Test Bank for Commercial Refrigeration for Air Conditioning Technicians 3rd Wirz

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Answers to *Commercial Refrigeration* QUIZ
Chapter 2 – Evaporators

Name: __***MASTER***_____ Number Right: _____ Scorer: _____

1- The difference between the evaporator temperature and the suction line temperature at the coil outlet is:
a. superheat b. latent heat c. artificial heat d. extended heat

2- A typical **evaporator temperature** in an air conditioning system with 75° return air is:
a. 25° **b. 40°** c. 55° d. 75°

3- A typical **evaporator temperature** in a 35° medium temperature **walk-in** system is:
a. 25° b. 40° c. 55° d. 75°

4- The **TD** (temperature difference) between evaporator and box temperature of a reach-in is:
a. 35° **b. 20°** c. 10° d. 5°

5- The greater the evaporator **TD** the _____ moisture is removed from the air passing over the evaporator.
a. more b. less

6- If an evaporator has less than 5° superheat it is considered to be _____.
a. starving **b. flooding** c. about normal

7- If an evaporator has more than 20° superheat it is considered to be _____.
a. **starving** b. flooding c. about normal

8- If an evaporator has distributor tubes coming off the TEV distributor it is a _____.
a. flooded evaporator.
b. cap-tube evaporator.
c. multiple-circuit evaporator.
d. stamped evaporator.

9- What is the temperature differential (cut-in to cut-out) of an air sensing thermostat in a medium temperature refrigeration unit?
a. 2° **b. 5°** c. 10° d. 20°

10- A walk-in at 35° box temperature would require what type of defrost?
a. Off cycle
b. Planned defrost – clock only
c. Planned defrost with clock and electric heaters

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REVIEW for the **Mid-Term Exam**
Commercial Refrigeration

Review of Subjects:

1. Know why walk-ins are designed for slightly lower temperatures than reach-ins.

2. Know the approximate design box temperatures for:
   a. Walk-in refrigerator _____, and walk-in freezer _____.
   b. Reach-in refrigerator _____, and reach-in freezer _____.

3. Assume a walk-in refrigerator condensing unit and an A/C condensing unit are installed next to each other. They both use R22 refrigerant. Compare their condensing temperatures and their evaporator temperatures and understand why.

4. Understand the transfer of heat: That heat goes to cold and that the greater the temperature difference the faster the transfer of heat.

5. Know condenser splits of standard medium temperature refrigeration units and the C/S for freezers.

6. Given the desired condenser split be able to determine the condensing temperature for different ambient conditions.

7. Know what condensing temperature is and how to determine it given the head pressure and the refrigerant type.

8. Understand the relationship between ambient temperature, condensing temperature, head pressure, condenser split, and subcooling. Be able to calculate one given the other.

9. Know what evaporator TD is and how it is determined.

10. What is the standard TD for walk-ins? What is the standard TD for reach-ins? Understand the relationship between box temperature, evaporator temperature, suction pressure, and superheat. Be able to calculate one given the other.

11. What is the relationship of moisture removal of an evaporator and its TD?

12. What is the <u>standard</u> superheat and subcooling of commercial refrigeration units per T.R.O.T.?

13. What is the minimum allowable superheat and subcooling for most refrigeration units? What is the maximum?

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14. Above what superheat would indicate a starving evaporator?

15. Below what superheat would indicate a flooding evaporator?

16. Below what subcooling would indicate an undercharged unit?

17. Above what subcooling would indicate an overcharged unit?

18. Be able to calculate superheat/subcooling from given pressures and temperatures. Then be able to tell what that condition means in terms of starving/flooding or an overcharge/undercharge.

19. Know how to take superheat and subcooling and how to calculate it given the pressures, temperatures, and line temperatures.

20. Know the difference between off-cycle defrost, planned defrost, and planned defrost with the addition of heat to defrost the evaporator. At what temperatures are each used? (Above 36° is off-cycle, 35° is planned defrost, and below 33° is planned defrost with heat added.)

21. What is a multi-circuited evaporator and what type of TEV must be used?

22. At what minimum condensing temperature is some type of head pressure control needed?

23. How do HPR controls, fan cycle controls, and dampers control head pressure?

24. What is the normal condensing temperature maintained by water cooled units?

25. On a water cooled unit what is the difference between the temperature of the leaving water and the condensing temperature?

26. On a water cooled unit does the incoming water enter the condenser where the warm liquid refrigerant is leaving the condenser, or where the hot gas from the compressor is entering the condenser?

27. What is clearance volume when associated with a reciprocating compressor?

28. What is volumetric efficiency?

29. Know how to determine a compressor's compression ratio. Also, know which raises the compression ratio more: a drop in suction pressure or a rise in head pressure?

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30. When diagnosing compressor damage what would most likely cause a broken suction valve, discharge valve, connecting rod, crankshaft, or blown head gasket?

31. What is the most likely cause of blow-by or evidence of a worn piston on an air cooled compressor?

32. What are the most frequent causes of compressor overheating for an air cooled compressor? How about a suction cooled compressor?

33. If you tore down the compressor, what are some of the signs of overheating?

34. What is the maximum discharge line temperature?

35. What is the most likely cause of random wear on a compressor crankshaft?

36. What would you suspect on a suction cooled compressor if the crankshaft bearing closest to the suction service valve was worn, but the bearing closest to the oil pump was not worn?

37. What are the causes and how do you prevent flooding?

38. What are the causes and how do you prevent slugging (oil or refrigerant)?

39. What are the causes and how do you prevent flooded starts?

40. What would you suspect on a burned out compressor that also had worn crankshaft bearings? Is the problem electrical or mechanical and why?

41. Know how a TEV operates and how to adjust a Sporlan TEV.

42. What do the numbers & letters mean in the following Sporlan expansion valves: FV-1GA, FV-1/2C, FJE-1C, FS-1/3Z, FSE-1ZP?

43. Know how to size a TEV based on evaporator Btuh rating.

44. What are the opening and closing forces on a TEV? If the bulb lost its charge what would happen and how would the evaporator pressures respond?

45. When replacing an existing cap tube with a different sized cap tube remember the following guidelines: Smaller I.D. replacement must be shorter than the original and a larger I.D. replacement must be longer than the original cap tube.

46. What is the function of a metering device?

47. What are the forces that influence the operation of a fixed metering device?

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48. What are the forces that influence the operation of a TEV?

49. If a TEV is starving, what are 3 things that must be checked to correct it?

50. If a TEV is flooding, what are 3 things that must be checked to correct it?

51. What can cause a starving cap tube? How would you correct the problem?

52. Why is superheat important? When will you get the best superheat reading? What affects superheat?

53. According to T.R.O.T., where is the best place to mount the TEV bulb on a horizontal suction line?

54. What precautions are necessary when mounting a TEV bulb to a vertical suction line?

55. How does a TEV react to head pressure? How about a cap tube?

56. How does a TEV react to evaporator load? How about a cap tube?

57. How does a TEV react to a dirty or iced evaporator? How about a cap tube?

58. What should you try first if a TEV is hunting?

52. What should you do if you think a TEV is blocked or shut down internally?

53. What is the temperature differential or swing of an air sensing refrigeration tstat?

54. What is the benefit of a coil sensing tstat?

55. How do you use the suction service valve to check compressor efficiency?

56. Why should you be careful about front seating the discharge service valve?

57. What does an EPR do?

58. What does a CPR do?

59. What are the primary concerns when setting the low pressure control cut-in and cut-out?

60. How does an oil safety control work? What two pressures does it measure?

61. Why are current sensing relays sometimes used with oil safety controls?

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62. What is the maximum temperature drop across liquid and suction line filter-driers?

63. What are the uses and restrictions concerning suction filter-driers?

64. Know what the numbers on a Sporlan filter-drier mean. (Examples are: C304, C163S.)

65. What is a suction line accumulator used for and where is it located? Should it be used on any system that has a flooding problem? Why or why not?

66. When is an oil separator required? Where is it located?

67. Should an oil separator be used to correct a problem of oil loss due to it being trapped somewhere in the system because of improper piping?

68. What is a receiver used for and where is it located?

69. What is a king valve and what is it used for?

70. What is a heat exchanger used for and where is it located?

71. What is a vibration eliminator and where is it located?

72. What do you have to keep in mind when installing a vibration eliminator?

73. How would you know the maximum high pressure control setting on an outdoor unit?

74. Know and understand the "Technician Rules of Thumb" (T.R.O.T.) in the book. Be aware of their benefits as well as their limitations. Always use the manufacturer's recommendations whenever possible.

Information about the exam and test taking tips:

- Do not cram for the test. Do your review over several days or a week.
- Do not wait for the day before the exam! Things happen…
- Bring your P/T chart and a non-programmable calculator.
- Use a pencil, it is easier to change answers before highlighting them.
- Keep up a steady pace and try not to get hung up on a tough question.
- If you are not sure of the correct answer choose one, but mark the question so you can return later to re-check it.
- When you finish the exam, go back and highlight just the letter of the answer. This also gives you an opportunity to make sure you answered all of the questions.

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- You can mark on the test paper, make calculations, draw pictures, doodle, or whatever you want to do. Just make sure the person scoring your test knows which answer you have chosen to be the correct one.
- The test has 100 questions worth 1 point each. If you finish those and wish to try more, there are a few Extra Credit questions at ¼ point each.
- The test normally runs an hour and a half from 5:00 PM to 6:30 PM. This is enough time to finish the main part of the test (100 questions). Do not rush in order to do the Extra Credit questions. They do little good if you have not taken the time to concentrate on the first 100 questions.
- However, if you want to start early I will allow you to start at 4:30 which gives you 2 hours.
- Try to get there early so you can take about 5 minutes to get your mind in the "test mode." Don't cram; just look over a few of your old quizzes, that's all.
- Just before you start the exam I suggest you take about 30 seconds to close your eyes, breathe deeply, and relax your mind.
- The exam will be graded in class like the quizzes.
- I will enter your exam grades in my computer and determine your mid-term grade to date. I will give you a print-out so you can verify that my records on attendance, quizzes, and homework agree with your records.

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Commercial Refrigeration
ANSWERS to **Mid-Term Exam**

***Name:*_____ *MASTER* _____** *Number Right:*_____ Scored by:_____

Please circle the letter of the "best, most correct" answer below. Highlight the answers after you have finished the exam. NOTE, you can use P/T charts.

1) The approximate box temperature of most medium temperature walk-in refrigerators is:
   a. 75° b. 55° **c. 35°** d. 25°

2) The approximate box temperature of most medium temperature reach-in refrigerators is:
   a. 50° **b. 40°** c. 30° d. 20°

3) Walk-ins usually have slightly lower box temperatures than reach-ins because:
   a. Reach-ins are designed cheaper so they are more affordable.
   b. Walk-ins are designed for longer term storage, while reach-ins are more for convenience.
   c. Walk-ins have better wall insulation than reach-ins.
   d. Walk-ins have bigger compressors than reach-ins.

4) The remote condensing unit of a walk-in refrigerator and an A/C system are installed next to each other outside a building. They both use R22 and the outdoor ambient is 95°.
   The walk-in unit's condensing temperatures will be:
   a. About the same as the A/C unit.
   b. Much higher than the A/C unit.
   c. Much lower than the A/C unit.

5) The walk-in's evaporator temperatures in the example above will be :
   a. About the same as the A/C unit.
   b. Much higher than the A/C unit.
   c. Much lower than the A/C unit.

6) The evaporator temperature has to be lower than the box temperature because:
   a. Heat goes to cold; the heat in the box must transfer to the refrigerant in the evaporator.
   b. The compressor will be damaged by too high a suction temperature.
   c. Expansion valves are designed to lower evaporator temperatures.

7) The condensing temperature has to be higher than the ambient air temperature because:
   a. **Heat goes to cold; the heat in the condenser must transfer to the ambient air.**
   b. The compressor is designed to only raise temperatures, not lower them.
   c. To allow for a safety factor in case the condenser gets dirty.

8) What should be the condensing temperature of a standard medium temperature refrigeration unit if the ambient air (air entering the condenser) is 85°? 85° ambient + 30° C/S = 115° Cond.
   a. 95° b. 105° **c. 115°** d. 125°

9) What is the approximate condensing temperature of an R404A unit at 230 psig?
   a. 94° **b. 98°** c.104° d. 133°

10) What is the suction pressure of an R134a unit operating at an evaporator temperature of 20°?
   a. **18 psig** b. 20 psig c. 22 psig d. 24 psig

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11) The “low side” of a refrigeration system is considered to be the pressures located:
a. Between the discharge of the compressor and the inlet of the metering device.
b. **Between the outlet of the metering device and the inlet of the compressor.**
c. Between the inlet of the evaporator and the outlet of evaporator.
d. Only inside the compressor crankcase.

12) The difference between the evaporator temperature and the suction line temperature at the coil outlet is called:
a. **superheat** b. latent heat c. artificial heat d. extended heat

13) What is considered the “evaporator temperature”?
a. **The temperature of the refrigerant inside the evaporator tubing.**
b. The temperature of the air entering the evaporator.
c. The temperature of the air leaving the evaporator.
d. The temperature of the suction line leaving the evaporator.

14) How is the evaporator temperature determined?
a. **Take the suction pressure and use a pressure/temperature chart to find temperature.**
b. Use an electronic thermometer on the inlet and outlet of the evaporator.
c. Compare the head pressure to the suction temperature.
d. Subtract the evaporator inlet temperature from the evaporator outlet temperature.

15) The **TD** (temperature difference between evaporator and box temperature) of most walk-ins:
a. 35° b. 20° **c. 10°** d. 5°

16) The **TD** (temperature difference between evaporator and box temperature) of a most reach-ins:
a. 35° **b. 20°** c. 10° d. 5°

17) The evaporator temperature of a walk-in at a 35° box temperature should be about:
a. 15° **b. 25°** c. 35° d. 40°

18) The evaporator temperature of a reach-in at a 40°box temperature should be about:
a. 10° **b. 20°** c. 30° d. 40°

19) The lower the evaporator TD, the _____ moisture is removed from the space.
a. More **b. Less**

20) If an evaporator has less than 5° superheat it is considered to be _____.
a. Starving **b. Flooding** c. About normal

21) If an evaporator has more than 20° superheat it is considered to be _____.
a. **Starving** b. Flooding c. About normal

22) If an evaporator has distributor tubes coming off the TEV distributor it is a _____.
a. Flooded evaporator.
b. Cap-tube evaporator.
c. Multiple-circuit evaporator.
d. Stamped evaporator.

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23) For a standard off-cycle defrost in a 38° to 40° refrigerator the air-sensing thermostat has a differential of ____.
a. 2° **b. 5°** c. 10° d. 20°

24) A walk-in at a 35° box temperature may require what type of additional defrost?
a. Off-cycle defrost – requiring only an air sensing tstat.
b. Off-cycle defrost – requiring special tstat and only one defrost heater.
c. Planned defrost – requiring an air sensing tstat and a defrost clock.
d. Planned defrost – requiring an air sensing tstat, defrost clock, and electric heaters.

25) If airflow across an evaporator is decreased, what effect does it have on evaporator temperature and suction pressure?
a. The evaporator temperature increases and the suction pressure decreases.
b. The evaporator temperature decreases and the suction pressure increases.
c. Both evaporator temperature and suction pressure decrease.
d. Both evaporator temperature and suction pressure increase.

26) How is superheat determined?
a. Subtract evaporator temperature from the suction line temperature.
b. Add the evaporator temperature to the suction line temperature.
c. Use the pressure/ temperature chart to determine suction line temperature.
d. Calculate the difference between air temperature entering and leaving the evaporator.

27) What is the superheat if the suction pressure on an R134a system is 35 psig and the suction line temperature is 46°? 46° line temperature – 40° evaporator temperature = 6° S/H
a. 2° **b. 6°** c. 10° d. 12° e. 30°

28) If an R134a system has suction pressure of 20 psig and a suction line temperature of 46° the evaporator is _____. 46° line temperature – 22° evaporator = 24° S/H (starving)
a. Flooding **b. Starving** c. Operating properly d. Need more information

29) What is the superheat if the suction pressure on an R404A system is 16 psig and the suction line temperature is -10°? -10° line temperature – (-20°) evaporator = -10° + 20° = +10° S/H
a. 2° b. 6° **c. 10°** d. 12° d. 30°

30) The condenser is designed to:
a. absorb heat **b. reject heat** c. vaporize refrigerant d. warm the space

31) For most standard refrigeration systems some type of head pressure control is required if the condensing temperature goes below ___.
a. 32° **b. 90°** c. 105° d. 125°

32) After the liquid refrigerant leaves the condenser, what are two things that will cause it to flash off before it reaches the metering device?
a. A rise in temperature or a fall in pressure.
b. A rise in temperature with a corresponding rise in pressure.
c. A fall in temperature.
d. A rise in pressure.

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33) Why do most systems need to keep the head pressure above a certain level?
   a. So the suction pressure does not go too low.
   b. So the liquid will travel up a vertical pipe.
   c. So the subcooling will be maintained.
   d. So the TEV will operate properly.

34) How does an HPR valve (Head Pressure Regulating valve) maintain head pressure in cold ambient conditions?
   a. Turns off the condenser fan until the head pressure rises.
   b. Slows down the flow of water through the condenser.
   c. Backs up refrigerant in the condenser.

35) How is subcooling determined?
   a. Subtract the temperature of the liquid line leaving the condenser from the condensing temperature
   b. Add the temperature of the vapor line leaving the evaporator to the evaporator temperature
   c. Look at the high side gauge and find the temperature corresponding to the head pressure.
   d. Look it up on the pressure/temperature chart.

36) According to TROT what is considered an acceptable subcooling in most standard condensers
   a. 10° b. 25° c. 30° d. 40°

37) Which subcooling reading most likely indicates a low refrigerant charge?
   a. 2° b. 12° c. 15° d. 22° e. 30°

38) Which subcooling reading most likely indicates an overcharge of refrigerant?
   a. 2° b. 12° c. 15° d. 22° **e. 30°**

39) What is the subcooling if the condensing temperature is 115° and the liquid line is 100 °?
   a. 30° b. 25° c. 20° **d. 15°**

40) What is the subcooling of an R404A unit at 230 psig head pressure and a 90° liquid line?
   a. 8° b. 12° c. 18° d. 20° 98° condensing – 90° line = 8° S/C

41) In a water-cooled condenser, the leaving water temperature is normally ____ degrees below the condensing temperature. a. 30 b. 20 **c. 10** d. 5

42) In a water-cooled condenser the water regulating valve is usually set to maintain what condensing temperature? a. 75° b. 95° **c. 105°** d. 125°

43) Incoming cool water enters the end of a water cooled condenser where _____.
   a. hot gas is entering the condenser
   b. liquid refrigerant is leaving the condenser.
   c. the hot water is leaving the condenser.
   d. the compressor is located.

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44) How can you be sure a condenser is clean?
   a. Hire good apprentices to clean the units.
   b. Clean it yourself.
   c. Check the head pressure.
   d. Check the subcooling.

45) The difference between the ambient air temperature entering the condenser and the condensing temperature is known as _____.
   a. Condenser split
   b. Temperature swing
   c. Superheat
   d. Subcooling

46) What is the "condenser split" of a standard medium temperature refrigeration unit?
   a. 10° b. 20° **c. 30°** d. 50°

47) What is the "condenser split" of most low temperature refrigeration units?
   a. 15° **b. 25°** c. 35° d. 45°

48) What is the condenser split of an R134a unit with head pressure of 145 psig at an ambient air temperature of 90°? 110° condensing temperature – 90° ambient = 20° C/S
   a. 10° **b. 20°** c. 30° d. 40°

49) If the condenser split of a unit is supposed to be 30° what is the head pressure of an R404A unit supposed to be if the ambient air at the condenser is 84°?
   a. 210 psig b. 240 psig c. 270 psig **d. 290 psig**

50) An HPR valve (head pressure regulating valve) maintains head pressure by _____.
   a. Flooding the condenser by backing up refrigerant in the condenser
   b. Lowering the subcooling to maintain head pressure
   c. Raising the subcooling to raise the head pressure
   d. Cycling the fans to maintain head pressure

51) The "clearance volume" of a reciprocating compressor is the _____.
   a. amount of vapor refrigerant the compressor cylinder will hold during each stroke
   b. volume by which the compressor is rated
   c. space between the piston at top-dead-center and the bottom of the valve plate

52) Which would raise a compressor's compression ratio more?
   a. Lowering the suction pressure 10 psig below its design conditions.
   b. Raising the head pressure 50 psig highest design conditions.

53) What kind of damage do high compression ratios cause?
   a. Slugging b. Flooding c. Starving **d. Overheating**

54) What is the difference between slugging and flooding?
   a. Slugging is a little too much refrigerant; flooding is way too much refrigerant
   b. Flooding is a little too much refrigerant; slugging is way too much refrigerant
   c. No difference they are the same

55) If the suction valves are broken, what is the most likely cause of this type of damage?
   a. **Slugging** b. Flooding c. Starving d. Overheating

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56) On an air-cooled semi-hermetic compressor the most likely cause of piston wear allowing "blowby" of vapor into the crankcase is _____.
a. Slugging **b. Flooding** c. Starving d. Flooded start

57) What causes high motor heat on an air cooled compressor?
a. Broken discharge or suction valves
b. Inadequate airflow across the compressor from the condenser fan
c. Low mass flow of suction vapor to cool the compressor motor
d. Low ambient temperatures

58) What causes high motor heat on an suction cooled compressor?
a. Broken discharge or suction valves
b. Inadequate airflow across the compressor from the condenser fan
c. Low mass flow of suction vapor to cool the compressor motor
d. Low ambient temperatures

59) How do you prevent flooding and slugging?
a. Keep suction pressure up.
b. Keep superheat at proper levels.
c. Install a crankcase heater or pump-down solenoid.
d. Maintain proper head pressures.

60) What causes a flooded start?
a. Too fast a compressor start up
b. Compressor short cycling
c. Floodback
d. Refrigerant migration

61) How do you prevent flooded starts?
a. Keep suction pressure up
b. Keep superheat at proper levels
c. Install a crankcase heater or pump-down solenoid.
d. Maintain proper head pressures.

62) A multi-circuited walk-in refrigerator evaporator will require what type of TEV?
a. An externally equalized TEV.
b. An internally equalized TEV.
c. A "ZP" pressure limiting TEV.
d. A balanced port TEV.

63) When the load on the evaporator increases, the TXV:
a. Increases the flow of refrigerant.
b. Decreases the flow of refrigerant.
c. Maintains a steady flow of refrigerant.
d. Adjusts the superheat up in the evaporator.

64) If someone has the TEV way out of adjustment what would you do first to correct it?
a. Replace the TEV.
b. Try to adjust the valve to 10° superheat.
c. Find the midpoint of the valve adjustment.
d. Turn the adjuster out (counter-clockwise) 4 turns.

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65) What happens if the TEV bulb loses its charge?
a. The valve opens fully, flooding the evaporator.
b. The valve shuts down, starving the evaporator.
c. The valve starts hunting, first flooding then starving the evaporator.
d. Nothing, the valve will operate near normal on spring tension.

66) If a cap tube system is charged but running in a vacuum what is the most efficient remedy?
a. Add more refrigerant.
b. Cut a couple inches off the cap tube inlet and replace the filter drier.
c. Replace the filter drier and the complete and correctly sized cap tube.

67) The pressure-limiting TEV ("ZP" on a freezer) _____.
a. Allows the compressor to operate at low head pressures.
b. Feeds extra refrigerant to the evaporator during a hot pull down.
c. Prevents high suction pressure from overloading compressor during a hot pull down.

68) According to TROT, what is the standard evaporator superheat for a medium temperature walk-in?
a. 2° **b. 10°** c. 22° d. 30°

69) If an R404A system has suction pressure of 16 psig and a suction line temperature of –20° the evaporator is _____. -20° line temperature – (-20°) evap. temp. = -20° + 20° = 0° S/H
a. Flooding b. Starving c. Operating properly d. Need more information

70) If a Sporlan TEV has superheat 4° too high what stem adjustment would you make?
a. 4 turns clockwise **b. 1 turn counterclockwise** c. Counterclockwise ½ turn

71) Why is superheat important to a refrigeration system?
a. It provides a safety margin in the TEV operation to prevent flooding the compressor.
b. It provides a necessary function to fully utilize the evaporator for absorbing heat.
c. It will make sure the compressor will operate properly.
d. Superheat is required by the Evaporator Manufacturing Association.

72) Which of the following TEVs would you choose for an 8,000 Btuh evaporator?
a. ½ ton **b. ¾ ton** c. 1 ton d. 1-1/2 ton

73) When is the best time to check for proper superheat settings and to adjust if necessary?
a. On initial startup of the system.
b. After the compressor has cycled off on thermostat.
c. After the space temperature has fallen by 5°.
d. When the space temperature is within 5° of design temperature.

74) For the most accurate superheat calculation _____.
a. Take the suction pressure reading at the service valve and deduct 2 psig.
b. Take the suction pressure reading where the suction line temperature is taken.
c. Add 2 psig to the suction pressure.
d. Use a pocket thermometer to check line temperature at the TEV bulb.

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75) What is the primary opening force on a standard thermal expansion valve (TEV)?
- **a. Pressure from the sensing bulb.**
- b. Superheat adjustment spring pressure.
- c. Pressure at the TEV outlet to the evaporator.
- d. Suction pressure at the evaporator outlet.

76) A multi-circuited evaporator requires what type of TEV?
- a. Internally equalized
- **b. Externally equalized**
- c. Balanced port
- d. Pressure limiting

77) On a Sporlan TEV, turning the adjustment stem in (clockwise) one full turn will _____.
- a. Decrease superheat by 4°
- **b. Increase superheat by 4°**
- c. Decrease superheat by 1°
- d. Increase superheat by 1°

78) How do you know when a TEV is flooding the evaporator?
- a. Frost on the suction line
- b. Frost on the compressor
- **c. No superheat**
- d. High superheat

79) How do you know when a TEV is starving the evaporator?
- a. Frost on the suction line
- b. Frost on the compressor
- c. No superheat
- **d. High superheat**

80) What are three criteria needed for a TEV to work correctly?
- **a. Valve sized correctly, bulb installed correctly, and total liquid to the valve.**
- b. Valve sized correctly, bulb tight to the pipe, and high pressure to the valve.
- c. Valve sized correctly, bulb mounted on the bottom of the pipe, and pressure to the valve.
- d. Valve within ½ ton capacity, bulb at 4 or 8 o'clock, and proper superheat.

81) What are three things to check if a TEV is flooding?
- a. Suction pressure, head pressure, and superheat.
- b. Blockage in the valve, head pressure, and superheat.
- c. Superheat adjustment, bulb location, and head pressure.
- **d. Ice holding valve open, bulb not sensing suction line, and superheat.**

82) Which of the following is just one of the precautions that should be taken when installing a TEV bulb on a horizontal suction line?
- a. That the superheat is adjusted to compensate for the oil in the suction line.
- b. That the bulb cap tube is coming out the bottom of the bulb.
- **c. That the bulb is strapped tight to a smooth section of pipe.**
- d. That the superheat is above 5°.

Access Complete Test Bank for Commercial Refrigeration for Air Conditioning Technicians 3rd Wirz

83) How does an air sensing tstat prevent frost on a medium temperature evaporator?
a. It has a narrow temperature swing to prevent frost buildup.
b. It has a wide temperature swing to allow time to defrost.
c. The tstat won't start the compressor until the evaporator frost has melted.
d. The tstat knows when to go into defrost.

84) How does a coil sensing tstat prevent frost on a medium temperature evaporator?
a. It has a narrow temperature swing to prevent frost buildup.
b. It has a wide temperature swing to allow time to defrost.
c. The tstat won't start the compressor until the evaporator frost has melted.
d. The tstat knows when to go into defrost.

85) What is the primary purpose of the cap on a service valve stem?
a. To prevent refrigerant from leaking out of the valve stem when back seated.
b. To keep the valve stem from being damaged.
c. To prevent dirt from getting on the valve stem and damaging the packing when opened.
d. To make the compressor look good.

86) If you did not have factory instructions on setting the cut-out of a high pressure control, which of the following would most likely be acceptable for the outdoor unit you are working on?
a. Set the cut-out at 400 psig.
b. Set the cut-out at a pressure equivalent to a 155° condensing temperature for that refrigerant.
c. Set the cut-out at a pressure equivalent to 30° above the highest ambient the unit will probably encounter.
d. Use the maximum setting on the high pressure control you plan to use.

87) If oil is being trapped in a refrigeration system will an oil separator solve the problem? Why or why not?
a. Yes, because the oil separator will return all the oil back into the crankcase.
b. No, because an oil separator does not return all the oil to the crankcase.
c. Yes, because the compressor does not need all the oil returned anyway.
d. No, because the separators can lock up with too much oil.

88) What happens if the compressor runs when the discharge service valve is front-seated?
a. The unit will be pumped down and ready for servicing the low side.
b. The valves can be checked for leaking.
c. The compressor can be damaged.
d. The gauges can be removed and the compressor will run normally.

89) What is the primary function of a **CPR** valve?
a. Maintains a minimum suction pressure at the compressor.
b. Keeps pressures and temperatures up in the evaporator.
c. Prevents compressor overload during hot pull-down.

90) What is the primary function of an **EPR** valve?
a. Maintains a minimum suction pressure at the compressor.
b. Keeps pressures and temperatures up in the evaporator.
c. Prevents compressor overload during hot pull-down.

Access Complete Test Bank for Commercial Refrigeration for Air Conditioning Technicians 3rd Wirz

91) What is the primary function of a **receiver**?
- **a. Store refrigerant on TEV systems and systems with HPR valves.**
- b. Prevents compressor from floodback during hot pull-downs.
- c. Keeps head pressure up during low ambient conditions.
- d. Allow the system to be pumped down for repairs to the high side of the system.

92) What is the primary function of an **accumulator**?
- a. Store refrigerant on TEV systems and systems with HPR valves.
- **b. Protects the compressor from floodback during hot pull-downs.**
- c. Keeps head pressure up during low ambient conditions.
- d. Allow the system to be pumped down for repairs to the high side of the system.

93) A filter drier should be replaced if the temperature drop from inlet to outlet exceeds ____?
a. **3°** b. 7.5° c. 10° d. 15°

94) A filter-drier always traps debris and contaminants on the first pass through the filter.
a. True **b. False**

95) Once contaminants are trapped in a filter-drier they cannot be released back into the system.
a. True **b. False**

96) A filter-drier that has reached its maximum water capacity can release the moisture back into the system if the drier or the refrigerant temperature is increased.
a. **True** b. False

97) How do you know if a filter drier has reached its maximum moisture holding capacity?
- a. Check the temperature drop between the inlet and outlet of the filter-drier.
- b. Check the pressure drop across the filter-drier.
- **c. Check the sight glass moisture indicator.**
- d. Pump the system down and see if it will hold a vacuum.

98) If you see the sight glass bubbling should you add refrigerant? Why or why not?
- **a. No, the system may have just started or there may be a low load.**
- b. No, wait until the bubbles stop before adding refrigerant.
- c. Yes, bubbles always mean the system is low on charge.
- d. Yes, when in doubt you should always add refrigerant.

99) What is the primary function of a **heat exchanger** in a refrigeration system?
- a. Keeps heat in the liquid line during low ambient conditions.
- b. It prevents floodback by boiling off liquid refrigerant in the suction line.
- **c. It subcools the liquid refrigerant to prevent flash gas before the TEV.**

100) What two pressures does an **oil safety control** monitor?
- **a. Crankcase pressure and oil pump discharge pressure.**
- b. Suction pressure and head pressure.
- c. Low side pressure and receiver pressure.

Congratulations, you have just completed a very comprehensive exam. I'm sure your grade will reflect the effort you have put into the course this semester. You may take a break and relax. At about 6:30 pm we will exchange papers and grade the exams in class. Don't forget to highlight your answers.
If you wish, and if there is time remaining, you may want to try the Extra Credit Questions on the next page.

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If you have finished the exam and there is time remaining you may try the following:

Extra Credit Questions

Correct Answers = +1/4 point each
Wrong Answers = No Penalty

1) The approximate box temperature of most low temperature walk-in freezers is:
a. 10° b. 0° **c. -10°** d. -20°

2) The approximate box temperature of most low temperature reach-in freezers is:
a. 10° **b. 0°** c. -10° d. -20°

3) What is the approximate condensing temperature of an R22 unit at 230 psig?
a. 101° **b. 111°** c.121° d. 140°

4) What is the approximate condensing temperature of an R134a unit at 230 psig?
d. 101° b. 111° c.121° **d. 140°**

5)What is the suction pressure of an R22 unit operating at an evaporator temperature of 25°?
a. 18 psig b. 28 psig c. 35 psig **d. 49 psig**

6) What is the suction pressure of an R404A unit operating at an evaporator temperature of -10°?
a. 8 psig **b. 24 psig** c. 26 psig d. 34 psig

7) A typical evaporator temperature of a walk-in at a -10° box temperature is:
a. -30° **b. -20°** c. -10° d. 0°

8) A typical evaporator temperature of a reach-in at a 0° box temperature is:
a. -20° b. -10° c. 0° d. +10°

9) What is the primary function of a thermostatic expansion valve (TEV)?
a. To maintain the required superheat.
b. To prevent floodback to the compressor.
c. To prevent evaporator starving and compressor motor overheating.

10) If the original cap tube was .042 ID, the smaller replacement .040 cap tube should be_____.
a. Longer
b. Shorter
c. The same length
d. Cut with a tubing cutter

11) If a TEV is starving, which of the following set of three things must be checked?
a. High suction pressure, low head pressure, and low superheat.
b. Superheat adjustment, bulb not strapped to the suction line, and head pressure.
c. Ice holding valve open, if bulb is mounted properly, superheat adjustment.
d. Ice or debris blocking the valve, liquid at the valve inlet, superheat adjustment.

Access Complete Test Bank for Commercial Refrigeration for Air Conditioning Technicians 3rd Wirz

12) What is a sign that the TEV is “hunting”?
a. High superheat
b. Low superheat
c. Superheat fluctuation
d. Frost on the suction line

13) If the accumulator is sweating should it be insulated? Why or why not?
a. No because it would make rusting a greater problem.
b. Yes because rusting will cause pin-hole leaks in the steel body.
c. Yes because it will stop the sweating and prevent water damage.
d. No because it would stop the transfer of heat needed to boil off the refrigerant.

14) The primary desiccant (usually silica gel) in a filter drier is designed to remove what system contaminant?
a. Acid b. Wax c. Sludge **d. Moisture**

15) What is the normal time delay in an oil safety control before it trips?
a. 10 seconds b. 30 seconds c. 60 seconds **d. 120 seconds**

16) What is the minimum allowable oil pressure differential before an oil safety control will trip?
a. **10 psig** b. 20 psig c. 30 psig d. 40 psig

17) According to Copeland, what is the highest maximum allowable difference (blow-by) between suction and crankcase pressures?
a. 1 psig
b. 3 psig
c. 5 psig

How about those extra credit questions? I wanted to make sure you had a chance to show off all that studying you did. Are there any other questions I could have asked, or do you think we covered the first part of the semester pretty well?

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