

SIR ARTHUR LEWIS COM  
DIVISION OF TECHNICAL EDUCATION AND MANAGEMENT STUDIES

EXAMINATION SESSION : May 2015 Final Examination  
COURSE TUTOR : Mr. Percival Beausoleil  
PROGRAMME TITLE (S) : Air Conditioning Systems - Foundations  
PROGRAMME CODE (S) : 3ME-ACF-CE  
COURSE TITLE : Refrigeration Theory and Practice  
COURSE CODE : EGP108  
CLASS (ES) : Year One  
DATE : Thursday 14<sup>th</sup> May, 2015  
COMMENCEMENT TIME : 1:00 pm  
DURATION : 2 hours  
ROOM : TRB-LAB  
INVIGILATOR(S) : M. Lashley, A. Carrazana

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**INSTRUCTIONS**

Answer ALL Questions in each questions in EACH section.

**Section 1** Essay type Questions.  
Three marks for each correct answer.

**Section 2** The diagram of the Air-condition system.  
One mark for each correct answer.

**Section 3** Multiple Choice  
One mark for each correct answer.

## **Section 1**

Essay type Questions (3 Marks)

- 1 Describe briefly the basic refrigeration cycle
  - 2 What is the relationship between pressure and the boiling point of a liquid?
  - 3 What is meant by saturation temperature?
  - 4 Explain the terms **superheated vapor** and **sub cool liquid**.
  - 5 Explain the term **saturated vapor** and **saturated liquid**.
  - 6 What is the function of the evaporator in the refrigeration system?
  - 7 What is the function of the condenser in the refrigeration system?
  - 8 What is the function of the compressor in the refrigeration system?
  - 9 What happens to the refrigerant in the condenser?
  - 10 What is the function of the metering device?
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## **Section 2**

Using the diagram of the air-condition system, complete the following questions. (20marks)

1. Identify the four main parts of the refrigeration system on the diagram.
2. What is the pressure, the temperature and the condition of the refrigerant at the following numbered points on the diagram?
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_
9. \_\_\_\_\_
10. \_\_\_\_\_
11. \_\_\_\_\_

### **Section 3**

Multiple Choice (1mark)

1. The system component that is responsible for rejecting system heat is the:
  - A. Compressor
  - B. Condenser
  - C. Evaporator
  - D. Metering device
2. The system component that turns high-pressure vapour into a high-pressure liquid is:
  - A. Compressor
  - B. Metering device
  - C. Condenser
  - D. Evaporator
3. What is the condenser sub cooling temperature if the refrigerant condenses at 125 degrees F and leaves the condenser at 105 degrees F?
  - A. 10 degrees
  - B. 20 degrees
  - C. 105 degrees
  - D. 125 degrees
4. A compound gauge indicates pressure:
  - A. above and below atmospheric pressure
  - B. above and below 500psi
  - C. that are absolute pressure
  - D. that are measured with a bellows
5. The state of the refrigerant at the outlet of the evaporator is:
  - A. Low -pressure, low-temperature vapour
  - B. Low -pressure, low-temperature liquid
  - C. High -pressure, high-temperature vapour
  - D. High -pressure, high-temperature
6. What substance in CFC refrigerants is responsible for contributing to the depletion of the ozone layer?
  - A. Carbon
  - B. Hydrogen.
  - C. Fluorine.
  - D. Chlorine.
7. Which of the following is classified as an HFC refrigerant?
  - A. R-11
  - B. R-22
  - C. R-123
  - D. R-134a
8. In which direction does heat flow?
  - A. From a cold substance to a cold substance
  - B. Up
  - C. Down
  - D. From a warm substance to a cold substance
9. How can air be dehumidified?
  - A. Chemical absorption
  - B. Filtration
  - C. Cooling
  - D. Both A and B
10. Most modern refrigerants have which of the following molecules as their base.
  - A. Methane
  - B. Ethane
  - C. Octane
  - D. Both A and B
11. What is the dew point?
  - A. The temperature at which moisture freezes
  - B. The point at which dew forms
  - C. The temperature at which moisture first starts to condense from the air
  - D. None of the above

12. Temperature is defined as:
- How hot it is Chemical absorption
  - The level of heat
  - How cold it is
  - Why is it hot
13. The temperature at which molecular motion stops is:
- Zero degrees Celsius
  - Absolute zero
  - The substance boiling temperature
  - The substance freezing point
14. Heat transfer through a copper pipe is an example of which type of heat transfer
- Convection
  - Conduction
  - Radiation
  - Condensation
15. Latent heat causes:
- a rise in a thermometer reading
  - temperature to rise
  - a change in state
  - temperature to fall
16. British Thermal Unit is defined as the:
- The amount of heat required to increase the temperature of one pound of a water one degree Fahrenheit.
  - The amount of heat required to produce one kilowatt of electrical power.
  - Time it takes for one pound of water to boil.
  - The amount of heat required to freeze one pound of water at atmospheric pressure
17. Adding heat to a substance results in:
- Increased molecular motion the substance being heated.
  - Decrease molecular motion the substance being heated.
  - Increased motion the substance being heated.
  - Decrease motion the substance being heated.
18. The heat content in a substance is measured in:
- Degrees Fahrenheit
  - Degrees Celsius
  - British thermal unit
  - Temperature
19. The state of matter that has the weakest molecular bond is:
- Fluids
  - Solids,
  - Gases
  - Liquid
20. A gauge reading of 30psig is equivalent to what absolute pressure:
- 15 psia
  - 30 psia
  - 45 psia
  - 60 psia
21. One Chlorine atom can destroy how many ozone molecules?
- 1.
  - 10.
  - 1,000.
  - 100,000.
22. The temperature reading of 50 degrees Celsius is the same as \_\_\_\_\_ degrees Fahrenheit
- 10
  - 50
  - 122
  - 212
23. The temperature reading of 20 degrees Celsius is the same as \_\_\_\_\_ degrees Fahrenheit
- 72
  - 50
  - 68
  - 75



24. Power is defined as the amount of:
- Work performed
  - Energy generated
  - Work performed per unit time
  - Energy generated per unit time
25. Absolute Zero is the temperature at which:
- A substance freezes
  - All molecular motion within a substance stops
  - Water boils on the Celsius scale
  - Ice will melt at atmospheric pressure.
26. The second law of thermodynamics states that:
- Water will freeze at 32 degrees Fahrenheit
  - Heat travels from a cooler substance to a warmer substance.
  - Water will boil at 212 degrees Fahrenheit
  - Heat travels from a warmer substance to a cooler substance.
27. The method of heat transfer that results from heat energy being transferred between molecules of a substance is:
- Convection
  - Conduction
  - Radiation
  - Condensation
28. Latent heat transfers cause:
- A change of state with no change in temperature
  - A change of state and a change in temperature
  - A change in temperature with no change of state
  - Neither a change in state nor a change in temperature
29. Refrigerant is said to be saturated when it is:
- 100% liquid
  - 100% vapour
  - A mixture of liquid and vapour
  - Subcooled
30. The number of British Thermal Units required to melt one pound of ice at 32 degrees Fahrenheit is:
- 0.5
  - 1.0
  - 144.0
  - 200.0
31. The number of BTUS required to change the temperature of one pound of a substance is referred to as -----heat.
- Latent
  - Sensible
  - Specific
  - Hidden
- 32 Which of the following is true regarding the atoms of a substance in various states of matter.
- Liquid have less molecular attraction between them than solids
  - Fluids have less molecular attraction between than vapors
  - Solids have less molecular attraction between them than gases
  - Solids and fluids have the same molecular attraction
- 33 Evaporative pressure must be \_\_\_\_\_ so that the liquid boils at the correct temperature.
- Low enough
  - High enough
  - Twice the low-side pressure
  - None of the above
34. Increased molecular motion of the substance is the result of \_\_\_\_\_ the substance.
- Decreasing the pressure of
  - Heating
  - Cooling
  - Increasing the volume of
35. Change in temperature of one pound of water one degree Fahrenheit will require, how many BTUS?
- 0.5
  - 1.0
  - 144.0
  - 100.0

36. Matter is commonly found in which three states:
- Solids, gases and vapors.
  - Solids, liquids and gases
  - Vapors, gases and fluids
  - Fluids, liquids and gases
37. A rise in sensible heat causes:
- A rise in a thermometer reading
  - A fall in thermometer reading
  - No change in a thermometer reading
  - Ice to melt
38. The refrigerant line that connects the condenser to the metering device is the \_\_\_\_\_ line
- Discharge
  - Expansion
  - Liquid
  - Suction
39. The pressure temperature charts provides information about refrigerants that are:
- 100% liquid
  - 100% vapour
  - Saturated
  - Flammable
40. The state of the refrigerant at the outlet of the evaporator is:
- Low –pressure, low-temperature liquid to high –pressure, high-temperature liquid.
  - High –pressure, high-temperature vapour to a low –pressure, low-temperature vapour.
  - Low –pressure, low-temperature vapour to a high –pressure, high-temperature vapour.
  - high –pressure, high-temperature liquid to a low –pressure, low-temperature liquid
41. Refrigerant leaves the compressor through the \_\_\_\_\_ line:
- Suction
  - Expansion
  - Liquid
  - Discharge
42. The line that connects the compressor and the evaporator is called the \_\_\_\_\_ line
- Discharge
  - Expansion
  - Liquid
  - Suction
43. Subcooled refrigerants is always at a temperature that \_\_\_\_\_ saturation temperature:
- Lower than the condenser
  - higher than the condenser
  - Lower than the evaporator
  - Higher than the evaporator
44. A metric term for pressure is
- joule
  - kelvin
  - rankine
  - kilopascal
45. Refrigerant is said to be superheated when it is:
- Heated above its saturated temperature
  - Cooled below its saturated temperature 100% vapour
  - Located at the outlet of the condenser
  - Located at the inlet of the metering device
46. The system component that changes refrigerant from low –pressure liquid to a low-pressure vapour is the:
- Compressor
  - Condenser
  - Metering device
  - Evaporator
47. The system component that is responsible for absorbing heat into the system is the:
- Compressor
  - Condenser
  - Evaporator
  - Expansion device
48. One desirable property of refrigerants is that they:
- Are highly flammable
  - Absorb heat at lower temperature and reject heat at higher temperatures
  - Are colour coded.
  - Behave in an unpredictable manner.

