

Modern Refrigeration and Air Conditioning Questions

1. How does an evaporator remove moisture from the air?

- A. evaporation of moisture in space
- B. humidification of space
- C. absorption of heat in space
- D. super heated refrigerant

2 The definition of a Btu is: the equivalent quantity of energy needed to raise the temperature of one pound of water one degree F. How many Btu's will it take to raise 7 pounds of water from 100 degrees F to 112 degrees F?

- A. 112
- B. 84
- C. 700
- D. 7

3 The type of cooling system which removes sensible heat is:

- A. evaporative cooling
- B. refrigerated air
- C. mechanical air moving cooler
- D. sensible cooler

4. The boiling point of a liquid increases:

- A. when its temperature is lowered
- B. when the pressure is lowered
- C. when more heat is added
- D. when the pressure is increased

5. Heat transfer is by

- A. convection
- B. all of these
- C. radiation
- D. conductivity and conductance

6. Heat may be transferred by means of

- I. Convection
- II. Conduction
- A. II only
- B. neither I or II
- C. Both I & II
- D. I only

7. If you heat one end of an iron bar, the other end is heated by ?

- A. radiation
- B. conduction
- C. convection
- D. none of the these

8. Above a critical temperature a refrigerant

- A. cannot be used as a liquid
- B. is incompressible
- C. cannot exist as a vapor
- D. can absorb much more heat

9. Heat energy always travels from to

- A. stays the same
- B. Cold / warm
- C. warm / cold
- D. only with the use of a heat exchanger

10. Latent heat would be best described by which of the following statements?

- A. change of temperature and no change of state
- B. change of state and change of temperature
- C. change of state but no change of temperature
- D. no change of state and no change of temperature

11 Repeated bending of soft copper tubing is a sure way too cause:

- A. colloidal copper
- B. annealing
- C. work hardening
- D. thermal quenching

12 Hard drawn copper tubing is purchased in foot lengths.

- A. 10
- B. 12
- C. 20
- D. 21

13 The difference in sizes between nominal and outside diameter tubing is:

- A. 1/8"
- B. 1/16"
- C. 1/32"
- D. 1/64"

14 Type copper tubing is used on flare fittings.

- A. Type K soft drawn
- B. Type L hard drawn
- C. Type L soft drawn
- D. Type K hard drawn

15 Repeated bending of soft drawn copper tubing causes:

- A. colloidal development
- B. annealing
- C. work hardening
- D. thermal quenching

16 Type copper tubing should be used to flare fittings.

- A. Type K hard drawn
- B. Type L hard drawn
- C. Type K soft drawn
- D. Type L soft drawn

17 Repeated bending of soft drawn copper tubing causes:

- A. work hardening
- B. annealing
- C. colloidal development
- D. thermal quenching

18 What kind of copper tubing is suitable for bending in a refrigeration piping system?

- A. L soft
- B. K hard drawn
- C. M
- D. DWV

19 According to Modern Refrigeration and Air Conditioning, before copper tubing is flared, the flaring should be:

- A. coated with Teflon
- B. coated with refrigeration oil
- C. coated with melted bee's wax
- D. wire brushed

20 What is the major difference between soldering and brazing?

- A. the exposed surface area of the joint
- B. The temperature at which the filler material melts
- C. whether or not the parent metal melts
- D. the hardness of the filler metal

21 Which of the following terms describes oil at the lowest point at which it will flow?

- A. boil level
- B. pour level
- C. flash level
- D. critical level

22 The device in the air located between the compression hot gas outlet and the liquid line inlet is

- A. evaporator
- B. condenser
- C. TXV
- D. metering device

23 The operation of a thermostatic expansion valve depends upon

- A. the sensing bulb element
- B. placement of the TXV
- C. placement of the condenser
- D. location of the control device

24 A type of refrigerating system that has two compressors with the discharge of one compressor going to the suction of the second compressor.

- A. cascade
- B. compound
- C. parallel
- D. secondary

25 What is the name of the type of refrigerant system that has two compressors with the discharge of one compressor going to the suction of the second compressor?

- A. secondary
- B. cascade
- C. parallel
- D. compound

26 How do you tell when the refrigeration system is low on refrigerant?

- A. the sight glass is dark
- B. the sight glass is cloudy
- C. bubbles in the sight glass
- D. the sight glass is clear

27 Cooling is best accomplished when the refrigerant is

- A. changed from vapor to liquid
- B. changed from liquid to solid
- C. changed from liquid to vapor
- D. changed from vapor to solid

28 Suction line filters must be sized correctly in order to prevent

- A. excessive pressure drop in the suction line
- B. expansion valve hunt
- C. flood back to the compressor
- D. compressor overload

29 Of the following refrigerant controls, is a metering device.

- A. capillary tube
- B. solenoid valve
- C. sensing bulb
- D. high head pressure switch

30 In which of the following components of the refrigeration system does the cooling of the refrigerant occur?

- A. compressor
- B. evaporator
- C. condenser
- D. receiver

31 Compressors with cylinder unloaders should start:

- A. unloaded
- B. 90% loaded
- C. 75% loaded
- D. fully loaded

32 What is the purpose of a crank case heater?

- A. to keep the refrigeration oil from solidifying
- B. warm the refrigerant prior to being compressed
- C. warm the crank case
- D. evaporate refrigerant trapped in crankcase oil

33 What is used to prevent refrigerant from liquefying in the compressor crank case during cold weather?

- A. low pressure cut-out switch
- B. crankcase heater
- C. heat exchanger
- D. suction line accumulator

34 When liquid refrigerant passes through a metering device and suddenly changes to vapor, it is called:

- A. liquefied gas
- B. flash gas
- C. solidified gas
- D. compressed vapor

35 According to Code, a vibration isolator in an air supply system, which is also known in the trade as a flexible connector, and, is installed between an air handler and a duct system. The maximum length of a vibration isolator is:

- A. back-seating the suction service valve
- B. front-seating the suction service valve
- C. almost front-seating the discharge service valve
- D. almost front-seating the suction service valve

36 When a refrigeration system is charged using the low side method, proper system charging may be speeded up by:

- A. back-seating the suction service valve
- B. front-seating the suction service valve
- C. almost front-seating the discharge service valve
- D. almost front-seating the suction service valve

37 The automatic expansion valve maintains constant pressure at the

- A. condenser inlet
- B. evaporator inlet
- C. liquid line
- D. condenser outlet

38 In a compression system the expansion valve is located

- A. at the exit of the condenser
- B. on the coil
- C. at the exit of the evaporator
- D. at the entrance of the evaporator

39 A mechanical shaft seal is necessary in

- A. hermetic reciprocating compressor
- B. central air hermetic compressor
- C. hermetic rotary compressor
- D. an open type compressor

40 Which of the following is not a type of compressor lubrication?

- A. pressure system
- B. splash
- C. injector
- D. force feed

41 would only be seen in a cross charged thermostatic expansion valve.

- A. vapor & moisture
- B. liquid & vapor
- C. moisture & oil
- D. wax & vapor

42 What does a thermostatic expansion valve that is cross charged contain?

- A. liquid and gas
- B. water and air
- C. fluid different from the refrigerant in the system
- D. a thermal electric device used to sense the temperature

43 What does a thermostatic expansion valve that is cross charged contain?

- A. liquid and gas
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- C. fluid different from the refrigerant in the system
- D. a thermal electric device used to sense the temperature

44 A thermostatic expansion valve used in a refrigeration system is adjusted to obtain the best

- A. subcool
- B. superheat
- C. head pressure
- D. compressor life

45 A TXV bulb shall be positioned .

- A. on the side of the hot gas bypass
- B. immediately below the TXV
- C. on the top of the suction line
- D. on the bottom of the suction line

46 When utilizing an expansion valve, the equalizing line should be connected to the

- A. suction line
- B. discharge side
- C. condenser
- D. evaporator

47 A flooded evaporator is used for

- A. compressor capacity control
- B. cooling air blown over an evaporator
- C. flooding in an evaporator is an indication of poor air circulation
- D. cooling water and industrial purposes

48 The ability of the capillary tube to carry vapor is the same as its ability to carry liquid.

- A. True
- B. False

49 Identify the IC symbol used on internal and wiring diagrams for control systems.

- A. transformer
- B. transducers
- C. capacitors
- D. sparking cap

50 Identify the symbol in the diagram.

- A. transducer
- B. resistor
- C. transformer
- D. capacitor

51 Using the information shown in the diagram, identify the symbol.

- A. test fitting
- B. resistor
- C. capacitor
- D. motor

52 How is current measured using a clamp on amp meter?

- A. amp meter is connected in parallel with the load
- B. amp meter is connected in series with the load
- C. the amp meter senses a magnetic field produced by the current flow
- D. none of these

53 What is the purpose of an ammeter?

- A. current flow control
- B. check the current flow
- C. measures the watts consumed by an electrical device
- D. measures units of electromotive force

54 If the resistance (R) stays the same, and the voltage (E fm) increases, the current (Intensity of current in amperes) ?

- A. stays the same
- B. decreases
- C. increases
- D. current varies inversely with the voltage

55 According to Modern Refrigeration and Airconditioning. a circuit with too much current flow has an excess. This excess is converted to what form of energy?

- A. watts
- B. heat
- C. amp
- D. current

56 What are the basic voltages that can be taken from a 4 wire 208 volt system?

- A. 208 3 phase 60hz
- B. 220/208 3 phase 60hz, 220/208 1 phase 60hz
- C. 208 3 phase 60hz, 208/120 1 phase 60hz
- D. 208 3 phase 60hz , 220/110 1 phase 60hz

57 What type of motor does NOT need an external start switch?

- A. capacitor-start
- B. capacitor-run
- C. induction-run
- D. impedance-run

58 A split phase motor is a motor with a .

- A. air circulating directly over the windings
- B. a separate winding for starting
- C. a very high starting torque
- D. a shaded pole

59 In an airconditioning motor the stator may also be known as the

- A. housing
- B. frame
- C. rotor
- D. field windings

60 A motor that is started up remotely, should use a fuse rated not more than –

- A. 50 amps
- B. 100% to 110% of the rated ampere capacity of the motor
- C. 10 amps over the FLA
- D. 20 amps over the RLA

61 A shaded pole motor can be used in high torque applications.

- A. True
- B. False

62 What should happen when you jumper across the starting capacitor on a motor ?

- A. rupture the capacitor
- B. blow the internal fuse
- C. both of these
- D. none of these

63 An electric actuator for a proportional controller contains:

- A. bellows
- B. potentiometer
- C. heat anticipator
- D. cool anticipator

64 Set point may be defined as follows:

- A. the condition that is being met
- B. setting point on the control to maintain the desired conditions
- C. the deviation between the set point and the control point
- D. none of these

65 The contacts on a potential relay are

- A. a potential relay has contacts but must be specified as to closed or open
- B. normally open
- C. a potential relay has no contacts
- D. remain closed during the off part of the cycle

66 The contacts of a potential relay are in one position during off cycle?

- A. normally closed
- B. normally opened
- C. does not use contacts
- D. depends on its installed position

67 The chemical formula for refrigerant R-12 is

- A. CHCLF₂
- B. F₂L₂
- C. CHCL₃
- D. CCL₂F₂

68 What is the saturation psig of R-12 at 110 degrees F?

- A. 131.86
- B. 137.9
- C. 117.16
- D. 183.4

69 A refrigeration enthalpy/pressure chart uses which of the following pressures?

- A. absolute
- B. gauge
- C. atmospheric
- D. all

70 If a drum of R-12 partially filled with liquid refrigerant is stored in a 100 degree F room the pressure in the drum would be .

- A. 132 psig
- B. 117 psig
- C. 32" Hg
- D. 196 psig

71 In a R-22 system, evaporator pressure is 60 pounds. What is the corresponding saturated refrigerant temperature in degrees F?

- A. 45
- B. 40
- C. 34
- D. 55

72 What is the saturation psig of R-22 at 110 degrees F?

- A. 245.8
- B. 136.4
- C. 164.9
- D. 226.4

73 Sulfur Dioxide is a fairly stable refrigerant and is

- A. flammable
- B. toxic
- C. explosive
- D. irritating

74 Normally, in a refrigerating system, the refrigerant will be degrees F colder than the evaporator temperature when the unit is running.

- A. 10
- B. 15
- C. 18
- D. 5

75 Which of the following must be avoided in the selection of a refrigerant oil?

- A. oils that are fluid at low temperatures
- B. oils that react chemically with the refrigerant
- C. oils that are stable at high temperatures
- D. oils that are dry and moisture free

76 Moisture in a refrigeration system will cause

- A. freezing up the metering device
- B. all of the these
- C. break down of the insulation on the motor windings
- D. chemical changes in the oil

77 A moisture indicator is found where?

- A. suction line
- B. liquid line
- C. on the TXV
- D. at the exit of the evaporator

78 When wax forms and is separated from the oil it collects in the refrigerant control. What is the remedy to this situation?

- A. Remove capillary tube and clean and replace
- B. Remove valve and clean
- C. All of these
- D. Remove valve and replace

79 What color flame does a halide leak detector give off in the presence of hydrocarbons.

- A. Red
- B. Yellow
- C. Blue Green
- D. white

80 To charge a system with vapor you must connect a cylinder to the .

- A. evaporator
- B. liquid line
- C. discharge line
- D. suction line

81 The effect of sub-cooling is

- A. increases the sensible cooling effect in a refrigeration process
- B. decrease the overall efficiency of the total refrigeration process
- C. increase the overall efficiency of the total refrigeration process
- D. decreases the sensible cooling effect in a refrigeration process

82 When piping two or more compressors in parallel, care should be taken to

- A. make the piping slope to one compressor
- B. insulate the lines between the compressors
- C. install an oil equalizer line
- D. make sure the suction line has the correct ID Ratio

83 A compressor unloader is used to

- A. remove the compressor from its packing crate
- B. move the compressor from the truck to its mounting location
- C. stop the pistons when a reduced cooling load is sensed
- D. reduce the number of pistons pumping Freon when a reduced cooling load is sensed

84 Cylinder unloaders are a common method of capacity control on

- A. all types of compressors
- B. small compressors
- C. rotary compressors
- D. large compressors

85 What color flame does a halide leak detector give off when freon is present?

- A. yellow
- B. green
- C. red
- D. blue

86 The electronic leak detector carries a 1-B, CD rating, and therefore may safely be used in areas containing explosive or flammable vapors.

- A. True
- B. False

87 In a flooded cooling system, where does the water travel that needs to be cooled?

- A. in the shell
- B. in the tubes
- C. upper half of the tubes
- D. lower half of the tubes

88 Evaporators operating between 20 and 32 degrees F must frequently be

- A. purged
- B. defrosted
- C. painted
- D. repaired

89 What do you have when the suction line and the liquid line are soldered together?

- A. heat exchanger
- B. a mistake
- C. TXV
- D. AXV

90 Contactors are used

- A. instead of manual switches
- B. because they are low cost
- C. to replace controls
- D. because of heavy electrical load

91 A suction accumulator is used on the low side of a system to .

- A. serve as a heat exchanger
- B. remove impurities
- C. equalize pressure
- D. store liquid refrigerant

92 When an oil separator is used in a low temperature application it should be kept in a cool place for best Performance

- A. True
- B. False

93 Bubbles in the liquid line are an indication of:

- A. decreased efficiency
- B. system low on refrigerant
- C. has no effect
- D. increased efficiency

94 According to Modern Refrigeration and Airconditioning, the metering, two temperature valve acts more like a than a shut-off valve.

- A. throttling device
- B. modulating valve
- C. flow control device
- D. check valve

95 In a refrigeration system what kind of condenser is a shell & tube?

- A. water cooled
- B. air cooled
- C. marine worthy
- D. air inflatable

96 Cooling tower water is circulated to prevent what kind of buildup?

- A. algae
- B. scale
- C. chloride buildup
- D. static pressure

97 According to Modern Refrigeration and Airconditioning, panels for prefabricated walk-in boxes use to secured to each other.

- A. partition panel locks
- B. eccentric cam fasteners
- C. stainless steel clamps
- D. spring steel clamps

98 In checking out pressures on a refrigeration system, one would expect to use

- A. manifold gauges
- B. sight glass
- C. bourdon tube
- D. pressure gauge

99 The Ph scale is 1 - 14. Which of the following numbers represents an acidic condition?

- A. 6
- B. 7
- C. 8
- D. 9

100 The purpose of a filter dryer in a refrigeration line is:

- A. keeps the evaporator defrosted
- B. removes excess oil from the refrigerant
- C. keeps the condenser coils defrosted
- D. removes moisture from the refrigerant

101 How is a dryer used in a refrigeration system?

- A. removes moisture from the refrigerant
- B. removes excess oil from the refrigerant
- C. keeps the condenser coils defrosted
- D. keeps the evaporator defrosted

102 According to Modern Refrigeration and Airconditioning, after city water is circulated through an evaporative cooling system approximate times it must be bled off or treated to prevent scale.

- A. 2
- B. 4
- C. 6
- D. 8

103 A pH value of 13 indicates what?

- A. high acid
- B. low acid
- C. high alkaline
- D. low alkaline

104 According to Modern Refrigeration and Airconditioning, when winterizing and draining a refrigeration system, the condenser water system and other shut downs, all of the following plugs should be removed except:

- A. condenser circulating pump drain
- B. condenser shell drain
- C. tower sub drain
- D. refrigerant crankcase oil drain

105 According to Modern Refrigeration and Airconditioning, a drain line for a cooling tower should be installed with a pitch of inches per foot, or a pump should be installed to lift the condensate to its discharge location.

- A. 1/16
- B. 1/8
- C. 1/4
- D. 1/2

106 When first charging a commercial refrigeration system, which side of the system is refrigerant vapor introduced?

- A. mechanical room side
- B. high pressure side
- C. compressor side
- D. low pressure side

107 When a refrigeration system is charged using the low side method if the suction pressure is too low, it may cause:

- A. the compressor to pump oil
- B. rapid condensation of the refrigerant in evaporator
- C. rapid evaporation of the refrigerant in condenser
- D. the refrigerant cylinder to collapse

108 When a refrigeration system is charged using the low side method, if the suction pressure is too low, it may cause:

- A. rapid evaporation of the refrigerant in condenser
- B. rapid condensation of the refrigerant in evaporator
- C. the compressor to pump oil
- D. the refrigerant cylinder to collapse

109 According to Modern Refrigeration and Airconditioning, the method recommended to charge a system with refrigerant is:

- A. liquid refrigerant into the low side
- B. liquid refrigerant into the high side
- C. refrigerant vapor into the low side
- D. refrigerant vapor into the high side

110 Caution must be exercised when charging a unit with refrigerant using the low side method. If the suction pressure is too low it may cause:

- A. overwork the compressor
- B. oil pumping
- C. flash gas
- D. the refrigerant cylinder to act as a condenser

111 What is a dry evaporator designed for ?

- A. systems which require a low RH in the room being cooled
- B. a system where water surrounds the evaporator
- C. a system where air is to be blown over the evaporator
- D. systems which require a high RH in the room being cooled

112 A flooded type evaporator has excellent heat transfer efficiency because .

- A. the thinner the fluid the lesser the heat flow
- B. the denser the fluid the lesser the heat flow
- C. the thinner the fluid the greater the heat flow
- D. the denser the fluid the greater the heat flow

113 To achieve low temperature in refrigeration applications, cascade systems are used. They may be connected in series.

- A. True
- B. False

114 Cascading refrigeration systems connect two or more refrigeration systems.

- A. True
- B. False

115 If the condenser plugs up, which of the following could happen?

- A. TXV would shut down the compressor on low head pressure
- B. motor's going to be overloaded
- C. control device could sense less cooling
- D. capacity goes down

116 As condensing pressures approach the outlet temperature of the compressor, what will you expect to experience?

- A. all of these
- B. an increase in flash gas
- C. the compressor will pump to the higher temperature and pressure
- D. added loss in effective latent heat

117 Which of the following is used to determine compressor displacement?

- A. all of these
- B. RPM
- C. diameter of the cylinder
- D. length of the piston stroke

118 Clearance in a compressor has no effect on

- A. compressor capacity
- B. varies depending on compressor speed
- C. has an effect on compressor capacity
- D. varies depending on piston size

119 A compressor's displacement is determined by

- A. all of these
- B. diameter of the cylinder
- C. length of stroke of the piston
- D. number of pistons

120 A compressor displaces 15 cfm and pumps 12 cfm. What is its volumetric efficiency?

- A. 75%
- B. 40%
- C. 20%
- D. 80%

121 What is the coefficient of performance for an HVAC system when input Btu is 60,000 and its output is 49.2 KW?

- A. 3.58
- B. 2.4
- C. 2.8
- D. 2.2

122 The COP of a hot water HVAC system is 1.58. The input of the system is 62,000 Btu. What is the output of the HVAC system?

- A. 160,00 Btu
- B. 28.6 KW
- C. 62,000 Btu
- D. 150,000 KW

123 With a COP of 3.0, a water cooled HVAC system has an input of 20.5 Kw, what is its approximate output?

- A. 210,000 Btu's
- B. 21,000 watts
- C. 58,000 Btu's
- D. 40.2 Kw

124 Why is a double suction riser required in some installations?

- A. to increase capacity
- B. to lower installation costs
- C. to assist in oil return
- D. to save space

125 Good piping practice in mid and low temperature refrigerating systems requires that the common and interconnecting liquid lines area equals the sum of the areas of the individual lines.

- A. True
- B. False

126 When charging a refrigerant system using the low side method, PROPER system charging may be sped up by:

- A. almost front-seating (closing) the suction service valve
- B. closing the suction service valve
- C. almost closing the discharge service valve
- D. opening the suction service valve

127 Where does cooling tower water go after it leaves the cooling tower?

- A. condenser
- B. evaporator
- C. compressor
- D. generator

128 Plate type eutectic evaporators are most commonly used in:

- A. on board ship
- B. milk tankers
- C. railroad reefers
- D. semi trailers

129 Air conditioning can include

- A. chemical dehydration
- B. sensible heat plus humidification
- C. sensible cooling
- D. all of these

130 Relative humidity can be described as the ratio of water vapor in the air compared to the maximum amount of water vapor that the air can contain at a given temperature and pressure.

- A. True
- B. False

131 The dry bulb temperature is measured by blowing air across an ordinary thermometer which has wet gauze wrapped around the bulb.

- A. False
- B. True

132 If sensible cooling is 160,000 Btu per hr, and total cooling is 200,000 Btu per hr, what is the sensible heat factor?

- A. .8
- B. .1
- C. .4
- D. .53

133 Human comfort requires a relative humidity of about

- A. 40%
- B. 50%
- C. 10 %
- D. 20 %

134 The stratification of air can be avoided by

- A. larger return air grilles
- B. larger diffusers
- C. the lowest possible position of return air grilles
- D. sufficient air flow

135 Stratification of air will result when there is

- A. insufficient coil temperature
- B. insufficient air movement
- C. insufficient suction line pressure
- D. excessive air movement

136 Sensible heat factor is sensible heat divided by latent heat?

- A. True
- B. False

137 What of the following describes the action of a high limit switch?

- A. capacitive resistance
- B. electrical resistance
- C. snap action
- D. thermistor

138 When servicing console airconditioners, it is important to check .

- A. refrigerant charge
- B. operation of the TXV
- C. water flow
- D. all of these

139 A 16" round duct has which of the following equivalent rectangular size?

- A. 18 x 12
- B. 14 x 16
- C. 18 x 14
- D. 16 x 12

140 A radial flow fan is one in which

- A. the air flows at right angles to the axis
- B. the air flow is parallel to the axis
- C. is a power type fan
- D. is a slow speed fan

141 A 6" diameter duct will carry 50 cfm with a pressure drop of per 100' of duct length.

- A. .034 inches of water
- B. .03 inches of water
- C. .023 inches of water
- D. .020 inches of water

142 A 6-1/2" duct will carry CFM at a friction loss of 1" per 100' of duct length.

- A. 350
- B. 500
- C. 1500
- D. 460

143 A 6" diameter duct will carry 50 CFM with a pressure drop of "per 100' of duct length.

- A. .034
- B. .013
- C. .02
- D. 1.023

144 6000 CFM of air with a velocity of 1500 FPM will have a friction loss of per 100' of duct length.

- A. .15 inches of water
- B. 1 inches of water
- C. .1 inch of water
- D. .02 inches of water

145 If a duct is 18x12 and the velocity of the air in the duct is 1500 FPM, how many CFM is it carrying?

- A. 2350
- B. 2450
- C. 225
- D. 2100

146 6000 CFM of air with a velocity of 1500 FPM will have a of water. friction loss per 100 feet of duct of inches

- A. .02
- B. 1
- C. .15
- D. .1

147 According to Modern Refrigeration and Airconditioning, the minimum number of air changes per hour for ventilation in a residence during the heating season is 3.

- A. True
- B. False

148 If a high sounding noise is coming from a ceiling diffuser, and, the noise stops when the diffuser is removed, the cause of the noise problem is:

- A. restricted fitting in the duct
- B. air velocity too low
- C. sharp edges on the diffuser
- D. sharp exposed edge in the duct

149 How does a charcoal filter work?

- A. adsorption
- B. condensate
- C. condensive
- D. ion exchange

150 Which of the following statements about heat pumps is true?

- A. the reversing valve never operates while the system thermostat is set on heating
- B. the most effective method to defrost the outside coil is to reverse the system to the cooling cycle
- C. an accumulator is not necessary
- D. when the outside air temperature drops below freezing, all the heat is supplied by the electric strips

151 Heat pumps which supply heating and cooling shall be sized to the requirements and will be provided to make up the difference between calculated heating load and the heat pump capacity.

- A. cooling, auxiliary heat
- B. cooling, latent heat
- C. cooling, sensible heat
- D. none of these

152 What is used on a centrifugal air conditioning chiller to automatically remove non-condensables?

- A. air compressor
- B. automatic air vent
- C. a purge pump
- D. an eliminator circuit

153 When installing precharged refrigerant lines on a domestic residential air conditioning system, it is recommended that the quick-connecting fitting be coated with just before assembly.

- A. refrigeration oil
- B. leak lock
- C. pipe dope
- D. Teflon tape

154 Before pre-charged refrigerant lines are installed, fittings should be coated with:

- A. refrigerant oil
- B. with leak-lock
- C. with Teflon tape
- D. fittings should never be coated

155 The gas fired portions of a roof mounted heating/cooling units, usually uses a electronic ignition for a gas pilot.

- A. True
- B. False

156 A heat anticipator on a heating stat should be wired in with the contact.

- A. either
- B. parallel
- C. neither
- D. series

157 What is the purpose of a lockout relay?

- A. senses changes in temperature in the heated space
- B. prevent system from being opened by a non- EPA certified technician
- C. protect the compressor when a safety device opens
- D. turns the condenser fan off in the event of insufficient air flow across the evaporator coil

158 A limit control switch will

- A. upon detection of a rise in temperature allow the burner to cycle on
- B. upon detection of unsafe conditions, shut the system down
- C. control the amount of gas entering the burner
- D. upon a drop in temperature, cause the fan to turn on

159 A motor for operating dampers uses power to open the damper works against and holds the damper open until the set point is reached.

- A. spring pressure
- B. pneumatic pressure
- C. gravity
- D. inertial pressure

160 When the high-pressure gauge of a gauge manifold is firmly installed on the high side of a refrigerant system, the dial scale may be graduated in increments.

- A. 2.5 #
- B. 1.5 #
- C. 1.2 #
- D. 2 #

161 In determining heat gain for a structure, which of the following must be considered?

- A. the summer outside design temperature
- B. all of these
- C. radiation from the sun
- D. heat and moisture gained by infiltration

162 Internal heat gains of a space may consist of the following:

- A. lights
- B. people
- C. copy machine
- D. all of these

163 The definition of heat leakage is .

- A. the heat that is conducted through the walls, ceilings, and floors of a building
- B. amount of heat that is conducted through a structure at a given time
- C. the amount of heat that is lost through cracks in the structure
- D. the amount of warm air that is lost through seams and cracks in the supply air ducts

164 The "R" value of a substance is a measure of

- A. Conductivity
- B. Thermal transmittance
- C. Conductance
- D. Resistance

165 According to Modern Refrigeration and Air conditioning, which of the following describes what may cause a lock-out relay to energize on a warm air heating system?

- A. contacts on the fan control open
- B. contacts on the thermostat open
- C. contacts on the automatic pilot close
- D. contacts on the motor protector open

166 According to Modern Refrigeration and Airconditioning, which one of the following describes what may cause a lockout relay to energize on a warm air heating system?

- A. contacts on the thermostat open
- B. contacts on the motor protector open
- C. contacts on automatic pilot close
- D. contacts on the fan control close

167 A lock out relay will energize in a warm air heating system if the contacts:

- A. close on the motor protector
- B. open
- C. close
- D. open on the motor protector

168 Which of the following is defined as a series of operating controls used in a pre-set order to stop or start a heating unit?

- A. primary controls
- B. sequencing controls
- C. secondary controls
- D. staging controls

169 A class 2 thermostat circuit rated at 0V to 15V would carry a maximum of amps.

- A. 10
- B. 12
- C. 15
- D. 18

170 Heat transmission through a window is by:

- A. radiation
- B. conductance
- C. convection
- D. none of these

171 Disposal of refrigerants in accordance with EPA can be only accomplished by:

- A. incineration by reclamation companies at 900 F
- B. incineration by reclamation companies at 1200
- C. purging to atmosphere
- D. storage in listed containers

172 The specific volume of standard air is 13.33 cubic feet per pound. Therefore its density would be 1 divided by 13.33 or:

- A. .075
- B. .055
- C. .065
- D. .051

173 What is the density of water?

- A. 62.4 pounds per cubic foot
- B. 7.8 pounds per gallon
- C. 2.31 pounds per square inch
- D. none of these

174 The specific heat of ice is

- A. .504
- B. 57.5
- C. 1.00
- D. 5.04

175 What is the weight of one gallon of water?

- A. 62.3 pounds
- B. 2.3 pounds
- C. 2.0 pounds
- D. 8.3 pounds

176 What is the specific heat of ice?

- A. .504 Btu per pound
- B. .999 Btu per pound
- C. 143.5 Btu per pound
- D. .5 Btu per pound

177 What is the Btu value of ice?

- A. .999 Btu per pound
- B. .504 Btu per pound
- C. .555 Btu per pound
- D. 143.5 Btu per pound

178 33,000 foot-pounds of energy is equal to

- A. Electric horse power
- B. 1 horse power
- C. 746 watts
- D. 1 horse power, or 746 watts

179 If an electric heater is rated at 30 KW, how many Btu per hour output is the heater?

- A. 2,457
- B. 1,023
- C. 204,780
- D. 102,420

180 Which of the following is most closely related to horsepower?

- A. 12,000 BTU'S
- B. Water into air stream
- C. Refrigeration ratings
- D. British thermal units

181 One gallon of water weighs approximately

- A. 2.1
- B. 6.2
- C. 8.3
- D. 62.4

182 One pound of water has grains.

- A. 700
- B. 7
- C. 70
- D. 7000

183 A temperature is listed as 35 degrees Celsius. What is the degrees in Fahrenheit degrees?

- A. 95
- B. 35
- C. 67
- D. 105

184 A compressors compression ratio depends upon what?

- A. clearance space to the total volume of the cylinder
- B. absolute low side pressure to absolute highside pressure
- C. absolute high side pressure to absolute low side pressure
- D. none of these

185 Entropy is the engineering calculations for the power required for compression.

- A. True
- B. False

186 Total resistance is equal to the sum of individual resistances.

- A. True
- B. False

187 What is it called when oil flows best at a given temperature?

- A. pour ability
- B. viscosity
- C. lubricity
- D. dielectric property

188 What happens when oil reaches it's flash point?

- A. it boil's
- B. it turns to a vapor
- C. it will flow
- D. it will burn

189 Natural gas has a heating value in BTU per CF of

- A. 2150 BTU per CF to 2450 BTU per CF
- B. 3030 BTU per CF to 4000 BTU per CF
- C. 1000 BTU per CF to 1100 BTU per CF
- D. 4100 BTU per CF to 4500 BTU per CF

190 Given: A constant volume of gas. If the temperature changes, the pressure changes. This is an example of Law.

- A. Dalton's
- B. Boyles'
- C. Charles'
- D. Ohm's

191 What are the proper installation locations for two refrigerant connections used for a dual pressure motor control?

- A. compressor suction and receiver king valve outlet
- B. liquid line receiver outlet and compressor suction
- C. liquid line and compressor discharge

192 Why is it necessary to be cautious when handling contaminated refrigeration oil?

- A. it is a controlled substance according to the DEA
- B. it may be acidic
- C. it may be alkaline
- D. it may stain your clothes

193 When is a liquid and a vapor the same temperature?

- A. never
- B. at the heat of fusion
- C. at the point of crystallization
- D. at boiling point

194 Which of the following is most closely related to 1 ton of refrigeration.

- A. 12,000 BTU'S
- B. British thermal unit
- C. 50 degrees or above
- D. Refrigeration ratings

195 Which of the following is NOT a basic type of condenser?

- A. Air-cooled
- B. Refrigerated
- C. Evaporated
- D. Water Cooled

196 What type of heat is conveyed with air movement?

- A. transference
- B. conduction
- C. radiation
- D. convection

197 When you perspire the evaporation on the skin is an example of what type of heat transfer?

- A. radiation
- B. evaporative
- C. conduction
- D. convection

198 How is density expressed?

- A. rpm
- B. psi
- C. pounds per cubic feet
- D. pounds

199 Air temperature as indicated by an ordinary thermometer is

- A. dry bulb temperature
- B. wet bulb temperature
- C. dew point temperature
- D. none of these

200 Enthalpy is .

- A. sensible heat loss
- B. the total heat content of a substance
- C. latent heat of a substance
- D. none of these

201 Enthalpy is the total amount of heat in one pound of a substance calculated from accepted temperature base.

- A. True
- B. False

202 Heat exchangers are used in process heating and cooling.

- A. True
- B. False

203 Define the term hermetically sealed.

- A. air leakage on jalousy window
- B. degree of penetration of silicone caulking
- C. closure between aluminum glassing and casement
- D. traps air between sheets of glass

204 There are two latent heats for each substance.

- A. melting and condensing
- B. freezing and condensing
- C. melting and freezing; and vaporizing and condensing
- D. vaporizing and condensing

205 The term "modulating control" signifies

- A. a control of several positions between open and closed
- B. a control with infinite positions between open and closed
- C. an electrically operated unit
- D. an air operated unit

206 Which of the following instruments measures in thousandths of an inch?

- A. micrometer
- B. psychrometer
- C. anemometer
- D. pyrheilometer

207 A reciprocating pump is a pump having a(an) moving up and down or back and forth.

- A. scroll
- B. pump rod
- C. impeller
- D. piston

208 The relationship between water vapor present in air to the greatest amount possible at a given temperature is termed

- A. humidity ratio
- B. density
- C. humidity index
- D. relative humidity

209 Sub-cooling is a term used to describe the cooling of

- A. liquid refrigerant at a constant pressure
- B. vapor refrigerant at a constant pressure
- C. liquid refrigerant at a constant temperature
- D. vapor refrigerant at a constant temperature

210 Sensible heat may be defined as the heat left in order to

- A. raise or lower the temperature of a substance 4 degrees F
- B. change the state of a substance without changing it's temperature
- C. raise or lower the temperature of a substance 1 degree C
- D. change the temperature of a substance without changing it's state

211 A super heated gas may be defined as a gas where no liquid is present.

- A. True
- B. False

212 Superheat is the amount of heat gained after the liquid refrigerant vaporizes.

- A. True
- B. False

213 A shell and tube flooded evaporator uses water flowing through the tubes.

- A. True
- B. False

214 What is a splash system?

- A. method of condensing refrigerant vapor
- B. method of metering refrigerant in an evaporator
- C. method of lubricating the moving parts in a crankcase
- D. method of delivering sub freezing air to food in a cold box

215 A thermister is ?

- A. a device whose resistance changes in response to a change in temperature
- B. a thermostat with a resistor inside
- C. two thermostats wired in series
- D. a device used in VAV air distribution systems

216 In a whetstone bridge electrical or electronic controls are not passed.

- A. True
- B. False

217 Zero gauge pressure is equal to what pressure on the absolute pressure scale?

- A. 32 PSIA
- B. 14.7 PSIA
- C. 0 PSIA
- D. 9 PSIA

218 To raise 35 pounds of water from 60 degrees F to 70 degrees F requires

- A. 200 Btu
- B. 20 Btu
- C. 100 Btu
- D. 350 Btu

219 How many btu's are required to lower the temperature of 3 lbs of water 2 degrees F. ?

- A. 2 Btu
- B. 5 Btu
- C. 4 Btu
- D. 6 Btu

220 A ton of refrigeration is equal to

- A. the heat absorbed when one pound of ice melts
- B. 2,000 pounds of refrigerant
- C. 12,000 Btu per hours
- D. the energy to melt one ton of ice in 24 hours (may also be correct)

221 According to Modern Refrigeration and Air Conditioning, refrigeration service tubing for domestic work is made from:

- I. Soft copper for domestic use
- II. Hard drawn for commercial use

- A. I only
- B. II only
- C. both I and II
- D. neither I nor II

222 Soft copper tubing can be worked to give it certain properties by repeated bending or hammering. This is known as:

- A. work softening
- B. tempering
- C. work hardening
- D. annealing

223 According to Modern Refrigeration and Airconditioning, which one of the following type of Stainless Steel is most often used when Stainless Steel tubing is required for a dairy plant installation.

- A. 302
- B. 304
- C. 303
- D. 301

224 Cleanliness of refrigerant tubing is always at the forefront of the technicians mind when cutting the tube. To prevent contamination of the tube, the technician should before cutting the tubing.

- A. wipe down the tubing with refrigeration oil
- B. burn off any dirt on sludge with his torch
- C. scrape the tubing with the reamer end of the tubing cutter to mark the end and then cut it
- D. wipe down the tubing with rag and then clean the tubing with emery cloth or steel wool

225 According to Modern Refrigeration and Airconditioning, would be a safe radius for a tubing bend.

- A. 15 times the radius
- B. 12 times the radius
- C. 8 times the radius
- D. you should not bend tubing

226 According to Modern Refrigeration and Airconditioning, the best method for joining copper tubing in a refrigeration system to prevent leaks is:

- A. threading
- B. flaring
- C. crimping
- D. brazing

227 According to Modern Refrigeration and Airconditioning, when two pieces of soft copper tubing are swaged, diameters. the overlap should be at least pipe

- A. 1/2
- B. 3/4
- C. 1
- D. 1 1/8

228 Where is the last point of vapor in the refrigeration cycle?

- A. receiver
- B. evaporator
- C. compressor
- D. condenser

229 The compressor in the picture is:

- A. hermetic
- B. screw
- C. centrifugal
- D. open type

230 Where is the TXV located in the refrigeration system?

- A. between the condenser & compressor
- B. between the high pressure side and the low pressure side - OUTLET SIDE OF THE EVAPORATOR
- C. between the evaporator & compressor
- D. on the discharge side of the compressor

231 Of the following metering devices, which one is the most widely used in today's household refrigerator's, freezers, air conditioners, dehumidifiers, and small commercial applications?

- A. high side float valve
- B. automatic expansion valve
- C. low side float valve
- D. capillary tube

232 What is the name of the refrigerant system that has two compressors with the discharge of one compressor going into the suction of the second compressor.

- A. secondary
- B. parallel
- C. compound
- D. cascade

233 A refrigeration system has two compressors connected so they will operate at the same time. The evaporator of the first system cools the condenser of the second system. This is a system.

- A. secondary
- B. parallel
- C. compound
- D. cascade

234 In a refrigeration system, the function of the condenser is to the refrigerant has absorbed in the evaporator.

- A. absorb heat into
- B. dissipate heat from
- C. control
- D. pump

235 Which of the following components would be found in an open-reciprocating type refrigeration compressor?

- A. rotor
- B. vane
- C. impeller
- D. piston

236 Which of the following compounds is used by the compressor to operate an unloader?

- A. electro-mechanical switch
- B. oil
- C. natural gas
- D. LP gas

237 To prevent refrigerant from liquefying in the compressor crankcase and being trapped in the refrigerant oil during cold weather it is sometimes necessary to use a

- A. crankcase heater
- B. low pressure cutout switch
- C. heat exchanger
- D. suction line accumulator

238 The term indicates that portion of the refrigerant which evaporates instantly as it passes through the refrigerant control orifice.

- A. superheat
- B. subcooling
- C. flash gas
- D. out gassing

239 Superheat is heat added to a refrigerant

- A. in raising water temperature
- B. after all the liquid has been changed to a vapor
- C. in changing a liquid to a vapor
- D. to increase pressure

240 Modern Refrigeration and Air Conditioning, the function of an external equalizing line in a in a thermostatic expansion valve is:

- A. compensates for any pressure loss through the evaporator while the compressor is running
- B. prevents excess refrigerant from entering the evaporator
- C. prevents liquid refrigerant from entering the suction line
- D. compensates for any pressure loss through the condenser while the compressor is running

241 What type of switch is used with a capacitor start motor?

- A. pressure
- B. temperature
- C. centrifugal
- D. time

- A. RC, G, W
- B. RH, G, W
- C. RH, Y, G
- D. Y, W, G

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242 Using the information in the picture, determine which terminals will be wired.

- A. RC, G, W
- B. RH, G, W
- C. RH, Y, G
- D. Y, W, G

243 _ overload devices are the most common safety device for motor protection.

- A. circuit breaker
- B. bimetal switches
- C. fuse
- D. time-delay relay

244 By adjusting a variable pitched pulley to make the belt ride at the outer edge of the motor pulley instead of the shaft, the expected result would be:

- A. fan speed decrease
- B. fan speed increase
- C. motor speed increase
- D. motor speed decrease

245 A variable pitch pulley is adjusted so that the belt rides at the top edge of the motor's pulley. What will happen when the motor is turned on?

- A. the fan speed will increase
- B. the fan speed will decrease
- C. the motor speed will increase
- D. the motor speed will decrease

246 Refer to the condensing unit wiring diagram. The compressor motor is "ON" when:

- I. Switches 1 and 2 are closed
- II. Switches 2 and 3 are closed
- III. Switches 1 and 3 are closed

- A. I only
- B. II only
- C. III only
- D. both II and III

247 Which of the following refrigerants are possible replacements for R-12 and R-11?

- A. 123 and 501
- B. 134a and 501
- C. 134a and 123
- D. R-22

248 The pressure in an evaporator containing R-22 refrigerant is 60 PSIA. What is the saturated temperature of the refrigerant?

- A. 45
- B. 34
- C. 53
- D. 29

249 What is the base of refrigeration oil?

- A. petroleum
- B. naphtha or paraffin
- C. freon
- D. alcohol

250 What function does the ozone layer perform?

- A. filters the sun's ultraviolet rays
- B. filters the sun's ultraviolet rays
- C. filters the earth's atmosphere
- D. purification of the earth's atmosphere

251 What do the letters EPA stand for?

- A. Energy Production Association
- B. Environmental Protection Agency
- C. Environmental Protection Association
- D. Environmental Prosecution Agency

252 Refrigerant reclamation machines must meet SAE standards and remove of the moisture and oil particulates.

- A. 100%
- B. 80%
- C. 60%
- D. 40%

253 Refillable refrigerant containers should be filled to the maximum of of volume with liquid.

- A. 100%
- B. 40%
- C. 60%
- D. 80%

254 The electrical controls in a small refrigerator operate at volts.

- A. 48
- B. 12
- C. 24
- D. 120

255 The simplest type of domestic refrigerator uses which of the following methods of defrosting?

- A. off time
- B. hot gas
- C. resistance heaters
- D. reverse cycle

256 Breaker strips, usually made of plastic, used in a household refrigerator.

- A. releases the ice into the hopper
- B. connects the metal case of the freezer to the outer shell
- C. covers evaporator fan
- D. moulds the cabinet hinges

257 The two types of fuel that a halide leak detector can use are:

- A. propane & acetylene
- B. kerosene and acetylene
- C. propane and kerosene
- D. acetylene and hydrogen

258 When warming a cylinder of refrigerant for charging, degrees F should be considered to be the maximum temperature.

- A. 80
- B. 90
- C. 100
- D. 120

259 In line filter dryers are used for ALL of the following except:

- A. water removal
- B. acid removal
- C. dryness indicator
- D. particle entrapment

260 Of the characteristics of a desiccant, would be the LEAST desirable.

- A. replaceable core
- B. chemical dryer
- C. water soluble
- D. refrigerant tolerant

261 When refrigerant is sub-cooled it is at a temperature lower than its saturated temperature.

- A. True
- B. False

262 A shell and tube condenser may also be used as a/an:

- A. evaporator
- B. receiver
- C. oil separator
- D. oil pump

263 Which one of the following controls is designed to shut off the compressor to protect it from possible overloading and overheating?

- A. low pressure control
- B. head pressure control
- C. evaporative fan control
- D. condenser fan control

264 On a household refrigerator, the thermostat has three wires on it. Of these, one is a ground and one is the power supply line connected to one of the thermostat terminals. Where does the third wire go to?

- A. the door switch
- B. the compressor relay
- C. the defrost timer
- D. the mullion heater

265 A moisture indicator is installed in an air conditioning system. How much time is required to obtain an accurate color signal?

- A. 1 hrs
- B. 4 hrs
- C. 6 hrs
- D. 8 hrs

266 What is the purpose of the access valve on a filter dryer?

- A. change the core
- B. allows the addition of refrigerant
- C. adjust the pressure
- D. allows the service tech to check the pressure drop

267 Filter dryers used in refrigeration systems have access valves used for:

- A. adding refrigerant oil
- B. recharging the system with refrigerant
- C. reactivating the desiccant
- D. measuring the pressure drop in the filter

268 When is it safe to charge a refrigeration system through the high side?

- A. prior to completion before operation
- B. after pulling a vacuum in the piping system
- C. before pulling a vacuum in the piping system
- D. upon completion before operating

269 It is very important that liquid refrigerant not be allowed to reach the compressor, why?

- I. Liquid refrigerant is compressible
- II. Compressor valves bearings and rods could be ruined

- A. I only
- B. II only
- C. either I or II
- D. neither I nor II

270 When is it recommended to charge a refrigeration system from the high side?

- A. before starting the compressor
- B. after starting the compressor
- C. upon initial start up
- D. not recommended

271 What indicates a lack of refrigerant in a TEV installation?

- A. unit shuts down
- B. sight glass is clear
- C. there is a knocking sound at the refrigerant control
- D. there is frost or sweat at the outlet of the evaporator to the sensing bulb of the TEV

272 When refrigerant expands too quickly through the metering device, which of the following may result?

- A. liquefied gas
- B. flash gas
- C. compressed gas
- D. broken metering device

273 In a multiple evaporator unit refrigeration system, individual suction lines are connected to a header. According to Modern Refrigeration and Air Conditioning, which of the following terms describes this installation?

- A. cascade system
- B. compound system
- C. cryogenic system
- D. manifold system

274 What is the purpose of a double suction riser in a refrigeration system?

- A. to increase the suction pressure
- B. to reduce the suction pressure
- C. to assist in the return of oil
- D. it serves no useful purpose

275 An exposed chilled water pipe inside a building can accumulate condensed moisture and possibly create a hazard if the surface temperature goes below which of the following temperatures?

- A. indoor air
- B. saturation
- C. dew point
- D. outdoor air

276 The velocity pressure method of measuring air velocity uses an instrument called:

- A. pitot tube
- B. sono tube
- C. ohmmeter
- D. millimeter

277 In newer furnaces the has been replaced by an electronic ignition system as an energy conservation measure.

- A. high limit control
- B. gas burner control
- C. thermocouple safety gas shut-off
- D. pilot

278 Window and thru-the-wall air conditioners consist of the following basic parts.

- A. evaporator which used a capillary tube control
- B. condenser
- C. hermetic compressor
- D. all of these

279 An evaporative cooler is most efficient during days:

- A. when the sky is overcast
- B. of high humidity
- C. of low humidity
- D. when it is raining or storming

280 What does a yellow pilot light on a furnace indicate?

- A. dirty thermocouple
- B. adjusted to produce a blue flame
- C. unit shut-down and

281 According to Modern Refrigeration and Airconditioning, a two-stage warm air furnace combines two-stage heating with:

- A. two stage air delivery
- B. constant air circulation
- C. variable air delivery
- D. variable temperature delivery

282 Which of the following sources of air should be used to replace exhausted air in a building?

- A. make-up
- B. return
- C. outside
- D. exhaust

283 What is the most common ignition system found in roof top gas-fired heating units?

- A. electronic ignition
- B. pilot light
- C. hot surface
- D. direct spark

284 A gas furnace has a yellow flame. Which of the following is true?

- I. Could be caused by lack of primary air
- II. Reset secondary air port and check flame color

- A. I only
- B. II only
- C. both I and II
- D. neither I nor II

285 A 330 Kw electric heater will produce approximately

- A. 1,102,390 Btu's an hour
- B. 1,023 Btu's an hour
- C. 204,780 Btu's an hour
- D. 2,457 Btu's an hour

286 What type of air is brought back from the conditioned space, reconditioned, and then sent back to the conditioned space?

- A. make-up
- B. outside
- C. return
- D. supply

287 When the specific ventilation requirement for a building is not known, it is best to size the ventilation System area .based on CFM per square foot of floor

- A. 1
- B. 2
- C. 3
- D. 4

288 What is the outside air requirement in CFM per square foot per person?

- A. 1
- B. 2
- C. 3
- D. 4

289 According to Modern Refrigeration and Airconditioning, the minimum cooling air changes per hour is:

- A. 3
- B. 4
- C. 5
- D. 6

290 A housing that contains a blower or fan for the purpose of distributing supply air to a room, space, or area is called:

- A. return air fan
- B. exhaust fan
- C. air handling unit
- D. makeup air fan

291 The most likely reason for a high pitched noise from a floor register is:

- A. air hitting sharp metal edges
- B. air velocity at the register is too low
- C. a burr in the duct
- D. restriction in the register fitting

292 A steady low-pitched rumble noise traveling along a duct system is caused by:

- A. rapid expansion and contraction of the ducts caused by temperature fluctuations
- B. air inside the duct hitting sharp edges causing harmonic vibration
- C. motor sounds traveling along the duct system
- D. air velocity inside the duct is too high

293 When a steady low pitched rumble travels along a duct system it is usually caused by:

- A. fan and motor misalignment or imbalance
- B. rapid expansion and contraction of the ducts caused by temperature fluctuations
- C. air inside the duct is hitting sharp edges causing a harmonic vibration
- D. air velocity inside the duct is too high

294 Use the following HVAC data to determine the round duct size to correctly handle the CFM required for Rooms 1, 2, 5:

1. .1" friction loss per 100'
2. If sizing results in between sizes, use the next larger

- A. 10"
- B. 9"
- C. 8"
- D. 7"

295 According to Modern Refrigeration and Airconditioning, the heat pump is best used for:

- A. ventilation
- B. heating
- C. cooling
- D. heating and cooling

296 Which one of the following controls is NOT normally installed on a residential air conditioning condensing unit?

- A. low pressure control
- B. head pressure control
- C. oil pressure control
- D. condenser fan control

297 A solar water heating system uses a device to mix the solar heated water with the cold water supply. This is called:

- A. mixing valve
- B. tempering valve
- C. motorized valve
- D. flow control valve

298 Which of the following types of solar collectors are the most popular in the United States?

- A. ethylene glycol
- B. caustic soda
- C. drain down
- D. passive

299 In a two-tank domestic hot water solar heating system, which of the following is the location where you install the tempering valve?

- A. just before connection to building heating system
- B. before the solar water storage tank
- C. after the solar water storage tank
- D. in the line connecting the solar water in the line connecting the solar storage tank and the conventional water heater

300 According to Modern Refrigeration and Airconditioning, a modulating gas regulator changes the size of the gas flame size in response to the temperature difference between the

- A. thermostat setting and bonnet control
- B. thermostat setting and fan control
- C. thermostat setting and room temperature
- D. fan control and limit switch

301 According to Modern Refrigeration and Airconditioning, a modulating gas valve used in an electronically controlled gas furnace will start the burners at about % of capacity and then adjust the flame.

- A. 50 - 80
- B. 30 - 60
- C. 40 - 70
- D. 20 - 50

302 A modulating gas valve is used in electronically controlled gas furnaces. It changes the burner flame in response to the temperature difference between the thermostat setting and the room temperature.

- A. True
- B. False

303 As the moisture content of the air surrounds an electronic humidistat changes, the humidistat sensor changes its:

- A. wattage
- B. voltage
- C. amperage
- D. resistance

304 The moisture holding capacity of dessicant increases when:

- A. head pressure decreases
- B. at lower refrigerant temperatures
- C. lower condensing pressures
- D. increased refrigerant temperatures

305 The freezing point of brine is determined by:

- A. solution strength of brine
- B. hydrometer
- C. density of solution
- D. the brackish point

306 A device installed in piping to allow movement due to expansion and contraction is:

- A. control joint
- B. contraction joint
- C. expanded
- D. expansion joint

307 What instrument is used to test the strength of a brine solution?

- A. tachometer
- B. barometer
- C. hydrometer
- D. anemometer

308 What is a thermocouple ?

- A. a safety device that generates electricity
- B. several thermal expansion valves
- C. a safety device
- D. limit switch