REFRIGERATION AND AIR CONDITIONING

True or false

1. COP of vapor absorption refrigeration system is larger than vapour compression refrigeration system
2. For saturated air relative humidity is 100 %
3. Degree of saturation is difference between dry bulb temperature and wet bulb temperature
4. Theoretical COP of refrigeration system is always less than Carnot COP
5. Refrigerant R22 used for Air conditioning applications

Numerical

1. An ammonia Vapour Compression Refrigeration system is working between temperature limit of -30 C and 40 C as per the conditions refrigerant in the system following data are obtained from PH chart for cycle
   1. Enthalpy of refrigerant at evaporator inlet = 400 KJ/kg
   2. Enthalpy of refrigerant at evaporator inlet = 1150 KJ/kg
   3. Enthalpy of refrigerant after compression = 1300 KJ/kg
   4. Mass Flow rate of ammonia = 5 kg/sec
   5. Specific volume of refrigerant = 0.50 m3/kg
      Find the following performance parameters for system
1. Power required for running the system in Kw
2. Heat rejection rate for Condenser in KW
3. Work required for compression in KJ
4. Theoretical COP of the system
5. Carnot COP of the refrigeration system
6. Refrigeration Capacity in TR
7. Volume of vapour entering the compressor per sec
8. If practical COP of the system is 0.5 of theoretical COP what is Practical COP

2. The readings from a sling psychomotor are as follows
1. Dry bulb temperature = 30°C
2. Wet bulb temperature = 20 °C
3. Barometer reading = 740 mm of hg
   Using steam table determine:

   1. Dew Point Temperature
   2. Relative humidity
   3. Specific humidity
   4. Degree of saturation

5. Vapor density

3.In a psychrometric process, the sensible heat added is 30 kJ/sec and the latent heat added is 20 kJ/sec. The sensible heat factor for the process will be

4. The atmosphere air at dry bulb temperature of 15°C enters a heating coil maintained at 40°C. The air leaves the heating coil at 25°C. The bypass factor of the healing coil is

5. An ammonia Vapour Compression Refrigeration system is working between temperature limit of -30 C and 40 C as per the conditions refrigerant in the system following data are obtained from PH chart for cycle

   1. Enthalpy of refrigerant at evaporator inlet = 400 KJ/kg

   2.Enthalpy of refrigerant at evaporator inlet = 1150 KJ/kg

   3. Enthalpy of refrigerant after compression = 1300 KJ/kg

   4. Capacity of plant = 10TR

   5. Specific volume of refrigerant = 0.50 m3/kg

      Find the following performance parameters for system

 1.Power required for running the system in Kw

 2.Heat rejection rate for Condenser in KW

 3.Work required for compression in KJ

 4.Theoretical COP of the system

 5.Carnot COP of the refrigeration system

 6.Mass flow rate of refrigerant in Kg/Sec

 7.Volume of vapour entering the compressor per sec

 8.If practical COP of the system is 0.5 of theoretical COP what is Practical COP

1. Psychometric sensible heating process means

       1. Increasing the temperature of air without changing relative humidity

       2   Increasing the temperature of air without changing degree of saturation

       3. Decreasing the temperature of air without changing its humidity

       4.None of the above options

2. Which compressor type is used for handling large volume of vapor refrigerant at low and medium pressure

1. Reciprocating compressor
2. Rotating blade type rotary compressor
3. Centrifugal Compressor
4. None of the above

3. Factors affecting the condenser capacity in refrigeration system

1. Material of condenser

2. Contact between Condenser surface and condensing medium

3. Temperature difference between condensing medium and vapor of refrigerant

4. All three above

4. From the below which component is absent in air cycle refrigeration system

   1 Compressor

7. Expander
8. Evaporator
9. Refrigerator

5. In simple saturation cycles following conditions of refrigerant is present
1. Dry suction superheated compression without sub cooling
2. Wet suction superheated compression with sub cooing
3. Dry suction superheated compression wit sub cooling
4. Wet suction dry compression without sub cooling

6. What is effect of increasing the condenser pressure in vapor compression refrigeration system
     1 COP of the system will be improve
     2 COP of the system will be decreases

3. No Change in COP

4. None of above

7. What is effect of increasing suction pressure in the vapor compression refrigeration system

1. Work required for compression will be decreases
2. Work required for compression will be increases
3. Work required for compression will be same
4. None of above

8. During the refrigeration Cycle heat rejected by the refrigerant in a

1 Compressor

2 Condenser

3 Evaporator

4 Expansion Valve

9. The lowest temperature during the cycle in vapor compression refrigeration system occurs

1 Compression

2. Condensation

3 Evaporation

5 Expansion

10. In the linde system, the high pressure air from the compressor is cooled in a heat exchanger to a temperature of

1 -53.6 C

2 – 72.8 C

3. – 106.7 C

4 – 138.5 C

11. The human body feels comfortable when the heat stored in the body is

1 Positive

2 Negative

3. Zero

4 None of above

12. The sensible heat factor for auditorium or cinema hall is generally kept as

      1. 0.6

      2. 0.7

      3. 0.8

      4. 0.9

13. In winter air conditioning the air is

1. Cooled and humidified
2. Cooled and dehumidified
3. Heated and humidified
4. Heated and dehumidified

14. When the outside air is introduced for ventilation there is a

      1 Sensible heat gain

      2. Latent heat gain

      3. Sensible heat and latent heat

15. Which one of the following refrigerants has the highest critical temperature?

A)

Water

B)

Carbon dioxide

C)

Freon 12

D)

Ammonia

16. Which of the following refrigerant has the maximum ozone depletion potential in the stratosphere?

A)
Ammonia

B)
Carbon dioxide

C)
Sulpher dioxide

D)
Fluorine

17. In a domestic refrigerator, a capillary tube controls mean flow of refrigerant from the

A)
the expansion valve to the evporator

B)
evoporator to the thermostat

C)
condensor to the expansion valve

D)

condensor to the evoporator

18. A condenser of a refrigerator system rejects heat at a rate of 120 kW, while its compressor consumes power of 30 kW. The coefficient of performance of the system would be

A)

1/4

B)

1/3

C)

3

D)

4

19. Match List - I with List - II and select the correct answer using the codes given below the lists.

List I

A. Bell colemen refrigeration

B. Vapor compression refrigeration

C. Absorption

D. Jet refrigeration

List II

1. Compressor

2. Generator

3. Flash chamber

4. Expansion cylinder

20. Match List - I with List - II and select the correct answer using the codes given below the lists.

List I

A. Ammonia

B. R134a

C. R12

D. R410a

List II

1. Compressor

2. Generator

3. Flash chamber

4. Expansion cylinder

21. The significant advantage of using NH3 as a refrigerant is it's

A)

low sensible heat

B)

medium latent heat

C)

high latent heat

D)

low latent heat

22. If a sample of moist air of φ = 50% at atmospheric pressure is isothermally compressed to a pressure & two atmospheric then

A)

Saturation pressure will increase twice the value

B)

φ will reduce to 25%

C)

Sample of air will become saturated

D)

φ will remain unchanged

23. By pass factor for a cooling coil

A)

increases with increase in velocity of air passing through it

B)

decrease with increase in velocity of air passing through it

C) remains unchanged with increase in velocity of air passing through it

D) may increase or decrease with increase in velocity of air passing through it depending upon the condition of air entering

24. In a saturated air-water vapour mixture, the

A)

dry bulb temperature is higher than the wet bulb temperature

B)

dew point temperature is lower than the wet bulb temperature

C)

dry bulb, wet bulb and dew point temperatures are the same

D)

dry bulb temperature is higher than the dew point temperature

25. At 100% relative humidity, the wet bulb temperature is

A)

more than dew point temperature

B)

same as dew point temperature

C)

less than dew point temperature

D)

equal to ambient temperature

26. Evaporative air cooler is used effectively when

A)

dry bulb temperature is very close to the wet bulb temperature

B)

dry bulb temperature is high and relative humidity is high

C)

dry-bulb temperature is low and relative humidity is high

D)

dry bulb temperature is high and the relative humidity is low

27. When dry-bulb and wet-bulb temperatures are identical, it means that the

A)

air is fully saturated and dew-point temperature has reached

B)

air is fully-saturated

C)

dew-point temperature has reached and humidity is 100%

D)

partial pressure of water vapour is equal to total pressure

28. Replacing a water cooled condenser with an air cooled one in a VCS with const. evaporator pressure will result in

A)

Increase in condensation temp

B)

Decrease in pr. Ratio

C)

Increase in pr. ratio

D)

Increase in condensation pressure

29. In the case of sensible cooling of air, the coil efficiency is given by (BPF = Bypass factor)

A)

BPF-1

B)

1- BPF

C)

1/BPF

D)

1 + BPF

30. The atmosphere air at dry bulb temperature of 15°C enters a heating coil maintained at 40°C. The air leaves the heating coil at 25°C. The bypass factor of the healing coil is

31. During sensible cooling of air

A)

Its wet bulb temperature increases and dew point remains constant

B)

Its wet bulb temperature decreases and the dew point remains constant

C)

Its wet bulb temperature increases and the dew point decreases

D)

Its wet bulb temperature decreases and dew point increases

32. The conditioned air supplied to the room must have the capacity to take up.......

A.Room sensible heat load only

B.Room latent heat load only

C.Both B and C

33. The boiling point of ammonia is

A.-10.50C

B.-30.50C

C.-33.30C

C.-77.60C

34. Which of the following refrigerant is highly toxic and flammable.......

A.Ammonia

B.Carbon dioxide

C.Sulphur dioxide

D.Freon-12

35. In air-conditioning of aeroplanes,using air as refrigerant,the cycle is used is.......

   A.Reversed carnot cycle

   B.Reversed joule cycle

   C.Reversed Brayton cycle

   D.Reversed Otto cycle

36. The relative coefficient of performance (C.O.P.)is equal to.......

   A.Theoritical C.O.P./Actual C.O.P.

   B.Actual C.O.P./Theoritical C.O.P.

   C.Theoritical C.O.P. x Actual C.O.P.

   D. None of the above

37. In vapour compression refrigeration cycle,the condition of refrigerant is high pressure saturated liquid ....

   A.Before entering the expansion valve

   B.Before entering the compressor

   C.After passing through the condenser

   D.Before passing through the condenser

E. After passing through the expansion or throttle valve

38. In vapour compression refrigeration cycle,the condition of refrigerant is superheated vapour ....

A.Before entering the expansion valve

B.Before entering the compressor

C.After passing through the condenser

D.Before passing through the condenser

E.After passing through the expansion or throttle valve

39. One tonne of refrigeration is equal to the refrigeration effect corresponding to melting of 1000 kg of ice ....

A.In one hour

B.In one munite

C.In 24 hours

D.In 12 hours

E.In 10 hours

40. Absorption system normally uses following refrigerant....

A.CO2

B.SO2

C.Freon-11

D.Ammonia

41. The most suitable refrigerant of a commercial ice plant.......

A.Brine

B.NH3

C.Freon

D.Air

42. For obtaining high COP,the pressure range of compressor should be.......

A.High

B.Low

C.Optimum

D.Any value

42. The value of COP in vapour compressure cycle is usually.......

A.Always less than unity

B.Always greater than unity

C.Equal to unity

D.None of the above

43. Pick up the wrong statement. A refrigerant should have

(a) Tow specific heat of liquid

(b) high boiling point

(c) high latent heat of vaporisation

(d) higher critical temperature

(e) low specific volume of vapour.

44. Condensing temperature in a refrigerator is the temperature

(a) of cooling medium

(b) of freezing zone

(c) of evaporator

(d) at which refrigerant gas becomes liquid

45. At lower temperatures and pressures, the latent heat of vaporisation of a refrigerant

(a) decreases

(b) increases

(c) remains same

(d) depends on other factors

46. Which of the following is not a desirable property of a refrigerant

(a) high triiscibility with oil

(b) low boiling point

(c) good electrical conductor

(d) large latent heat

47. Efficiency of a Cornot engine is given as 80%. If the- cycle direction be reversed, what will be the value of COP of

reversed Carnot cycle

(a) 1.25

(b) 0.8

(c) 0.5

(d) 0.25

48. If a heat pump cycle operates between the condenser temperature of +27°C and evaporator temperature of - 23°C, then

the Carnot COP will be

(a) 0.2

(b) 1.2

(c) 5

(d) 6

49. In a refrigeration cycle, the flow of refrigerant is controlled by

(a) compressor

(b) condenser

(c) evaporator

(d) expansion valve

50. The leaks in a refrigeration system using Freon are detected by

(a) halide torch which on detection produces greenish flame lighting

(b) sulphur sticks which on detection gives white smoke

(c) using reagents

(d) smelling

(e) sensing reduction in pressure.

51. Short horizontal lines on pressure-enthalpy chart show

(a) constant pressure lines

(b) constant temperature lines

(c) constant total heat lines

(d) constant entropy lines

(e) constant volume lines.

52. The coefficient of performance is the ratio of the refrigerant effect to the

(a) heat of compression

(b) work done by compressor

(c) enthalpy increase in compressor

(d) all of the above

53. Vertical lines on pressure-enthalpy chart show constant

(a) pressure lines

(b) temperature lines

(c) total heat lines

(d) entropy lines

54. Most of the domestic refrigerators work on the following refrigeration system

(a) vapour compression

(b) vapour absorption

(c) carnot cycle

(d) electrolux refrigerator

55. Cooling water is required for following equipment in ammonia absorption plant

(a) condenser

(b) evaporator

(c) absorber

(d) condenser and absorber

(e) condenser, absorber and separator (rectifier).

56. The COP of a vapour compression plant in comparison to vapour absorption plant is

(a) more

(b) less

(c) same

(d) more/less depending on size of plant

57. Highest temperature encountered in refrigeration cycle should be

(a) near critical temperature of refrigerant

(b) above critical temperature

(c) at critical. temperature

(d) much below critical temperature

58. In a refrigerating machine, heat rejected is _____ heat absorbed.

A.   equal to

B.   less than

C.   greater than

59. The formation of frost on cooling coils in a refrigerator

A.   increases heat transfer

B.   improves C.O.P. of the system

C.   increases power consumption

D.   reduces power consumption

60. The difference between dry bulb temperature and wet bulb temperature, is called

A.   dry bulb depression

B.   wet bulb depression

C.   dew point depression

D.   degree of saturation

61. As relative humidity decreases, the dew point temperature will be _____ wet bulb temperature.

A.   same as

B.   lower than

C.   higher man

62. The amount of radiation mainly depends upon the

A.   nature of the body

B.   temperature of the body

C.   type of surface of the body

D.   all of these

63. An electrolux refrigerator is called a _____ absorption system.

A.   single fluid

B.   two fluids

C.   three fluids

64. During adiabatic saturation process on unsaturated air _____ remains constant.

A.   relative humidity

B.   dew point temperature

C.   dry bulb temperature

D.   wet bulb temperature

65. The coefficient of performance of Heat Pump is always _____ one.

A.   equal to

B.   less than

C.   greater than

66. A refrigeration system

A.   removes heat from a low temperature body and delivers it to a high temperature body

B.   removes heat from a high temperature body and delivers it to a low temperature body

C.   rejects energy to a low temperature body

D.   none of the above

67. The subcooling in a refrigeration cycle

A.   does not alter C.O.P.

B.   increases C.O.P.

C.   decreases C.O.P.

D.   none of these

68. During sensible cooling of air _____ decreases.

A.   wet bulb temperature

B.   relative humidity

C.   dry bulb temperature

D.   specific humidity

69. In a split air conditioner, ODU (Outdoor Unit) has

(A) compressor, condenser and expansion device

(B) compressor and condenser

(C) evaporator

(D) expansion device and evaporator

70. to 74 True or false

1. COP of vapor absorption refrigeration system is larger than vapour compression refrigeration system
2. For saturated air relative humidity is 100 %
3. Degree of saturation is difference between dry bulb temperature and wet bulb temperature
4. Theoretical COP of refrigeration system is always less than Carnot COP
5. Refrigerant R22 used for Air conditioning applications

75. The window air conditioner is used for

(A) auditorium

(B) cinema hall

(C) small size room

(D) all of the above

76. In a split air conditioner, IDU (Indoor Unit) has

(A) compressor and condenser

(B) evaporator

(C) expansion device and evaporator

(D) compressor, condenser and expansion device

77. Split air conditioner available in the rage of

(A) 0.5 to 3 TR

(B) 5 to 10 TR

(C) 10 to 15 TR

(D) 0.1 to 0.5 TR

78. EER stands for

(A) Economical Energy Rating

(B) Environment Effectiveness Rating

(C) Energy Efficiency Ratio

(D) None of the above

79. Which of the following are the advantages of a split air conditioner over the window air conditioner?

(A) No compressor noise and vibrations in the room

(B) No window opening and fixing needed.

(C) The first part can be located anywhere the room with a decorative display

(D) All of the above

80. The air conditioner suitable for 5 to 100 TR cooling capacity is

(A) packaged air conditioner

(B) split air conditioner

(C) window air conditioner

(D) all of the above

81. Selection of a suitable air conditioning system depends on

(A) type of the building

(B) initial and running costs

(C) reliability and serviceability

(D) all of the above

82. In summer air conditioning, the air is

(A) cooled and dehumidified

(B) cooled and humidified

(C) heated and humidified

(D) heated and dehumidified

83. For summer air conditioning, the relative humidity of air should not be less than

(A) 40%

(B) 60%

(C) 75%

(D) 90%

84. In winter air conditioning, the air is

(A) cooled and humidified

(B) cooled and dehumidified

(C) heated and humidified

(D) heated and dehumidified

85. For winter air conditioning, the relative humidity air should not be more than

(A) 40%

(B) 60%

(C) 75%

(D) 90%

86. The year-round air conditioning system is

(A) used either as a summer air conditioning system or as a winter air conditioning system

(B) used during summer, the heaters are always switched-off

(C) used during winter, the heating and dehumidification coils are switched off

(D) all of the above

87. Sensible heat load

(A) raise the DBT of air in the conditioned space

(B) raise the specific humidity of air in the conditioned space

(C) raise both DBT and specific humidity of air in the conditioned space

(D) raise the DPT of air in the conditioned space

88. Which of the following is not latent heat gain source

(A) Lightening

(B) Ventilation and infiltration

(C) Occupants body

(D) Cooking foods, baking, and boiling

89. When the outside air is introduced for ventilation purpose, there is a

(A) sensible heat gain

(B) latent heat gain

(C) sensible heat gain as well as latent heat gain

(D) none of these

90. The function of ventilated air is

(A) to dilute the odours inside the occupied space to a socially acceptable level

(B) to maintain CO2 concentration at a satisfactory level

(C) to pressurizing the escape routes in the event of a fire

(D) all of the above

91. The function of the duct in the air conditioning unit is

(A) air cooling

(B) air cleaning

(C) air drying

(D) air distribution

92. The duct is made of

(A) galvanised iron

(B) aluminium

(C) fibreglass

(D) any one of these

93. The duct is made of

(A) galvanised ironor rectangular ducts, the aspect ratio is equal to

(A) sum of longer and shorter sides

(B) sum of longer and shorter sides

(C) product of longer and shorter sides

(D) ratio of longer and shorter sides

94. The aspect ratio for rectangular ducts should not be greater than_____in any case.

(A) 8

(B) 10

(C) 12

(D) 16

95. Rectangular ducts are generally preferred over the circular duct in building as

(A) for a given flow rate, the pressure drop is less compared to circular duct

(B) for a give pressure drop, it required less material compared to circular duct

(C) it is easy to fabricate & match better with building profile

(D) none of the above

96. In a duct of uniform cross section

(A) only static pressure remains constant

(B) static pressure increases along the length

(C) the total pressure decreases along the length

(D) only the dynamic pressure remains constant

97. Dynamic losses take place in the duct due to

(A) change in the velocity or direction of airflow due to the variety of fittings

(B) friction

(C) change in the pressure

(D) all of the above

98. Velocity reduction method is used for

(A) very simple duct layout

(B) very large duct layout

(C) simple and large duct layout

(D) all of the above

99. The method, in which the size of the duct is designed to give equal frictional pressure drop per meter length in all ducts is

(A) velocity reduction method

(B) equal friction method

(C) static regain method

(D) none of the above

100. The method used for high-velocity and long duct runs is

(A) velocity reduction method

(B) equal friction method

(C) static regain method

(D) none of the above

101. The static regain method of designing the ducts as compared to equal friction method

(A) increases balancing problems

(B) increases the cost of sheet metal for the duct

(C) decreases the cost of sheet metal for the duct

(D) none of the above

102. The metabolic rate depends mainly on

(A) age of the human being

(B) the activity level of the human being

(C) the sex of the human being

(D) all of the above

103. The index which corelates the combined effects of air temperature, relative humidity and air velocity on the human body, is known as

(A) mean radiant temperature

(B) effective temperature

(C) dew point temperature

(D) none of these

104. The optimum effective temperature for human comfort is

(A) higher in winter than in summer

(B) lower in winter than in summer

(C) same in winter and summer

(D) not dependent on season

105. When the temperature of the surrounding is higher than the temperature of the body, then the heat loss by convection from the body to the surrounding will be

(A) negative

(B) positive

(C) zero

(D) none of these

106. The comfort conditions in air conditioning are at (where DBT = Dry bulb temperature, and RH = Relative humidity)

(A) 25°C DBT and 100% RH

(B) 20°C DBT and 80% RH

(C) 25°C DBT and 50% RH

(D) 22°C DBT and 40% RH

107. A human body feels comfortable when the heat produced by the metabolism of the human body is equal to the

(A) heat stored in the human body

(B) heat dissipated to the surroundings

(C) sum of A and B

(D) difference of A and B

108. A mixture of dry air and water vapour, when the air has diffused the maximum amount of water vapour into it, is called

(A) dry air

(B) moist air

(C) saturated air

(D) specific humidity