

SIR ARTHUR LEWIS COMMUNITY COLLEGE

DIVISION OF TECHNICAL EDUCATION AND MANAGEMENT
STUDIES

EXAMINATION SESSION : May 2014 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 : Monday 12th May, 2014

COMMENCEMENT TIME : 9:00 am

DURATION : 2 hours

ROOM : EMT-W1

INVIGILATOR(S) : K. Numa, U. Joseph



#R9



INSTRUCTIONS

Section 1: Multiple Choice

One mark for each correct answer.

Section 2: Essay type Questions.

Three marks for each correct answer.

Section 3 : The diagram of the Air-condition system.

One mark for each correct answer.

Section 1 Multiple Choice

One marks for each correct answer. Use the answer sheet provided. (50mks)

1. What substance in CFC refrigerants is responsible for contributing to the depletion of the ozone layer?
 - a) Carbon
 - b) Hydrogen.
 - c) Fluorine.
 - d) Chlorine.

2. Which of the following is classified as an HFC refrigerant?
 - a) R-11
 - b) R-22
 - c) R-123
 - d) R-134a

3. Evaporative pressure must be _____ so that the liquid boils at the correct temperature.
 - a) Low enough
 - b) High enough
 - c) Twice the low-side pressure
 - d) None of the above

4. How can air be dehumidified?
 - a) Chemical absorption
 - b) Filtration
 - c) Cooling
 - d) Both A and B

5. Most modern refrigerants have which of the following molecules as their base.
 - a) Methane
 - b) Ethane
 - c) Octane
 - d) Both A and B

6. 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

7. Temperature is defined as:
 - a) how hot it is Chemical absorption
 - b) the level of heat
 - c) how cold it is.
 - d) why is it hot.

8. Matter is commonly found in which three states:
- Solids, gases and vapors.
 - Solids, liquids and gases.
 - Vapors, gases and fluids.
 - Fluids, liquids and gases
9. A rise in sensible heat causes:
- a rise in a thermometer.
 - a fall in thermometer.
 - no change in a thermometer.
 - ice to melt.
10. The temperature reading of 50degrees Celsius is the same as _____ degrees Fahrenheit
- 10
 - 50
 - 122
 - 212
11. The temperature reading of 20degrees Celsius is the same as _____ degrees Fahrenheit
- 72
 - 50
 - 68
 - 75
12. Power is defined as the amount of:
- Work performed
 - Energy generated
 - Work performed per unit time
 - Energy generated per unit time
13. 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.
14. 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.
15. The method of heat transfer that results from heat energy being transferred between molecules of a substance is:
- Convection
 - Conduction
 - Radiation
 - Condensation
16. 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

17. The number of British thermal units required to melt one pound of ice at 32 degrees Fahrenheit is:
- a) 0.5
 - b) 1.0
 - c) 144.0
 - d) 200.0
18. The number of Btus required to change the temperature of one pound of a substance is referred to as -----heat.
- a) Latent
 - b) Sensible
 - c) Specific
 - d) Hidden
19. 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.
20. Which of the following is true regarding the atoms in various states of matter.
- a) Liquid have less molecular attraction than solids
 - b) Fluids have less molecular attraction than vapors
 - c) Solids have less molecular attraction than gases
 - d) Solids and fluids have the same molecular attraction
21. British thermal unit is defined as the:
- a) The amount of heat required to increase the temperature of one pound of a water one degree Fahrenheit.
 - b) The amount of heat required to produce one kilowatt of electrical power.
 - c) Time it takes for one pound of water to boil.
 - d) The amount of heat required to freeze one pound of water at atmospheric pressure
22. Increased molecular motion the substance is the result of _____ the substance.
- a) Decreasing the pressure of
 - b) Heating
 - c) Cooling
 - d) Increasing the volume of
23. Change in temperature of one pound of water one degree Fahrenheit will require how many Btus.
- a) 0.5
 - b) 1.0
 - c) 144.0
 - d) 100.0
24. The temperature at which molecular motion stops is:
- a) Zero degrees Celsius
 - b) Absolute zero
 - c) The substance boiling temperature
 - d) The substance freezing point
25. Heat transfer through a copper pipe is an example of which type of heat transfer
- a) Convection
 - b) Conduction
 - c) Radiation
 - d) Condensation

26. Latent heat causes:
- a rise in a thermometer.
 - temperature to rise .
 - a change in state.
 - temperature to fall.
27. 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.
28. The heat content in a substance is measured in:
- Degrees Fahrenheit
 - Degrees Celsius
 - British thermal unit
 - Temperature
29. The state of matter that has the weakest molecular bond is:
- Fluids
 - Solids,
 - Gases
 - Liquid
30. A gauge reading of 30psig is equivalent to what absolute pressure:
- 15 psia
 - 30 psia
 - 45 psia
 - 60 psia
31. One Chlorine atom can destroy how many ozone molecules?
- 1.
 - 10.
 - 1,000.
 - 100,000.
32. The state of the refrigerant at the outlet of the evaporator is:
- Low –pressure, low-temperature vapour.
 - Low –pressure, low-temperature liquid.
 - High –pressure, high-temperature vapour.
 - high –pressure, high-temperature liquid
33. Refrigerant is said to be saturated when it is:
- 100% liquid
 - 100% vapour
 - A mixture of liquid and vapour
 - Sub cooled
34. 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

35. The system component that changes refrigerant from low -pressure liquid to a low-pressure vapour is the:
- Compressor
 - Condenser
 - Metering device
 - Evaporator
36. The refrigerant line that connects the condenser to the metering device is the _____ line
- Discharge
 - Expansion
 - Liquid
 - Suction
37. The pressure temperature charts provides information about refrigerants that are :
- 100% liquid
 - 100% vapour
 - Saturated
 - Flammable
38. Sub cooled 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
39. The system component that is responsible for absorbing heat into the system is the:
- Compressor
 - Condenser
 - Evaporator
 - Expansion device
40. 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.
41. the process of refrigeration involves:
- Making a substance cold
 - Transferring heat from one place where it is unwanted to a place when it is not objectionable.
 - Adding heat to a substance being cooled.
 - Using refrigerants the behave in an unpredictable manner
42. A standard efficiency air-conditioning system operating with an outside temperature of 95 degrees will have a condenser saturation temperature of about -----degrees:
- 100
 - 105
 - 115
 - 125
43. When do refrigerants follow the pressure temperature relationship:
- When the refrigerant is 100% liquid
 - When the refrigerant is 100% vapour
 - When the refrigerant is in the compressor
 - When the refrigerant is saturated

44. 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
45. Refrigerant leaves the compressor through the _____ line:
- Suction
 - Expansion
 - Liquid
 - Discharge
46. The line that connects the compressor and the evaporator is called the _____ line
- Discharge
 - Expansion
 - Liquid
 - Suction
47. The system component that is responsible for rejecting system heat is the:
- Compressor
 - Condenser
 - Evaporator
 - Metering device
48. The system component that turn high–pressure vapour into a high-pressure liquid is:
- Compressor
 - Metering device
 - Condenser
 - Evaporator
49. What is the condenser sub cooling if the refrigerant condenses at 125 degrees and leaves the condenser at 105 degrees:
- 10 degrees
 - 20 degrees
 - 105 degrees
 - 125 degrees
50. A high efficiency air-conditioning system operating with an outside temperature of 95 degrees will have a condenser saturation temperature of about -----degrees:
- 100
 - 105
 - 115
 - 125

Section 2: Essay type Questions.

Three marks for each correct answer.

1. Describe briefly the basic refrigeration cycle
2. What is the relationship between pressure and the boiling point of liquids
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 or air-conditioning system?
7. What is the purpose of the heat exchange between the metering device and the suction line?
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 second law of thermodynamics?

Section 3: Complete the diagram of the air-condition system. (20mks)

Marks are awarded accordingly

1) Identify the four main parts of the air-condition system on the diagram.

2) What is the pressure, the temperature and the condition of the refrigerant at the following area on the diagram?

3) _____

4) _____

5) _____

6) _____

7) _____

8) _____

9) _____

10) _____

11) _____

End of Examination

A typical air-conditioning system for R-22 showing temperatures and airflow. Red indicates warm to hot; blue indicates cool to cold.

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