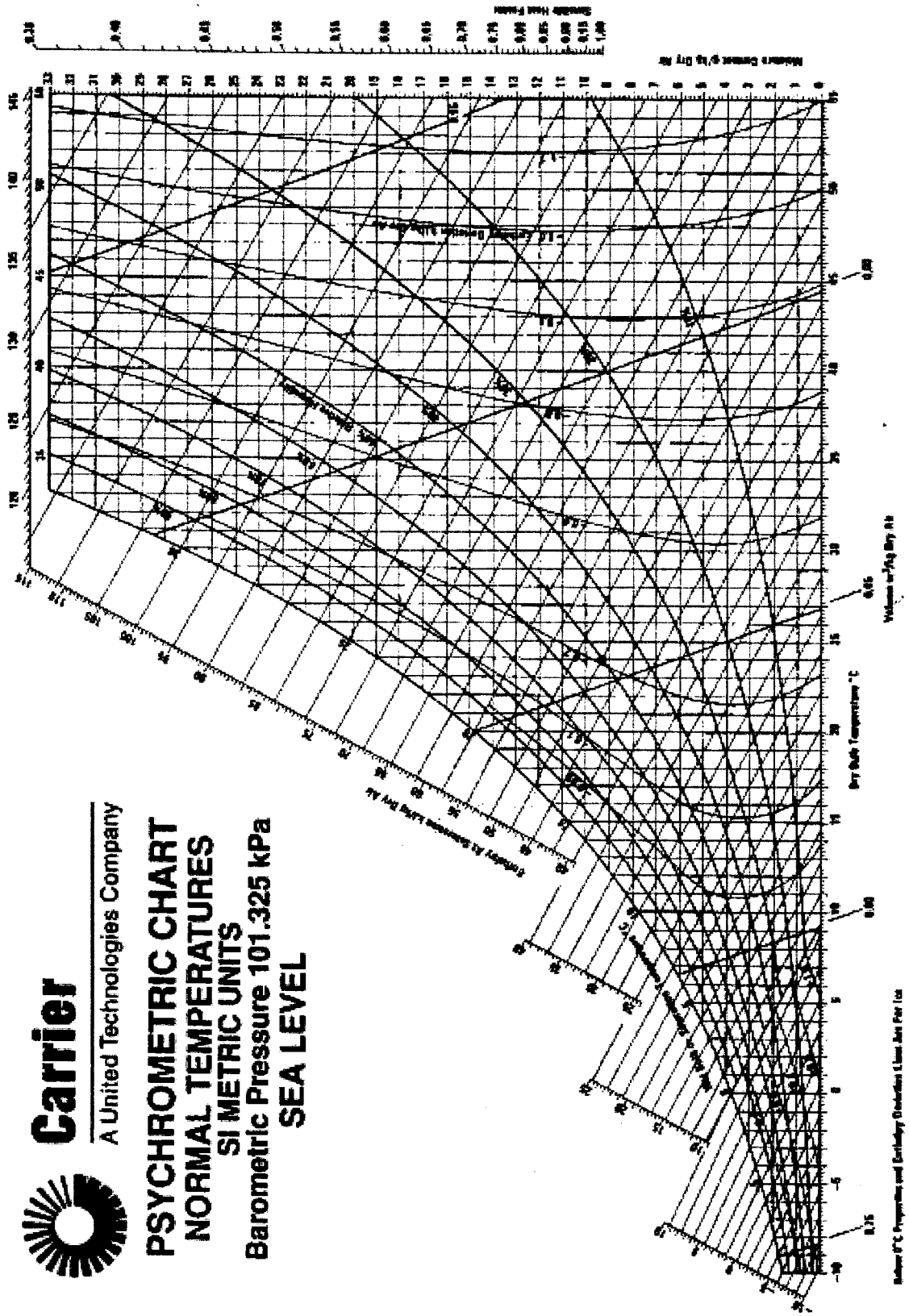
QUESTION 4

(a) Identify and explain the components of a refrigeration system. **(16 Marks)**

(b) An air–vapour mixture is at 60°C dry bulb temperature and 35°C wet bulb temperature. Using the psychrometric chart determine all other properties **(8 Marks)**

(c) Describe the difference between backward feed and forward feed multiple effect evaporators. **(6 Marks)**

[TOTAL MARKS = 30]


Carrier
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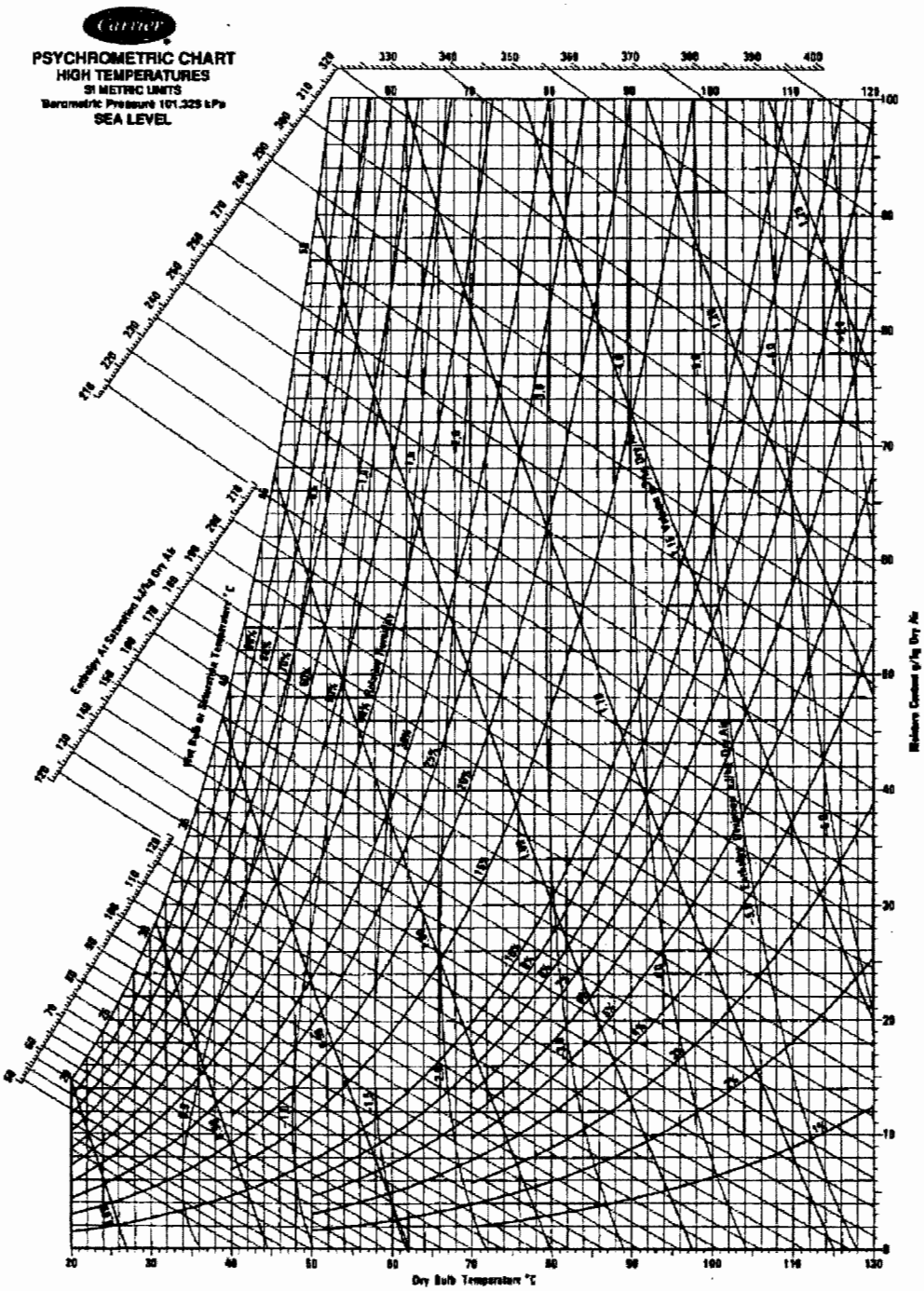
PSYCHROMETRIC CHART
NORMAL TEMPERATURES
SI METRIC UNITS
Barometric Pressure 101.325 kPa
SEA LEVEL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