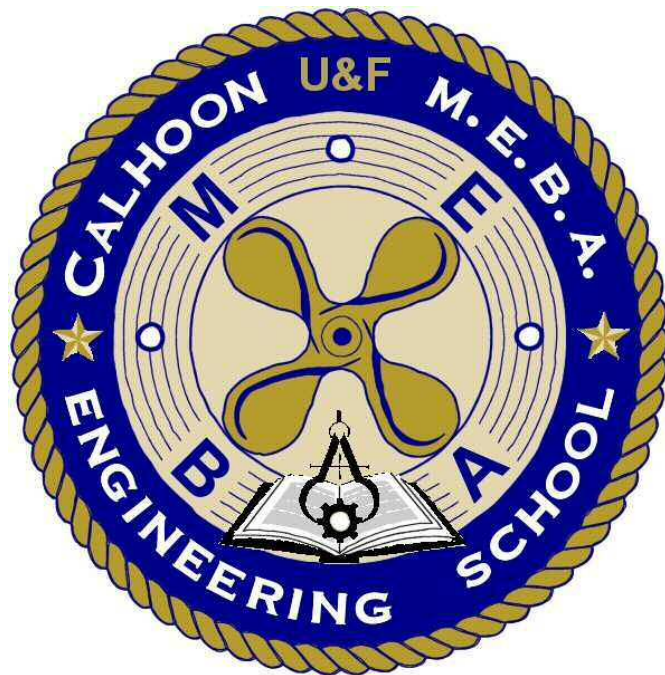


Calhoun MEBA Engineering School

**Study Guide
for Proficiency
Testing
Refrigeration**



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January 2016

1. To prevent an injury when working with refrigerants, what safety precautions are necessary?
2. When halogens are in contact with an open flame, know what gas is produced.
3. When leak testing systems using nitrogen, you should what are safe practices.
4. Know how to prevent a refrigerant from slugging the compressor when charging the system.
5. Know the rules regarding use and discarding of disposable refrigerant cylinders.
6. With other parameters normal, if a system shows a high low-side superheat with high condenser sub-cooling, what is most likely the problem?
7. Know the compressor oil-types that are generally considered the most compatible with HFC refrigerants?
8. Know the refrigerant classification of HCFC 22.
9. Know the BTU's per hour of a ton of refrigeration.
10. Calculate several examples of the heat required to melt various quantities of ice.
11. List the main parts of a refrigeration system.
12. Know the states of a refrigerant as it passes through suction, compressor, condenser and liquid lines.
13. Know where service valves should be seated out a manifold gauge to read the operating high and low side pressures of the system.
14. Know what an automatic expansion valve directly controls.
15. Know what a thermostatic expansion valve directly controls.
17. Know what parameter operates the oil pressure failure control on a compressor.
18. Know which refrigerant is not miscible with mineral oil?
19. Know the properties and effects of hygroscopic refrigerant oil.
20. Know the commonly used compressor types and the operational characteristics of each.
21. How the compression ratio of a refrigeration compressor is determined.

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22. Know the common temperature differential from the air entering a condenser and the refrigerant condensing temperature.

23. Know what two pressures control the water-regulating valve on a water-cooler condenser.

Quit here

24. What condition is the refrigerant in before it enters the metering device?

- A. A high-pressure, high temperature saturated liquid
- B. A high-pressure, low temperature saturated liquid
- C. A high pressure, high temperature subcooled liquid
- D. A high pressure , high temperature saturated liquid/vapor mixture

25. If a system using a TXV has a suction line of 4 3/4" diameter, where should the sensing bulb be placed?

- A. At the 4 o'clock or 8 o'clock position
- B. At the 12 o'clock position
- C. At the 2 o'clock or 10 o'clock position
- D. At the 6 o'clock position

26. The principle reason for pulling down into a deep vacuum when evacuating a refrigeration system is to:

- A. Check for leaks.
- B. Remove refrigerant.
- C. Remove air.
- D. Remove moisture.

27. You notice that the suction end of a container units semihermetic compressor is covered in ice, this is an indication that:

- A. The system is low on refrigerant.
- B. The system is overcharged with refrigerant
- C. The system has an abnormally low suction pressure
- D. The system is operating correctly.

28. Container units will use modulating cooling when:

- A. Loaded with frozen cargo.

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- B. Loaded with perishable cargo.
 - C. Loaded with either frozen or perishable cargo.
 - D. When outside ambient temperatures are below 32°F.
29. The fresh air makeup vent on container units must be closed when transporting:
- A. Perishable foods or controlled atmosphere loads.
 - B. Perishable foods or when pulling down a cargo to set point.
 - C. Frozen loads or controlled atmosphere loads.
 - D. Frozen loads or pharmaceuticals.
30. After performing a low side pump down all of the following components can be serviced with the exception of the:
- A. Filter/drier
 - B. Modulation valve
 - C. Receiver
 - D. Heat exchanger
31. A 20VA control transformer rated for 24-volts on the secondary can safely draw a maximum secondary amperage of:
- A. .50
 - B. .83
 - C. 1.25
 - D. 8.0
32. Removing refrigerant from a system and storing it in a cylinder without performing any testing or processing is called:
- A. Evacuation
 - B. Recycling
 - C. Reclaiming
 - D. Recovery
33. An oil separator has which of the following lines or connection attached to it?
- A. Inlet, outlet, oil line
 - B. Inlet and outlet
 - C. Inlet and oil line
 - D. Outlet and oil line
34. A refrigerant classified as an "Azeotropic blend":
- A. Will not fractionate

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- B. Behave much like two different refrigerants
 - C. Has a temperature glide.
 - D. Must always be charged as a liquid.
35. How is superheat increased on a TXV system?
- A. By increasing evaporator temperature
 - B. By increasing evaporator pressure.
 - C. By turning the TXV valve stem counterclockwise.
 - D. By turning the TXV valve stem clockwise
36. The pressure that tends to open the TXV valve is the
- A. Spring pressure
 - B. Evaporator pressure
 - C. Bulb pressure
 - D. Spring and evaporator pressure
37. When a TXV tends to overfeed or underfeed in an attempt to find a balance point and become stable, is known as
- A. Drifting
 - B. Hunting
 - C. Balancing
 - D. Stabilizing
38. The TXV bulbs on container units are
- A. Liquid charged
 - B. Gas charged
 - C. Cross charged
 - D. Gas cross charged
39. In general, the correct superheat will be determined on the temperature difference between the
- A. Suction line temperature and the evaporator temperature
 - B. Condensing temperature and the evaporator temperature
 - C. Saturation temperature and liquid line temperature
 - D. Suction line temperature and TXV bulb temperature
40. What is an indication of a leak in a ship service system?

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- A. Excessively high discharge pressures
 - B. Air in the system
 - C. Ice forming on the filter/drier
 - D. Traces of oil around a copper fitting
41. When pressurizing a container system during a leak test, what should be used?
- A. Nitrogen and a trace of the refrigerant used in that unit
 - B. Nitrogen and a trace of HFC 134A
 - C. Nitrogen and a trace of HCFC 22
 - D. Nitrogen and a trace of CO₂
42. All refrigerant cylinders in the United States must be approved by
- A. The Environmental Protection Agency
 - B. The Cylinder Inspectors of America
 - C. The Department of Transportation
 - D. The United States Coast Guard
43. What will decrease the evacuation time on a refrigeration system?
- A. The removal of a Schrader valve core, smaller-diameter hoses, and higher ambient temperatures
 - B. The removal of a Schrader valve core, larger-diameter hoses, and higher ambient temperatures
 - C. The removal of a Schrader valve core, smaller-diameter hoses, and lower ambient temperatures
 - D. By-passing the Schrader valve, larger-diameter hoses, and higher ambient temperatures
44. At a minimum how often should the oil be replaced in a vacuum pump?
- A. After every evacuation
 - B. Before every evacuation
 - C. After every other use
 - D. After the number of running hours specified by the manufacturer
45. Which refrigerant is most harmful to the ozone layer?
- A. CFC 12
 - B. HCFC 22
 - C. HFC 134A
 - D. CFC 11

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46. Gauge manifold hoses may now be removed and re-installed on systems containing
the same refrigerant without additional purging
- A. As long as a slight positive pressure remains in the manifold set.
 - B. As long as the previous system used the same oil.
 - C. As long as the set has been pumped down after its last use.
 - D. As long as the sets gauges are in good working order.
47. New manifold gauge sets should be
- A. Only used with HFC refrigerants
 - B. Dedicated for use with only one refrigerant.
 - C. Never evacuated.
 - D. Only used on container units.
48. All of the following factors will affect the speed of a system evacuation
except:
- A. System size
 - B. Amount of moisture in the system
 - C. Amount of refrigerant in the system
 - D. Ambient air temperature
49. Which of the following will not cause a high discharge pressure on a container units
refrigeration
system?
- A. Dirty evaporator
 - B. Dirty condenser
 - C. Air in the system
 - D. Condenser fan motor failure
50. The primary function of the liquid/suction gas heat exchanger used on some
container units is to
- A. Aid the condenser in removing superheat
 - B. Aid the evaporator in superheating the refrigerant
 - C. Prevent liquid refrigerant going back to the compressor
 - D. Increase the units cooling capacity by increasing subcooling to the
TXV
51. What are the symptoms of an air conditioning system that has a low refrigerant
charge?
- A. The evaporator coil will be partially frosted and discharge pressure will

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- increase.
- B. The suction line will sweat and the low side pressure will decrease.
 - C. The low side pressure will decrease and the evaporator coil will be partially frosted.
 - D. The discharge pressure will decrease and the suction pressure will increase.
52. What are the symptoms of a refrigeration system that has a bad compressor discharge valve?
- A. High suction pressure, high discharge pressure, and low amp draw
 - B. High discharge pressure, low suction pressure, and high amp draw
 - C. Low amp draw, low suction pressure, and high discharge pressure
 - D. Low discharge pressure, high suction pressure, and low amp draw
53. If a TXV sensing bulb had lost its charge, what effect would it have on a system?
- A. It would cause the high side pressure to increase.
 - B. It would cause the low side pressure to increase
 - C. It would cause the low side pressure to decrease
 - D. It would cause the high and low side pressure increase.
54. What are two problems that can cause a sight glass in a refrigeration system to have bubbles?
- A. An overcharge and a restricted metering device
 - B. Air in the system and an undercharge
 - C. A dirty evaporator coil and a low charge
 - D. An undercharge and a partially restricted liquid line filter/drier
55. An air conditioning system keeps tripping out on the high-pressure switch. What are three possible causes for this problem?
- A. Condenser air being recirculated, plugged metering device, and overcharge
 - B. Excessively bent condenser fins, air in the system, and undercharged
 - C. Dirty condenser, incorrect condenser fan rotation, and bad compressor valves
 - D. Dirty condenser coil, bent condenser fins, air in the system
56. When testing across a closed switch in an energized circuit, you should read:

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- A. 0 resistance
- B. Infinite resistance
- C. 0 Vac
- D. 120 Vac

57. When testing with an ammeter, you should place the meter

- A. In series with the circuit being tested.
- B. In parallel with the circuit being tested.
- C. On the highest possible setting.
- D. On the lowest possible setting.

58. When testing single phase compressor windings, you take the following readings:
What is your diagnosis?

Common to Run: 2 ohms
Common to Start: infinite resistance
Run to Start: infinite resistance

- A. The compressor motor is good.
- B. The run winding is shorted.
- C. The start winding is open.
- D. The start winding is shorted.

59. The part of a schematic that lists and explains the system components is called the:

- A. Appendix
- B. Guide
- C. Index
- D. Legend

60. What is the synchronous speed of a three-phase motor that has six poles and is operated on 60 Hz AC.

- A. 1,200 RPM
- B. 3,600 RPM
- C. 4,320 RPM
- D. 7,200 RPM

61. How many terminals does a dual-voltage three-phase compressor have?

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- A. 3
- B. 6
- C. 9
- D. 12

62. The load rating of a transformer is stated in:

- A. Amperes
- B. Volts
- C. Volt-amperes
- D. Watts

63. What type of AC motor has the highest starting torque and the greatest efficiency?

- A. Capacitor-start, capacitor run
- B. Permanent split-capacitor
- C. split-phase
- D. Three-phase

64. How does the power factor of an inductive motor affect efficiency?

- A. The lower the power factor, the less efficient the motor.
- B. The lower the power factor, the more efficient the motor.
- C. The higher the power factor, the less efficient the motor.
- D. The higher the power factor, the more efficient the motor.

65. The maximum temperature at which refrigerant may be stored is?

- A. 120°F
- B. 125°F
- C. 135°F
- D. 150°F

66. When the heat load on an evaporator increases, what is the effect on the system?

- A. Suction pressure decreases and discharge pressure increases.
- B. Suction pressure increases and discharge pressure decreases.
- C. Suction pressure and discharge pressure both decrease.
- D. Suction pressure and discharge pressure both increase.

67. The evacuation of a refrigeration system is considered complete when a vacuum of

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_____ can be maintained.

- A. 200 microns
- B. 350 microns
- C. 500 microns
- D. 1,000 microns

68. Which of the following statements about understanding wiring diagrams are **not** true?

- A. Electricity always follows the path of least resistance.
- B. Every circuit must have a load that consumes power in exchange for work.
- C. Every circuit must have a power source.
- D. Schematics are always shown with the circuits energized.

69. Which of the following types of wiring diagrams are best suited for troubleshooting electric circuits?

- A. Installation diagrams.
- B. Ladder schematics.
- C. Pictorial diagrams.
- D. Point-to-point diagrams.

70. Which of the following is measured to determine the total resistance to air flow in a ductwork system?

- A. Current draw at the compressor.
- B. External static pressure at the air handler
- C. Internal static pressure at the condensing unit
- D. External static pressure at the condensing unit

71. What problem results when the limit temperature of the discharge line at the compressor is exceeded?

- A. Evaporator superheat will be excessive, causing capacity loss.
- B. Temperature in the compressor will be high enough to vaporize the lubricant.
- C. Temperature in the compressor will be high enough to brake down motor winding insulation.
- D. Temperature in the compressor will be high enough to destroy the refrigerant.

72. A refrigeration system should be operated at least _____ before taking temperature measurements.

- A. 20 minutes
- B. 30 minutes

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- C. 45 minutes
- D. 60 minutes

73. What potential problem is associated with the use of dye injected for the purpose of leak detection?

- A. Dye may damage a manifold gauge set is installed.
- B. Dye can increase the pumping ratio of the compressor.
- C. Overuse of dye can change the mixing properties of refrigerant and oil.
- D. Overuse of dye can create acid in the oil.

74. Temperature readings taking on the refrigerant discharge line 6 inches from the compressor must never exceed:

- A. 150
- B. 200
- C. 225
- D. 250

75. Self piercing access valves:

- A. Tend to leak over time and should not be left on a system.
- B. Should be leak tested after the system is recharged.
- C. Should only be installed on the compressor's process stub.
- D. Are the only way to access small appliances.

76. What is the safe test pressure for a refrigeration system?

- A. 50 psig
- B. 125 psig
- C. Low side test pressure.
- D. High side test pressure.

77. Electronic leak detectors can detect leaks as small as:

- A. 0.05 oz/year
- B. 0.50 oz/year
- C. 1.0 oz/year
- D. 1.5 oz/year

78. As an air cleaner begins to become clogged

- A. It becomes less efficient.
- B. It becomes more efficient.
- C. Its resistance decreases.
- D. It will cause the fan to become overloaded.

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79. After the vacuum pump is isolated from the system, the micron gauge rises to a level

of 7500 microns and stays there. What does this indicate?

- A. There is a leak in the system.
- B. There is air still in the system.
- C. There is moisture still in the system.
- D. The evacuation process is complete.

80. Coefficient of Performance COP is derived by:

- A. Input kwh/Output kwh
- B. Cooling Input/Cooling Output
- C. Heat Input/Heat Output
- D. BTU output/Input kWh x 3.413