Choose the correct answer for the following

1. The steam condenser is a thermal power plant is a heat exchanger of __c____.

(a) Direct contact

(b) Regenerator

(c) Recuperator

(d) Non of these

2. The normal automobile radiator is a heat exchanger of the type __d___.

(a) Direct contact

(b) Parallel flow

(c) Counter flow

(d) Cross flow

3. Choose the correct statement with respect to a counter-flow heat exchanger ____c____.

(a) Both the fluid at the inlet are in their coldest state

(b) Both the fluids at the exit are in their hottest state

(c) Both the fluids at the inlet are in their hottest state

(d) One fluid hottest and the other is coldest at inlet

4. The requirement of transfer of a large heat is usually met by __d___.

(a) Increase the length of the tube

(b) Decreasing the diameter of the tube

(c) Increase the number of tubes

(d) Having multiple tube o shell passes

5. The shell of a tuber heat exchanger is provided with exansion bellows to ___c____.

(a) facilitate an increase in the length of the boiler shell

(b) impart structural strength to exchanger.

(c) account for the uneven expansion of shell and tube bundles

(d) reduce the pressure drop

6. In a heat exchanger with one fluid evaporating or condensing, the surface area required is least in ___b_____.

(a) Parallel flow

(b) Counter flow

(c) Cross flow

(d) Same in parallel, counter and cross flow arrangements

7. In a counter- flow heat exchanger, cold fluid enters at $30^{o}C$ and leaves at $50^{o}C$, whereas the hot fluid enters at $150^{o}C$ and leaves at $130^{o}C$. The mean temperature difference for this case is ___c____.

(a) $20^{o}C$

(b) $80^{o}C$

(c) $100^{o}C$

(d) indeterminate

8. Multi-pass heat exchangers are used to ___c___.

(a) Reduce the pressure drop

(b) Get a compact unit

(c) Obtain a high heat transfer coefficient

(d) Facilitate a very large temperature drop through the tube wall

9. In a heat exchanger, the hot liquid enters with a temperature of $180^{o}C$ and leaves at $160^{o}C$. The cooling fluid enters at $30^{o}C$ and leaves at $110^{o}C$. The capacity ratio of the heat exchanger is ___a____.

(a) 0.25

(b) 1.5

(c) 0.33

(d) 0.2

10. A cross flow type air heater has an area of $50m^2$ the overall transfer coefficient is $100W/m^2.^{o}C$ and heat capacity of both hot and cold stream is $1000W/^{o}C$. The value of NTU is ___c_____.

(a) 1000

(b) 500

(c) 5 (d) 0.2

11. Which of the following terms is not associated with heat exchanger? ____b_____.

(a) Fouling

(b) Mc Adam's correction factor

(c) NTU (d) Capacity ratio

12. The overall heat transfer coefficient for a shell and tube heat exchanger for clean surfaces is U_o=400W/m^2.K. The fouling after one year of operation is found to be h_o=2000W/m^2.K. The overall heat transfer coefficient at this time is ___c___.

(a) 1200W/m^2.K (b) 894W/m^2.K (c) 333W/m^2.K (d)287W/m^2.K

13. A correction of LMTD is necessary in case of __a____ heat exchanger.

(a) Cross flow

(b) Parallel flow

(c) Counter current

(d) All of theses

14. Consider the following is not an advantage of recuperator type heat exchanger.

1. More economic
2. More suitable for stationary plants
3. High heat transfer coefficient
4. Less maintenance

Select the correct answer code: __d__

(a) 1 and 3 (b) 1 and 2 (c) 2 and 4 (d) 3 and 4

15. Air heaters are an example of ___a____.

(a) Regenerator type heat exchangers

(b) Recuperative type heat exchangers

(c) Open type heat exchangers

(d) Combination of regeneration and recuperative type heat exchangers

16. Evaporators in ice plant is an example of __b____.

(a)Regenerator type heat exchangers

(a) Recuperative type heat exchangers

(b) Open type heat exchangers

(c) Combination of regeneration and recuperative type heat exchangers

17. Fouling factor is used ___d____

(a) In heat exchanger design as a safety factor

(b) In case of Newtonian fluids

(c) When a liquid exchanges heat with a gas

(d) None of theses

18. In a shell and tube heat exchanger, baffles are provided on the shell side to ____d____.

(a) Improve heat transfer.

(b) Provide support for tubes

(c) Prevent stagnation of shell side fluid

(d) All of these

19. The ratio of actual heat transfer to the maximum possible heat transfer is called ____b_____.

(a) Efficiency of heat exchanger

(b) Effectiveness of heat exchanger

(c) Performance index of heat exchanger

(d) None of these

20. The mathematical range of capacity ratio is ___a_____.

(a) 0 to 1 (b) -1 to 1 (c) 1 to infinity (d) 0 to infinity

21. Maximum effectiveness of a parallel flow heat exchanger could be __a___.

(a) 0.5 (b) 1.0 (c) 0.65 (d) 0.8

22. If a heat exchanger LMTD is zero then heat transfer surface become ___c____.

(a) Maximum (b) minimum (c) infinity (d) moderate

23. In a two-fluid heat exchanger, the inlet and outlet temperature of the hot fluid are 65°C and 40°C respectively. For the cold fluid these are 15°C and 42°C. The heat exchanger is a ___b____.

(a) Cross-flow heat exchanger

(b) Counter-flow heat exchanger

(c) Parallel-flow heat exchanger

(d) None of theses

24. In case of heat exchanger, the value of LMTD should be ___b___.

(a) As small as possible

(b) As large as possible

(c) Constant

(d) Has a specific level of temperature which depends on the size of the heat exchanger

25. How is the logarithmic mean temperature difference (LMTD) calculated for heat exchangers? ____d____.

Where ΔT_i= temperature difference between hot and cold fluid at inlet of heat exchanger.

ΔT_o= temperature difference between hot and cold fluid at exit of heat exchanger.

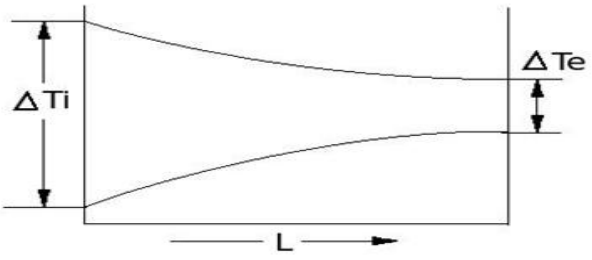
(a) Ln(ΔT_i -ΔT_e)

(b) Ln(ΔT_e -ΔT_i)

(c) (ΔT_i -ΔT_e)/$\left(ln(\Delta T_e/ln\Delta T_i)\right)$

(d) (ΔT_i -ΔT_e)/$\left(ln(\Delta T_i/ln\Delta T_e)\right)$

26. Which type of flow in heat exchanger is represented in below diagram? ___a____.



Temperature Profile of Fluids in Heat Exchanger

(a) Parallel flow heat exchanger

(b) Counter flow heat exchanger
(c) Cross flow heat exchanger
(d) None of the above

27. The arithmetic mean temperature difference for parallel flow heat exchanger is given as _____d_____.

(a) $\Delta T_{am} = (\Delta T_i - \Delta T_e)$
(b) $\Delta T_{am} = (\Delta T_i + \Delta T_e)$
(c) $\Delta T_{am} = (\Delta T_i - \Delta T_e)/2$
(d) $\underline{\Delta T_{am} = (\Delta T_i + \Delta T_e)}/2$

28. When is the arithmetic mean temperature difference of heat exchanger used instead of LMTD? ___c____.

(a) When the temperature profiles of two fluids of heat exchanger are sloping downward with curve
(b) When the temperature profiles of fluids of heat exchanger are slop upward with curve
(c) <u>When the temperature profiles of two fluids of heat exchanger are straight</u>
(d) None of the above

29. How can the arithmetic mean temperature and LMTD of a same heat exchanger be compared? __ b____.

(a) The arithmetic mean temperature difference is less than LMTD of a same heat exchanger.
(b) <u>The arithmetic mean temperature difference is more than LMTD of a same heat exchanger</u>
(c) The arithmetic mean temperature difference and LMTD of a same heat exchanger are equal
(d) None of the above

30. Which of the following temperature difference is safer than other to consider in designing of heat exchanger? ___b___.

(a) Arithmetic Mean Temperature Difference (ΔT_{am})
(b) <u>Logarithmic Mean Temperature Difference (LMTD)</u>
(c) Both have nothing to do with safety
(d) Other

31. For the same inlet and exit temperatures of two fluids, the LMTD for counter flow is always ___b_____.

(a) Smaller than LMTD for parallel flow

(b) Greater than LMTD for parallel flow

(c) Same as LMTD for parallel flow

(d) Unpredictable

32. For the same heat transfer Q and same overall heat transfer coefficient U_o, surface area required for parallel flow heat operation is always ___b_____.

(a) Less than that for counter flow

(b) More than that for counter flow

(c) Same as that for counter flow

(d) Unpredictable

33. In parallel flow heat exchangers, ___c___.

(a) The exit temperature of hot fluid is always equal to the exit temperature of cold fluid.

(b) The exit temperature of the hot fluid is always less than the exit temperature of cold fluid

(c) The exit temperature of hot fluid is always more than the exit temperature of cold fluid

(d) We cannot predict comparison between exit temperatures of hot fluid and cold fluid

34. For the same heat transfer Q and same overall heat transfer coefficient U_o, surface area required for cross flow operation is always ____a____.

(a) Less than LMTD for parallel flow

(b) More than LMTD for parallel flow

(c) Same as LMTD for parallel flow

(d) Unpredictable

35. A heat exchanger transfers heat from one fluid to another __b___.

(a) Solid (b) fluid (c) solid & fluid (d) none

36. Latent hat is transferred in a heat exchanger during ___c___.

(a) Heating (b) cooling (c) phase change (d) none

37. Sensible heat is transferred in a heat exchanger like ___a____.

(a) Cooler (b) boiler (c) condenser (d) None

38. In a direct contact heat exchanger, there is ___c____

(a) Mass transfer

(b) Heat transfer

(c) Heat & mass transfer

(d) None

39. The direct contact heat exchanger is ___c_____.

(a) Boiler

(b) Condenser

(c) Desert cooler

(d) None

40. In a regenerator heat exchanger ____b____.

(a) Both hot and cold fluids are passed simultaneously

(b) First hot fluid & the cold fluid is passed

(c) Can't say

(d) None

41. The operation of a regenerator heat exchanger is ___b_____.

(a) Continuous

(b) Intermittent

(c) Both continuous & intermittent

(d) None

42. In a recuperator heat exchanger, the hot & cold fluid ___b____.

(a) Mixed physically

(b) Do not mix physically

(c) Mix chemically

(d) None

43. Which of the following is the recuperator heat exchanger? __a____.

(a) Automobile radiator

(b) Desert cooler

(c) Cooling tower

(d) None

44. In a parallel flow heat exchanger, the angle between hot and cold fluid is __c___.

(a) 90^o (b) 180^o (c) 0^o (d) None

45. In counter flow heat exchanger, the angle between hot and cold fluids is __b____.

(a) 90^o (b) 180^o (c) 90^o (d) None

46. In a cross flow heat exchanger, the angle between hot and cold fluids is ___a____.

(a) 90^o (b) 180^o (c) 0^o (d) None

47. In a condenser, the temperature of the hot fluid is __c___.

(a) Decreasing

(b) Increasing

(c) Remains constant (d) None

48. In a condenser, the temperature of the cold fluid is ___b___.

(a) Decreasing

(b) Increasing

(c) Remains constant

(d) None

49. In a boiler, the temperature of the hot fluid is __a___.

(a) Decreasing

(b) Increasing

(c) Remains constant

(d) None

50. In a boiler, the temperature of the boiling fluid is __c____.

(a) Decreasing

(b) Increasing

(c) Remains constant (d) None

51. Rate of transfer by condensing fluid is ___b____.

(a) $\dot{m}Cp\Delta T$ (b) $\underline{\dot{m}h_{fg}}$ (c) $\dot{m}\Delta T$ (d) None

52. The sequence of the modes of heat transfer in case of a heat exchanger are ____c_____.

(a) Cond. + conv. + rad.

(b) Conv. +rad. + conv.

(c) Conv. + cond. + conv.

(d) None

53. The effectiveness of a parallel and counter flow heat exchanger is of same value in a ___b_____.

(a) Radiator

(b) Condenser

(c) Pre-heater

(d) None

54. Use a correction factor 'F' to calculate the rate of heat transfer in case of a ___c____.

(a) Parallel flow heat exchanger

(b) Counter flow heat exchanger

(c) Cross flow heat exchanger

(d) None

55. The heat capacity ratio 'C' in heat exchanger is zero in case of a __c___.

(a) Radiator (b) Pre-heater (c) Condenser (d) None

56. In case of a 1:1 heat exchanger, use ___a____.

(a) LMTD (b) NTU (c) LMTD or NYU (d) None

57. The equation of LMTD is ___c___.

(a) $(\Delta T_a + \Delta T_b)/ln(\Delta T_a/\Delta T_b)$

(b) $(\Delta T_a \Delta T_b)/ln(\Delta T_a/\Delta T_b)$

(c) $(\Delta T_a - \Delta T_b)/ln\left(\frac{\Delta T_a}{\Delta T_b}\right)$ (d) $None$

58. Heat exchanger effectiveness is ___a_____.

(a) < 1.0 (b) =1.0 (c) > 1.0 (d) None

59. In condensers/boilers, heat capacity ratio is ___b____.

(a) Infinity (b) Zero (c) 1.0 (d) None

60. The direct contact heat exchanger operates under ___b____.

(a) Transient conditions

(b) Steady state conditions

(c) Transient /steady state conditions

(d) None

61. The recuperator heat exchangers operate under ___b____.

(a) Transient conditions

(b) Steady state conditions

(c) Transient/ steady state conditions

(d) None

62. The regenerator heat exchanger operates under ___a____.

(a) Transient conditions

(b) Steady state conditions

(c) Transient/steady state conditions

(d) None

63. The overall heat transfer coefficient in condensers and boilers is __a__.

(a) High (b) Low (c) High & Low (d) None

64. Do we consider the conduction heat transfer in the tube in between the two fluids? ___a____.

(a) No (b) yes (c) yes/No (d) None

65. The specific heat of hot fluid in a heat exchanger is ___c___.

(a) Increasing (b) Decreasing (c) No change (d) None

66. The overall heat transfer coefficient in a heat exchanger is __c_.

(a) Increasing

(b) Decreasing

(c) No change

(d) None

67. The correction 'F' for multi-pass exchangers depends on __c___.

(a) P+R (b) P/R (c) P & R (d) None

68. The parameter 'P' in a multi- pass heat exchanger is the ratio of ___c____.

(a) Rise in temperature of cold fluid and fall of temperature of hot fluid.

(b) Fall of temperature of hot fluid to rise of temperature of cold fluid

(c) Rise of temperature of cold fluid to difference between inlet temperatures of hot and cold fluids

(d) None

78. Factor 'R' in multi-pass heat exchanger is the ratio of __b__.

(a) Rise in temperature of cold fluid and fall of temperature of hot fluid

(b) Fall of temperature of hot fluid to rise of temperature of cold fluid

(c) Rise of temperature of cold fluid to difference between inlet

(d) None

79. The change in correction factor 'F' with the increasing value of Prameter 'R' at ficed value of parameter 'P'.___b___.

(a) Constant (b) Increases (c) Decreases (d) None

80. The change in correction factor 'F' with the increasing value of parameter 'P' at a fixed value of parameter 'R' ___c___.

(a) Constant (b) Increases (c) Decreases (d) None

81. Overall heat transfer coefficient is associated with __d___.

(a) Conduction (b) Convection (c) Radiation (d) None

82. Overall heat transfer coefficient is associated with ____d____.

(a) Conduction and radiation

(b) Conduction and radiation

(c) Radiation, convection and conduction

(d) None

83. Overall heat transfer coefficient is associated with ___d_____.

(a) Conduction and radiation

(b) Convection and conduction
(c) Radiation and convection
(d) None

84. Thermal contact resistance in conduction heat transfer is due to __b__.
(a) Polished surfaces in contact
(b) Rough surface in contact
(c) Smooth surface in contact
(d) None

85. Thermal contact resistance decreases the temperature ___c___.
(a) Linearly (b) Parabolic (c) Instantaneously (d) None

86. Conduction heat flux is __b____.

(a) –kAdT/dx (b) –k dT/dx (c) +kAdT/dx (d) None

87. Convection heat flux is _____c____.

(a) $hAdT$ (b) h A (c) h dT (d) None

88. The expression for overall heat transfer coefficient for a single wall construction is __a___.

(a) $\frac{1}{U} = \frac{1}{h_i} + \frac{x}{k} + \frac{1}{h_o}$

(b) $\frac{1}{UA} = \frac{1}{h_i A_i} + \frac{x}{kA} + \frac{1}{h_o A_o}$

(c) $\frac{1}{UA} = \frac{1}{h_i A_o} + \frac{x}{kA} + \frac{1}{h_o A_i}$

(d) None

90. Temperature variation in a pipe is ___c____.

(a) Linear
(b) Parabolic
(c) Logarithmic
(d) None

91. Temperature variation in a pipe is ___a____.

(a) Linear (b) Parabolic (c) Logarithmic (d) None

92. In the heat interchanger, finned tubes are used for one of the following purposes. __a___.

(a) Increasing the surface area

(b) Introducing the cold fluid

(c) Introducing the cold fluid

(d) Reducing the size of apparatus

94. The general equation for heat transfer rate $\dot{Q}$, is expressed as: __c___

(a) $A\Delta T/U$ (b) $U/A\Delta T$ (c) $AU\Delta T$ (d) $UA/\Delta T$

95. For heat insulation, one of the following is used __c___.

(a) Al. wire (b) Cu foils (c) Glass wool (d) Fe filling

96. In the double pipe heat exchanger, the two tubes are arranged in one of the following ways ___a____.

(a) Coaxial (b) Concentric (c) Parallel (d) series

97. Which heat interchanger consists of bent tubes? ___a___.

(a) Double pipe heat exchanger

(b) Floating head two-pass heater

(c) Multi-pass heater

(d) Tubular heater

98. Fourier's law is applicable to one of the following types of heat flow. __a__.

(a) Conduction (b) Convection (c) Radiation (d) Emission

99. In the convection process for process for a liquid in a tube, one of the following offers great resistance ___d___.

(a) Central layer of liquid

(b) Liquid layer adhered to the metal wall

(c) Metal wall

(d) Stagnant liquid layer between viscous and turbulent flow .