

國立臺北科技大學 106 學年度碩士班招生考試

系所組別：1411 能源與冷凍空調工程系碩士班甲組

第二節 冷凍空調原理 試題 (選考)

第一頁 共二頁

注意事項：

1. 本試題共四題，每題 25 分，共 100 分。
2. 請標明大題、子題編號作答，不必抄題。
3. 全部答案均須在答案卷之答案欄內作答，否則不予計分。

(1) (25%) Moist air at 20°C dry-bulb and 8°C thermodynamic wet-bulb temperature is to be processed to a final dew-point temperature of 13°C by adiabatic injection of saturated steam at 110°C. The rate of dry airflow is 2 kg/s.

- (A) (10%) Plot this process on schematic psychrometric chart.
 (B) (15%) Find the final dry-bulb temperature of the moist air and the rate of steam flow.

(2) (25%) Please answer the following questions for the refrigerants used in HVAC industry.

- (A) (4%) Why the R22 is being phased down?
 (B) (21%) Complete the table below.

Refrigerant Number	Chemical Formula	Type
R134a	(a)	HFC
(b)	CHClF ₂	(c)
R32	(d)	(e)
(f)	NH ₃	--
R290	(g)	--

(3) (25%) For an ideal multistage vapor compression refrigeration cycle using R-134a, the saturated evaporator temperature is -20°C, the saturated condensing temperature is 30°C, and the refrigeration load is 50 kW. The saturation temperature of the refrigerant in the intercooler is 0°C.

- (A) (10%) Plot the component layout schematically of this refrigeration cycle.
 (B) (10%) Determine the work needed in the low pressure and high pressure compressors respectively.
 (C) (5%) Determine the COP of this refrigeration cycle.

Thermodynamic Property Values for Problem (3)

State	Temperature, °C	Pressure, kPa	Specific Volume, m ³ /kg	Specific Enthalpy, kJ/kg	Specific Entropy, kJ/(kg·K)
1	-20.0	132.73	0.14739	386.55	1.7413
2	2.8	292.80	0.07097	401.51	1.7413
3	0.0	292.80	0.06931	398.60	1.7282
4	33.6	770.20	0.02726	418.68	1.7282
5	30.0	770.20	0.00084	241.72	1.1435
6	0.0	292.80	0.01517	241.72	1.15297
7	0.0	292.80	0.000772	200.00	1.0000
8	-20.0	132.73	0.01889	200.00	1.00434

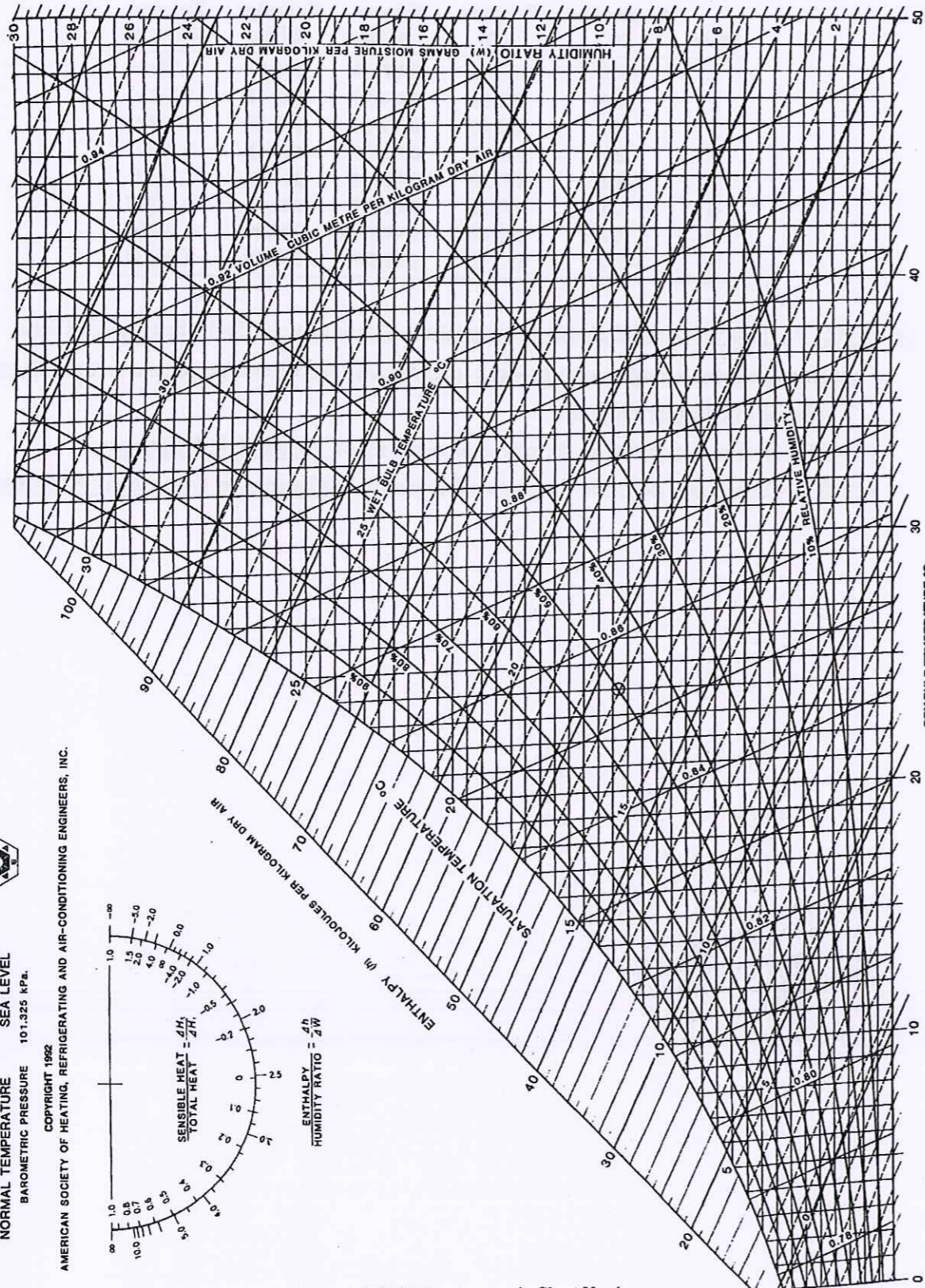
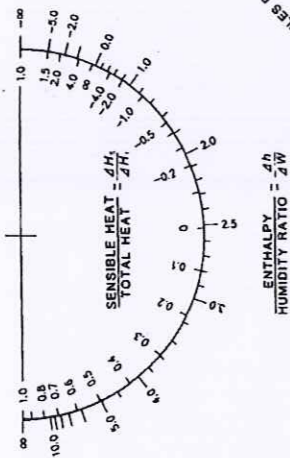
- (4) (25%) For a positive displacement compressor, please answer the following questions.
 (A) (10%) Plot the compression process lines for various discharge pressures on a Pressure vs. Volume in cylinder diagram.
 (B) (7%) Define and describe the physical meaning of Volumetric Efficiency.
 (C) (8%) Define and describe the physical meaning of Clearance Volumetric Efficiency.

注意：背面尚有試題



ASHRAE PSYCHROMETRIC CHART NO. 1
NORMAL TEMPERATURE SEA LEVEL
BAROMETRIC PRESSURE 101.325 kPa.

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