



UNIVERSITI KUALA LUMPUR
Malaysia France Institute

FINAL EXAMINATION
JULY 2010 SESSION

SUBJECT CODE : FRD 10103
SUBJECT TITLE : REFRIGERATION FUNDAMENTAL & TOOLS
LEVEL : DIPLOMA
TIME / DURATION : 3.00pm – 6.00pm
(3 HOURS)
DATE : 12 NOVEMBER 2010

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 only question 2 write the answer on the question booklet.
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 3 questions only
6. Answer all questions in English.
7. Mollier and Psychrometric chart is appended must be submitted together with question booklet

THERE ARE 10 PAGES OF QUESTIONS, EXCLUDING THIS PAGE.

SECTION A (Total: 25 marks)**INSTRUCTION: Answer ALL questions.****Please use the answer booklet provided.**

1. Which item below is/are categorized as HFCs
 - I. R11 (CCl_3F)
 - II. R410A ($\text{CH}_2\text{F}/\text{C}_2\text{HF}_5$)
 - III. R22 (CHClF_2)
 - IV. R134a (CH_2FCF_3)

A. I and II	C. II and IV
B. I and III	D. II and III

2. When a substance changes state from liquid to a gas, the spacing of its molecules;

A. decreases greatly	C. stays the same
B. decrease slightly	D. increases greatly

3. 3 common types energy encountered in refrigeration system considered is:
 - I. Mechanical Energy
 - II. Electrical Energy
 - III. Heat Energy
 - IV. Chemical Energy

A. I, II and III	C. I, II and IV
B. I, II and IV	D. II, III and IV

4. What do you understand about heat flow?
 - A. Heat flows from warmer to Cooler state
 - B. Heat flows from cooler to warmer state
 - C. Heat flows will stop when encountering same temperature
 - D. Heat flow will increase when same temperature

5. ".....is a form of energy its related to the molecular motion or vibration" This is the definition for:
- A. Heat
 - B. Temperature
 - C. Heat flow
 - D. Force
6. What is defining as Sensible heat?
- A. The physical state is changed but the temperature is same
 - B. The physical state is same but the temperature is changed
 - C. The physical state and temperature is changed
 - D. The physical state and temperature is same
7. Convert 24 °C to Fahrenheit:
- A. 75.2 °F
 - B. 57 °F
 - C. 57.5 °F
 - D. 77 °F
8. The function of a check valve in air conditioning is
- A. to detect the moisture occur in refrigeration system
 - B. to allow the refrigerant to flow in one direction
 - C. to break up the pressure pulses which create noise
 - D. to prevent the liquid refrigerant to entering compressor.
9. The purpose of a condenser is to:
- A. Remove water from the refrigeration system
 - B. Add heat to the refrigeration system.
 - C. Remove heat from refrigerant
 - D. Store liquid refrigerant
10. Which of the following is true of the function of capillary tube?
- A. It is always the same length
 - B. It is made of PVC pipe
 - C. It has no sensing bulb
 - D. It is use only with flooded evaporators

Question 11 to 14 are based on figure 1.

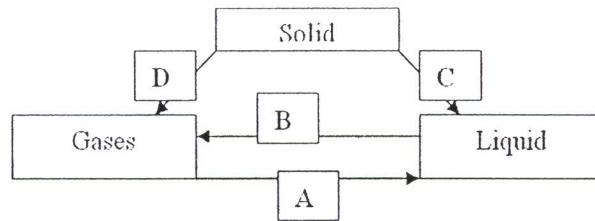


Figure Q11~Q14: Changes of three state

Referring to figure Q11~Q14 shows the changes of state. Give the name of the physical state for each process

11. At point A
 - A. Sublimation
 - B. Melting
 - C. Vaporization
 - D. Condensation

12. At point B
 - A. Sublimation
 - B. Melting
 - C. Vaporization
 - D. Condensation

13. At point C
 - A. Sublimation
 - B. Melting
 - C. Vaporization
 - D. Condensation

14. At point D
 - A. Sublimation
 - B. Melting
 - C. Vaporization
 - D. Condensation

15. Which two of the following belong to the Rotary compressor?

- I. Olham Coupling (Du bearing)
- II. Rolling Piston
- III. Sliding Vane
- IV. Impeller Vane

- A. I and II
- B. III and IV
- C. II and III
- D. I and IV

What is the normal cause for a compressor's piston or roller to break down

- A. Compressor compressing the refrigerant liquid
- B. Compressor compressing the liquid refrigerant vapor
- C. Compressor operating at high temperature
- D. Condenser clogged with dirt

17. A Muffler is placed between

- A. Condenser and metering device
- B. Compressor and Condenser
- C. Evaporator and metering device
- D. Compressor and evaporator

18. The TXV is controlled by:

- A. Coil temperature.
- B. The different between gas temperature and the temperature corresponding to the gas pressure.
- C. The difference between gas pressure and the pressure corresponding to the gas temperature.
- D. Coil pressure.

19. The low side of the refrigeration system includes:

- A. A metering device
- B. Accumulator
- C. Muffler
- D. A receiver

20. The function of "X" is to provide storage for the liquid condenser. What is "X"?
- A. Sight glass
 - B. Liquid Receiver
 - C. Accumulator
 - D. Muffler

21. Figure 2 is a four way valve (reverse valve), the main reason for the U-pipe movable is due to the :

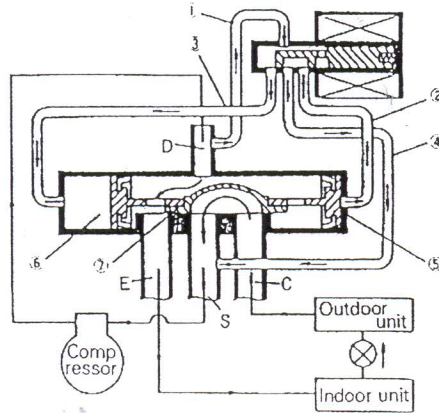


Figure 2 : On time constituting of refrigerant passage

- A. magnetic field electrified by the solenoid valve attract/push U-pipe
 - B. high pressure of line4 pushes the U-pipe
 - C. differential pressure created by solenoid valve between line2 and line3
 - D. mechanical motion of compressor in reverse compression
22. Classification compressor types in the range from 0.5 to 3 HP are
- I. Scroll Type
 - II. Screw Type
 - III. Centrifugal Type
 - IV. Rotary Type
- A. I and II
 - B. II and IV
 - C. II and III
 - D. IV only
23. A Compound gauge is used to.....
- A. Show the highest and the lowest temperature reached.
 - B. show pressure-temperature relationship
 - C. Measure pressure (psig) and vacuum (in. Hg)
 - D. Give accurate readings in the usual range and approximate readings over a wider range.

24. Which of the following is the most common tool to use for determining pressure and temperature?
- A. Thermometer
 - B. Pressure gauge
 - C. Vacuum gauge
 - D. Barometer
25. When testing a relay coil, a **multi meter** indicates a measurable resistance. This means that the coil is:
- A. shorted.
 - B. probably good.
 - C. open
 - D. partially shorted.

SECTION B (Total: 75 marks)**INSTRUCTION: INSTRUCTION: Answer THREE (3) questions only.****Please use the answer booklet provided only question 2 write the answer on the question booklet****Question 1**

a) State the function of the following safety devices and accessories: -

- i. Accumulator
- ii. Liquid receiver
- iii. 4 way valve
- iv. Filter drier

(8 marks)

b) List down the 2 modes of heat transfer and explain briefly each modes

(4 marks)

c) Name two (2) types of Reciprocating Compressor and state two (2) advantages and two (2) disadvantages of each type.

(6 marks)

d) Amount of Superheat and Subcool are determined by applying the following equation:

$$SH = \text{_____} - \text{_____}$$

$$SC = \text{_____} - \text{_____}$$

(hint): Temperature of the superheated vapor, temperature of the sub cooled Liquid, Saturation temperature corresponding to the pressure.

(4 marks)

e) What are the refrigerant states in a Condenser?

(3 marks)

Question 2

(Detached and submit together with the answer booklet).

- a) Fill the correct answer in table Q2 (a) below.

Table Q2 (a): Several type of Refrigerant

Refrigerant	Cylinder Color code	Application	Compressor type
R12			
R22		Residential and commercial A/conditioning	
R502			
R134A			
R11	Orange		

(13 marks)

- b) Complete table Q2(b) by writing your answer derived from using the Psychrometric chart.

(appendix 1)

Table Q2 (b) : Value reading from the chart

Dry Bulb (°C)	Wet Bulb (°C)	Dew point (°C)	RH (%)	Moisture (g/kg.da)	Enthalpy (KJ/kg)
27		24			
30			55		
19				10	

(12 marks)

Question 3

An air conditioning plant is required to supply 60 m³ air per minute a DBT of 21°C and 55 % RH, the outside air is at DBT of 28°C and 60% RH. Assume the air conditioning plant first dehumidify and then cool the air.

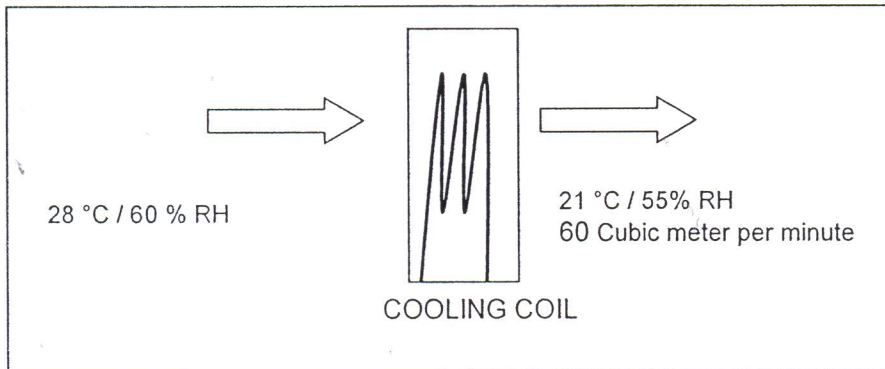


Figure Q3 : Air conditioning process at Cooling coil

- a) Explain the properties for specific volume, wet bulb and enthalpy for supply air and outside air by using psychrometric chart. (appendix 3)

(8 marks)

- b) Base on your plotting on Q3 (a) calculate:

- i. The mass flow rate, kg/s
- ii. The capacity of the cooling coil, kW
- iii. The Mass of water drained, kg/h

(9 marks)

- c) i. Draw the Refrigeration cycle diagram using Mollier chart R22 (appendix 4) refer to the below operating data;

- temperature evaporator = 0 °C
- temperature condenser = 40 °C
- sub cooling = +5 °C
- superheat = +5 °C

*Energy balance and isentropic compression

(5 marks)

- d) ii. Calculate the mass flow rate of refrigerant, kg/s

*Capacity from cooling coil (kW) equals the capacity in the refrigeration cycle

(3 marks)

Question 4

A basic Refrigeration system uses R-134a as refrigerant which the cycles without pressure drop at refrigerating capacity is 40 kW measured data such as:

- Low pressure : 2 barG
- Suction Temperature: 5 °C
- High Pressure: 9 barG
- TXV Temperature: 35 °C

a) Refer to the above data draw the Refrigeration cycle diagram using Mollier chart (appendix 2)

(7 marks)

b) Based on the answer Q4 (a) determine the discharge temperature, sub cool and the superheat

(6 marks)

c) and calculate the :-

- i. Compression ratio
- ii. Flash gas
- iii. Refrigerant Effect
- iv. Circulation rate of refrigerant
- v. power at compressor
- vi. COP

(12 marks)

END OF QUESTION