THERMODYNAMICS

01. A certain quantity of fluid in a cylinder bounded by a moving piston constitutes a
A. Closed system
B. Open system
C. Steady flow system
D. Isolated system
ANSWER: A

02. Hot coffee stored in a well-insulated thermos flask is an example of
A. Isolated system
B. Closed system
C. Open system
D. Non flow adiabatic system
ANSWER: A

03. Choose the correct statement
A. A gas turbine is a closed system
B. Automobile storage battery along with leads is an open system
C. A pressure cooker is a closed system
D. A mixture of water and steam in a vessel is an isolated system.
ANSWER: C

04. A collection of matter bounded by a wall impervious to the flow of mass and energy is called
A. Isolated system
B. Closed system
C. Open system
D. Steady flow system
ANSWER: A

05. The first law of thermodynamics deals with
A. Heat and work
B. Quality of energy
C. Energy balance
D. Measurement of energy transfer.
ANSWER: C

06. The law of thermodynamics which states that heat and work are mutually convertible is known as
A. Zeroth law of thermodynamics
B. First law of thermodynamics
C. Second law of thermodynamics
D. Third law of thermodynamics
ANSWER: B

07. A gas is compressed in a cylinder by a movable piston to a volume one-half of its original volume. During the process, 300 kJ heat left the gas and the internal energy remained same. What is the work done on the gas?
A. 100 kNm
B. 150 kNm
C. 200kNm
D. 300kNm
ANSWER: D

08. A gas expands from pressure P_1 to pressure P_2 ($P_2 = P_1/10$). If the process of expansion is isothermal, the volume at the end of expansion is $0.55m^3$. If the process of expansion is adiabatic, the volume at the end of expansion will be closer to
A. 0.45 m^3
B. 0.55 m^3
C. 0.65 m^3
D. 0.28 m^3
ANSWER: D

09. An ideal gas at 27°C is heat at constant pressure till its volume becomes three times. What would be the temperature of gas?
A. 81°C
B. 627°C
C. 543°C
D. 327°C
ANSWER: B

10. A fluid flowing along a pipe line undergoes a throttling process from 10 bar to 1 bar is passing through a partially open valve. Before throttling, the specific volume of the fluid is $0.5m^3/kg$ and after throttling is $2m^3/kg$. What is the change in specific internal energy during the throttling process?
A. Zero
B. 100 kJ/kg
C. 200 kJ/kg
D. 300 kJ/kg
ANSWER: D

11. 0.7 kg/s of air enters with a specific enthalpy of 290 kJ and leaves it with 450 kJ of specific enthalpy. Velocities at inlet and exit are 6 m/s and 2 m/s respectively. Assuming adiabatic process, what is power input to the compressor?
A. 120 kW
B. 118 kW
C. 115 kW
D. 112 kW
ANSWER: D

12. In a throttling process, which one of the following parameters remain constant?
A. Temperature
B. Pressure
C. Enthalpy
D. Entropy
ANSWER: C

13. 85 kJ of heat is supplied to a closed system at constant volume. During the next process, the system rejects 90 kJ of heat at constant pressure while 20 kJ of work done on it. The system is brought to the original state by an adiabatic process. The initial internal energy is 100 kJ. Then what is the quantity of work transfer during the process?
A. 100 kJ
B. 25 kJ
C. 20 kJ
D. 15 kJ
ANSWER: D

14. A gas is following through an insulated nozzle. If the inlet velocity of gas is negligible ad there is an enthalpy drop of 45 kJ/kg, the velocity of gas leaving the nozzle is
A. 100 m/s
B. 200 m/s
C. 300 m/s
D. 350 m/s
ANSWER: C

15. Under ideal conditions, the velocity of steam at the outlet of a nozzle for a heat drop of 450 kJ/kg from inlet reservoir condition up to the exit is
A. 649 m/s
B. 749 m/s
C. 849 m/s
D. 949 m/s
ANSWER: D

16. Heat transfer to a closed stationary system at constant volume is equal to
A. Work transfer
B. Change in internal energy
C. Change in enthalpy
D. Change in entropy
ANSWER: B

17. Heat transferred is equal to work done in the case of
A. Non flow constant pressure process
B. Non flow constant volume process
C. Non flow adiabatic process
D. Non flow isothermal process
ANSWER: D

18. Change of internal energy is equal to work transfer in the case of
A. Non flow adiabatic process
B. Non flow isothermal process
C. Non flow constant pressure process
D. Non flow constant volume process
ANSWER: A

19. The area under process curve in PV diagram represents
A. Heat transfer
B. Work transfer
C. Change in internal energy
D. Change in enthalpy
ANSWER: B

20. If a fluid expands suddenly into vacuum through an orifice of large dimension, then such a process is called
A. Free expansion
B. Hyperbolic expansion
C. Adiabatic expansion
D. Parabolic expansion
ANSWER: A

21. Which of the following is a succession of equilibrium states?
A. Isenthalpic process
B. Isentropic process
C. Quasi static process
D. Isothermal process
ANSWER: C

22. The displacement work done by a system is given by $\int pdV$. It is valid for
A. Any process
B. A quasi static process
C. A non quasi static process
D. An isentropic process
ANSWER: B

23. A series of state change of a system such that the final state is identical with initial state constitutes a
A. Quasi static process
B. Thermodynamic cycle
C. Reversible cycle
D. Non-quasi static process.
ANSWER: B

24. If the value of n is zero in polytropic process $pv^n = C$, then the process is known as
A. Constant volume process
B. Constant temperature process
C. Constant pressure process
D. Constant enthalpy process.
ANSWER: C

25. If the value of n is infinite in polytropic process $pv^n = C$, then the process is known as
A. Constant volume process
B. Constant temperature process
C. Constant pressure process
D. Constant enthalpy process
ANSWER: A

26. The process in which the system remains infinitesimally closed to an equilibrium state at all times is
A. Path equilibrium process
B. Cyclic equilibrium process
C. Phase equilibrium process
D. Quasi static or quasi equilibrium process.
ANSWER: D

27. Which of the following processes are thermodynamically reversible
A. Throttling
B. Free expansion
C. Hyperbolic
D. Isothermal and adiabatic.
ANSWER: D

28. In which one of the following processes, in a close system the thermal energy transferred to a gas is completely converted to internal energy resulting in an increase in gas temperature?
A. Isochoric process
B. Adiabatic process
C. Isothermal process
D. Free expansion
ANSWER: A

29. Measurement of temperature is based on which law of thermodynamics?
A. Zeroth law of thermodynamics
B. First law of thermodynamics
C. Second law of thermodynamics
D. Third law of thermodynamics
ANSWER: A

30. A non-flow quasi-static (reversible) process occurs for which P = (-3V + 16) bar, where V is volume in m^3. What is work done when V changes from 2 to 6 m^3?
A. 16×10^5J
B. 16.5×10^5J
C. 16×10^3J
D. 16.5×10^2J
ANSWER: A

31. According to Kelvin-Planck's statement of second law of thermodynamics
A. It is impossible to construct an engine working on a cyclic process, whose sole purpose is to convert heat energy into work
B. It is possible to construct an engine working on a cyclic process, whose sole purpose is to convert the heat energy into work
C. It is impossible to construct a device which while working in a cyclic process produces no effect other than the transfer of heat from a colder body to a hotter body
D. None of the above.
ANSWER: D

32. The property of a working substance which increases or decreases as the heat is supplied or removed in a reversible manner is known as
A. Enthalpy
B. Internal energy
C. Entropy
D. External energy.
ANSWER: C

33. The entropy may be expressed as a function of
A. Pressure and temperature
B. Temperature and volume
C. Heat and work
D. all of the above
ANSWER: A

34. The change of entropy, when heat is absorbed by the gas is
A. positive
B. Negative
C. positive or negative.
ANSWER: A

35. The condition for the reversibility of a cycle is
A. The pressure and temperature of working substance must not differ, appreciably from those of the surroundings at any stage in the process
B. All the processes taking place in the cycle of operation, must be extremely slow
C. The working parts of the engine must be friction free
D. all of the above.
ANSWER: D

36. In an irreversible process there is a
A. Loss of heat
B. No loss of work
C. Gain of heat
D. No gain of heat.
ANSWER: A

37. The main cause for the irreversibility is
A. Mechanical and fluid friction
B. Unrestricted expansion
C. Heat transfer with a finite temperature difference
D. all of the above.
ANSWER: D

38. The efficiency of the Carnot cycle may be increased by
A. Increasing the highest temperature
B. Decreasing the highest temperature
C. Increasing the lowest temperature
D. Decreasing the lowest temperature
E. Keeping the lowest temperature constant.
ANSWER: D

39. Which of the following is the correct statement?
A. All the reversible engines have the same efficiency
B. All the reversible and irreversible engines have the same efficiency
C. Irreversible engines have maximum efficiency
D. All engines are designed as reversible in order to obtain maximum efficiency.
ANSWER: A

40. In a Carnot engine, when the working substance gives heat to the sink
A. The temperature of the sink increases
B. The temperature of the sink remains the same
C. The temperature of the source decreases
D. The temperatures of both the sink and the source decrease
ANSWER: B

41. If the temperature of the source is increased, the efficiency of the Carnot engine
A. Decreases
B. Increases
C. Does not change
D. Will be equal to the efficiency of a practical engine
ANSWER: B

42. The efficiency of an ideal Carnot engine depends on
A. Working substance

B. on the temperature of the source only
C. On the temperature of the sink only
D. On the temperatures of both the source and the sink
ANSWER: D

43. In a reversible cycle, the entropy of the system
A. Increases
B. Decreases
C. Does not change
D. First increases and then decreases
ANSWER: C

44. A frictionless heat engine can be 100% efficient only if its exhaust temperature is
A. Equal to its input temperature
B. less than its input temperature
C. 0°C
D. 0°K
ANSWER: D

45. Heat is transferred to a heat engine from a furnace at a rate of 80 MW. If the rate of waste heat rejection to a nearby river is 50 MW, determine the net power output for this heat engine.
A. 30 MW
B. 40 MW
C. 50 MW
D. 60 MW
ANSWER: A

46. Heat is transferred to a heat engine from a furnace at a rate of 80 MW. If the rate of waste heat rejection to a nearby river is 50 MW, determine the thermal efficiency for this heat engine.2
A. 47.5 %
B. 27.5 %
C. 37.5 %
D. none of the mentioned
ANSWER: C

47. A car engine with a power output of 50 kW has a thermal efficiency of 24 percent. Determine the fuel consumption rate of this car if the fuel has a heating value of 44,000 kJ/kg .
A. 0.00273 kg/s
B. 0.00373 kg/s
C. 0.00473 kg/s
D. 0.00573 kg/s
ANSWER: C

48. The food compartment of a refrigerator is maintained at 4°C by removing heat from it at a rate of 360 kJ/min. If the required power input to the refrigerator is 2kW, determine the coefficient of performance of the refrigerator.4

A. 4
B. 3
C. 2
D. 1
ANSWER: B

49. The food compartment of a refrigerator is maintained at 4°C by removing heat from it at a rate of 360 kJ/min. If the required power input to the refrigerator is 2kW, determine the rate of heat rejection to the room that houses the refrigerator.5
A. 450 kJ/min
B. 460 kJ/min
C. 470 kJ/min
D. 480 kJ/min
ANSWER: D

50. What is the relation between COP of heat pump and refrigerator?
A. COP of pump=COP of refrigerator – 1
B. COP of pump=COP of refrigerator + 1
C. COP of pump=COP of refrigerator – 2
D. COP of pump=COP of refrigerator + 2
ANSWER: B

51. The latent heat of vaporisation at critical point is
A. less than zero
B. greater than zero
C. equal to zero
D. not determinable.
ANSWER: C

52. Which of the statement is true?
A. Boiling point involves equilibrium of solid and vapour phases
B. Melting point involves equilibrium of liquid and vapour phases
C. Critical point involves equilibrium of solid, liquid and vapour phases
D. Triple point involves equilibrium of solid, liquid and vapour phases
ANSWER: D

53. Choose the correct statement.
A. Specific volume of water decreases on freezing
B. Boiling point of water decreases with increasing pressure
C. Specific volume of CO_2increases on freezing
D. Freezing temperature of water decreases with increasing pressure.
ANSWER: D

54. What is the state, at which saturated liquid line with respect to vaporisation and saturated vapour line on p-v diagram of pure substance, meet called?
A. saturation state
B. critical state
C. vaporisation state
D. superheated vapour state
ANSWER: B

55. The temperature of a water at which the vapour pressure is equal to 760 mm Hg is called as
A. normal vapour point
B. normal boiling point
C. normal pressure point
D. normal sublimation point
ANSWER: B

56. The temperature at which pure water transforms into water vapour at constant pressure is called as
A. vaporisation temperature
B. normal temperature
C. saturation temperature
D. Dew point temperature
ANSWER: C

57. If x_1 and x_2 are the dryness fraction of steam after separating and throttling respectively in the combined separating and throttling calorimeter, then the actual dryness fraction of the steam sample is
A. $x_1.x_2$
B. x_1-x_2
C. x_1+x_2
D. x_1/x_2
ANSWER: A

58. Saturation temperature of steam increases
A. with decrease in pressure
B. with increase in pressure
C. first decreases and then increases with increase in pressure
D. is unaffected by change in pressure
ANSWER: B

59. When heat is added to water and if its temperature does not change, the heat added is called
A. isothermal heat
B. sensible heat
C. latent heat
D. constant pressure heat
ANSWER: C

60. What is the state of a pure substance from which a phase change occurs without a change of pressure or temperature?
A. pure state
B. phase state
C. critical state
D. saturation state
ANSWER: D

61. How can we differentiate Rankine cycle from Carnot cycle?
A. Heat addition process of Rankine cycle is reversible isothermal whereas heat addition process of Carnot cycle is reversible isobaric
B. Heat addition process of Rankine cycle is reversible isobaric whereas heat addition process of Carnot cycle is reversible isothermal
C. Heat addition process of Rankine cycle is reversible isentropic whereas heat addition process of Carnot cycle is reversible isothermal
D. both cycles are identical except the working fluid used
ANSWER: B

62. The maximum efficiency of Rankine cycle ($\eta_{Rankine}$) is the function of
A. the mean temperature of heat addition (T_m) only
B. the mean temperature of heat addition (T_m) and temperature of steam at the exit of the turbine
C. the mean temperature of heat addition (T_m) and temperature of steam at the entry of the turbine
D. the mean temperature of heat addition (T_m) and temperature of steam at exit of the condenser
ANSWER: A

63. What is the effect of increase in boiler pressure on pump work in the Rankine cycle?
A. the pump work increases
B. the pump work decreases
C. the pump work does not change with boiler pressure
D. the pump work depends only on steam volume
ANSWER: A

64. When the pressure at which heat is added in Rankine cycle increases, the moisture content at the turbine exhaust
A. increases
B. decreases
C. remains same
D. Unpredictable
ANSWER: A

65. Rate of corrosion of blades inside the steam turbine increases when
A. Steam pressure at turbine inlet increases
B. Steam pressure at turbine inlet decreases
C. Boiler pressure decreases

D. Condenser pressure increases
ANSWER: A

66. The smallest particle which can take part in a chemical change is called
A. Atom
B. Molecule
C. Electron
D. Compound
ANSWER: A

67. For each mole of oxygen, number of moles of nitrogen required for complete combustion of carbon are
A. 20/21
B. 2/21
C. 77/21
D. 79/21
ANSWER: C

68. Stoichiometric air-fuel ratio by mass for combustion of petrol is
A. 5
B. 10
C. 12
D. 15.05
ANSWER: D

69. Enthalpy of formation is defined as enthalpy of compounds at
A. 25°C and 10 atmospheres
B. 25°C and 1 atmosphere
C. 0°C and 1 atmosphere
D. 100°C and 1 atmosphere
ANSWER: B

70. Bomb calorimeter is used to find the calorific value of
A. calorific value of solid fuels
B. calorific value of gaseous fuels
C. calorific value of solid and gaseous fuels
D. dryness fraction of steam
ANSWER: A

71. When the fuel is burned and the water appears in the vapour phase, the heating value of fuel is called
A. enthalpy of formation
B. lower heating value

C. higher heating value
D.medium heating value
ANSWER: B

72. Choose the correct statement:
A. Number of atoms of each constituent are not conserved in a chemical reaction.
B. The mass of all the substances on one side of the equation may not be equal to the mass of all the substances on the other side.
C. The number of atoms of each constituent are conserved in a chemical reaction.
D. The number of moles of the reactants in a chemical equation are equal to the number of moles of the products
ANSWER: C

73. The difference of actual air supplied and the stoichiometric air required for complete combustion of fuel is called
A. Combustion Air
B. Theoretical Air
C. Dry Air
D. Excess Air
ANSWER: D

74. Heat energy released in combustion is measured with the help of:
A. Anemometer
B. Calorimeter
C. Thermometer
D. Energy meter
ANSWER: B

75. Burning hydrocarbons produces:
A. Water
B. Water and carbon dioxide
C. Carbon Dioxide
D. Water and Carbon
ANSWER: B

76. In a mixture of ideal gases of volume V and temperature T, what is the pressure exerted by each individual gas if it occupies the total volume V alone at temperature T called?

A.individual pressure
B. divided pressure
C. partial pressure
D. total pressure
ANSWER: C

77. What is reduced property of a substance?

A. critical property of a substance minus existing property of the same substance

B. existing property of a substance minus critical property of the same substance

C. ratio of critical property to existing property of the same substance

D. ratio of existing property to critical property of the same substance

ANSWER: D

78. The equation pv=RT is used for ideal gases. The right equation for real gases is vander Waals equation. What is the correct formula for the van der Waals equation? Where (a/v^2)= force of cohesion, b= coefficient related to volume of molecules

A. $(p+(a/v^2))\ (v + b) = RT$

B. $(p – (a/v^2))\ (v – b) = RT$

C. $(p + (a/v^2))\ (v – b) = RT$

D. $(p – (a/v^2))\ (v + b) = RT$

ANSWER: C

79. In which condition can real gas closely obey the ideal gas equation?

A. pressure is very small and temperature is very high

B. pressure is very high and temperature is very low

C. both pressure and temperature are very high

D. both pressure and temperature are very low

ANSWER: A

80. Hydrogen (H_2) is not

A. heavier than carbon dioxide

B. lighter than air

C. colored

D. insoluble

ANSWER: D

81. Water-soluble gases do not include

A. ammonia

B. carbon dioxide

C. hydrogen

D. oxygen

ANSWER: C

82. Gases denser than air include

A. carbon dioxide

B. oxygen

C. hydrogen

D. ammonia

ANSWER: A

83. Gases heavier than air can be collected through
A. upward delivery
B. downward delivery
C. downward displacement of air
D. upwards displacement of air
ANSWER: B

84. The total entropy of a mixture of gases is the ____ of the partial entropies.
A. average
B. weighted mean
C. sum
D. difference of the highest and the lowest
ANSWER: C

85. What is the maximum content of moisture allowed at the turbine exhaust in the steam power plant?
A. 50 %
B. 60 %
C. 30 %
D. 12 %
ANSWER: D

86. The region where Joule Thomson co-efficient, μ_J is positive is
A. Cooling region
B. Heating region
C. No change in temperature
D. Inversion curve
ANSWER: A

87. Locus of the points where Joule Thomson co-efficient, μ_J is zero is
A. Cooling region
B. Heating region
C. No change in temperature
D. Inversion curve
ANSWER: D

88. Joule Thomson effect describes gases about
A. Contraction
B. Sudden expansion
C. Expansion
D. volume increase
ANSWER: B

89. The region where Joule Thomson co-efficient,μ_J is negative is
A. Cooling region
B. Heating region
C. No change in temperature
D. Curve
ANSWER: B

90. In throttling process
A. Pressure increases and enthalpy constant
B. Pressure decreases and enthalpy constant
C. Pressure and enthalpy both remain constant
D. Enthalpy only changes
ANSWER: B

91. The compressibility factor and Joule Thomson coefficient for an ideal gas are respectively
A. Zero and unity
B. Unity and zero
C. Zero and zero
D. Unity and Unity
ANSWER: B

92. At the maximum inversion temperature in the graph of isenthalpic or joule-kelvin expansion of a gas, the value of Joule-Thomson coefficient is
A. Negative
B. Positive
C. Zero
D. Depends on initial temperature
ANSWER: C

93. The temperature at a point at where the constant enthalpy line intersects the inversion line is called
A. Maximum temperature
B. inversion temperature
C. maximum inversion temperature
D. minimum inversion temperature
ANSWER: B

94. The slope of constant enthalpy lines are negative at the region of
A. Heating
B. Cooling
C. Inversion
D. maximum inversion temperature
ANSWER: A

95. A closed system undergoes a process 1-2 for which the values of Q_{1-2} and W_{1-2} are +20 kJ and +50 kJ, respectively. If the system is returned to state 1 and Q_{1-2} is -10 kJ, what is the value of the work W_{2-1}?
A. +20 kJ
B. -40 kJ
C. -80 kJ
D. +40 kJ
ANSWER: B

96. An insulated tank initially contains 0.25 kg of gas with an internal energy of 200 kJ/kg. Additional gas with an internal energy of 300 kJ/kg and an enthalpy of 400 kJ/kg enters the tank until the total mass of gas contained is 1 kg. What is the final internal energy of the gas in the tank?
A. 250 kJ/kg
B. 275 kJ/kg
C. 350 kJ/kg
D. 450 kJ/kg
ANSWER: B

97. 85 kJ of heat is supplied to a closed system at constant volume. During the next process, the system rejects 90 kJ of heat at constant pressure while 20 kJ of work done on it. The system is brought to the original state by an adiabatic process. The initial internal energy is 100 kJ. Then what is the quantity of work transfer during the process?
A. 100 kJ
B. 25 kJ
C. 20 kJ
D. 15 kJ
ANSWER: D

98. A closed system receives 60 kJ heat its internal energy decreases by 30 kJ. Then the work done by the system is
A. 90 kJ
B. 30 kJ
C. -30 kJ
D. -90 kJ
ANSWER: A

99. If the work done on a closed system is 20 kJ/kg and 40 kJ/kg heat is rejected from the system, its internal energy decreases by
A. 20 kJ/kg
B. 60 kJ/kg
C. -20 kJ/kg
D. 60 kJ/kg
ANSWER: A

100. In a cyclic process, the heat transfer are +30J, -50 J, -10 J and + 60 J. The net work for the cyclic process is
A. 30 Nm
B. 40 Nm
C. 50 Nm
D. 60 Nm
ANSWER: A

101. Work done by free expansion process is
A. positive
B. negative
C. zero
D. maximum
ANSWER: C

102. The pressure exerted by an ideal gas is _____ of the kinetic energy of all the molecules contained in a unit volume of gas.
A. 1/2
B. 1/3
C. 2/3
D. 3/4
ANSWER: C

103. The ratio of specific heat at constant pressure (Cp) and specific heat at constant volume (Cv) is
A. equal to zero
B. equal to 1
C. less than 1
D. greater than 1
ANSWER: D

104. If the value of n = 0 in the equation $pv^n = C$, then the process is called
A. Isobaric process
B. Isochoric process
C. Isothermal process
D. Isobaric process
ANSWER: A

105. According to _____ for a perfect gas, p/T = constant, if v is kept constant.
A. Boyle's law
B. Charles law
C. Gay-Lussac law
D. Joules Law
ANSWER: C

106. There is no change in internal energy in an _____ process.

A. adiabatic
B. isothermal
C. isochoric
D. isobaric
ANSWER: B

107. Which of the following is correct?
A. Absolute pressure = Gauge pressure + Atmospheric pressure
B. Gauge pressure = Absolute pressure + Atmospheric pressure
C. Atmospheric pressure = Absolute pressure + Gauge pressure
D. Absolute pressure = Gauge pressure - Atmospheric pressure
ANSWER: A

108. The value of gas constant (R) in S. I. units is
A. 0.287 J/kgK
B. 2.87 J/kgK
C. 28.7 J/kgK
D. 287 J/kgK
ANSWER: D

109. All gases and vapours approach ideal gas behaviour at
A. High pressure and high density
B. Low pressure and low density
C. High pressure and low density
D. Low pressure and high density
ANSWER: B

110. Work done in a quasi-static process
A. depends on the path followed
B. independent of the path followed
C. depends only on the initial and final states
D. independent of the initial and final states
ANSWER: A

111. The energy of an isolated system
A. is always decreasing
B. is always constant
C. is always increasing
D. first increases and then decreases
ANSWER: B

112. Which property of a system is constant in reversible adiabatic process?
A. pressure
B. volume
C. temperature
D. entropy

ANSWER: D

113. What is the cyclic integral of dQ/T for irreversible process?
A. less than zero
B. zero
C. more than zero
D. infinity
ANSWER: A

114. When a system is taken from state A to state B through a reversible path 1 and again the system is taken to its initial state A from B through different reversible path 2, then what will be the effect on entropy?
A. entropy increases
B. entropy decreases
C. entropy remains constant
D. entropy decreases and then increases
ANSWER: C

115. What is the exergy of a system?
A. The minimum work that can be extracted from a system till it reaches thermodynamic equilibrium with its surroundings
B. The maximum work that can be extracted from a system till it reaches thermodynamic equilibrium with its surroundings
C. The maximum entropy that can be increased in a system till it reaches thermodynamic equilibrium with its surroundings
D. The minimum entropy that can be increased in a system till it reaches thermodynamic equilibrium with its surroundings
ANSWER: B

116. The internal energy of saturated water at the triple point is
A.1
B.0
C. -1
D. infinity
ANSWER: B

117. When a liquid and its vapour are in equilibrium at a certain pressure and temperature, then which of the following is required to identify the saturation state.
A. pressure
B. temperature
C. both pressure and temperature
D. either pressure or temperature
ANSWER: D

118. When does a vapour become superheated?
A. when the temperature of vapour is less than the saturation temperature at given pressure

B. when the temperature of vapour is more than the saturation temperature at given pressure
C. when the temperature of vapour is equal to the saturation temperature at given pressure
D. when the temperature of vapour is less than or equal to saturation temperature
ANSWER: B

119. The superheat or degree of superheat is given by
A. difference between the temperature of saturated liquid and saturation temperature
B. difference between the temperature of superheated vapour and saturation temperature
C. sum of the temperature of saturated liquid and saturation temperature
D. sum of the temperature of superheated vapour and saturation temperature
ANSWER: B

120. Dryness fraction of steam is defined as
A. mass of water vapour in suspension/(mass of water vapour in suspension + mass of dry steam)
B. mass of dry steam/mass of water vapour in suspension
C. mass of dry steam/(mass of dry steam + mass of water vapour in suspension)
D. mass of water vapour in suspension/mass of dry steam
ANSWER: C

121. With increase in pressure
A. enthalpy of dry saturated steam increases
B. enthalpy of dry saturated steam decreases
C. enthalpy of dry saturated steam remains same
D. enthalpy of dry saturated steam first increases and then decreases.
ANSWER: B

122. The temperature at which pure water transforms into water vapour at constant pressure is called as
A. vaporisation temperature
B. normal temperature
C. saturation temperature
D. sublimation temperature
ANSWER: C

123. With the increase in pressure
A. boiling point of water increases and enthalpy of evaporation increases
B. boiling point of water increases and enthalpy of evaporation decreases
C. boiling point of water decreases and enthalpy of evaporation increases
D. boiling point of water decreases and enthalpy of evaporation decreases
ANSWER: B

124. Instrument used for measuring dryness fraction of steam
A. Bomb calorimeter
B. Constant pressure calorimeter
C. Throttling calorimeter
D. Reaction calorimeter

ANSWER: C

125. Which of the statement is true?
A. Boiling point involves equilibrium of solid and vapour phases
B. Melting point involves equilibrium of liquid and vapour phases
C. Critical point involves equilibrium of solid, liquid and vapour phases
D. Triple point involves equilibrium of solid, liquid and vapour phases
ANSWER: D

126. In separating calorimeter which steam used is
A. Dry saturated
B. Very wet
C. Superheated
D. Saturated or superheated
ANSWER: B

127. The heat pump
A. receives heat from high temperature region and discharge it to low temperature region with production of useful work
B. receives heat from low temperature region and discharge it to high temperature region with production of useful work
C. receives heat from high temperature region and discharge it to low temperature region with utilization of external work
D. receives heat from low temperature region and discharge it to high temperature region with utilization of external work
ANSWER: C

128. What is the relation between $[COP]_{H.P.} = [COP]_{Ref.}$?
A. $[COP]_{H.P.} = [COP]_{Ref.}$
B. $[COP]_{H.P.} + [COP]_{Ref.} = 1$
C. $[COP]_{H.P.} - [COP]_{Ref.} = 1$
D. $[COP]_{H.P.} \times [COP]_{Ref.} = 1$
ANSWER: C

129. What is correct formula for calculating COP of heat pump ? (where Q1 is the heat pumped by the heat pump and Q2 is the heat extracted from the sink.)

A. [COP]H. P. = Q1 / W
B. [COP]H. P. = Q2 / W
C. [COP]H. P. = W / Q1
D. [COP]H. P. = W / Q2
ANSWER: A

130. COP of a heat pump is
A. always less than infinity
B. always less that 1

C. always equals to 1
D. always equals to infinity
ANSWER: A

131. The diagram below shows the Carnot cycle. What is the total quantity of heat added in the system?

A. (area under 3-2)
B. (area under 4-1)
C. (area under 4-1) – (area under 2-3)
D. (area enclosed by 1-2-3-4)
ANSWER: B

132. What is the criterion provided by Clausius inequality for the process which is impossible?
A. Cyclic $\int (đQ/T) = 0$
B. Cyclic $\int (đQ/T) < 0$
C. Cyclic $\int (đQ/T) > 0$
D. Both A and B
ANSWER: C

133. What is the relation between heat rejected by any heat engine (Q2) and heat rejected by reversible heat engine (Q2R), when both are operating between same heat source and same heat sink?
A. Q2 = Q2R
B. Q2 < Q2R
C. Q2 > Q2R
D. cannot say
ANSWER: C

134. What is unavailable energy (U. E.)
A. Energy supplied to a cyclic heat engine
B. Maximum energy utilized to produce maximum work from a certain heat supplied to a cyclic heat engine
C. Minimum heat energy rejected to sink by second law
D. Maximum heat energy rejected to sink by second law
ANSWER: C

135. What is the inversion curve in isenthalpic expansion or Joule-Kelvin expansion?
A. the locus of all points at which Joule-Kelvin coefficient is negative
B. the locus of all points at which Joule-Kelvin coefficient is positive
C. the locus of all points at which Joule-Kelvin coefficient is zero
D. the locus of all points at which Joule-Kelvin coefficient is one
ANSWER: C

136. How can we differentiate Rankine cycle from Carnot cycle?
A. Heat addition process of Rankine cycle is reversible isothermal whereas heat addition process

of Carnot cycle is reversible isobaric
B. Heat addition process of Rankine cycle is reversible isobaric whereas heat addition process of Carnot cycle is reversible isothermal
C. Heat addition process of Rankine cycle is reversible isentropic whereas heat addition process of Carnot cycle is reversible isothermal
D. both cycles are identical except the working fluid used
ANSWER: B

137. Which of the following is a path function?
A. Internal energy
B. Heat energy
C. Temperature
D. Pressure
ANSWER: B

138. All spontaneous processes are
A. very slow
B. quasi-static
C. reversible
D. irreversible
ANSWER: D

139. The total energy of the universe
A. is always increasing
B. is always decreasing
C. either increases or decreases
D. is always constant
ANSWER: D

140. How is the final temperature (Tf) of the two bodies given, when these bodies, having same heat capacity and initially at temperatures T1 and T2 (T1>T2) are brought together in thermal contact, without delivering any work?
A. $Tf = (T1 – T2)$
B. $Tf = (T1 – T2) / 2$
C. $Tf = (T1 + T2) / 2$
D. $Tf = \sqrt{(T1\ T2)}$
ANSWER: C

141. Which concept provides the useful measure of quality of energy?
A. entropy
B. exergy
C. energy
D. enthalpy
ANSWER: B

142. No liquid can exist at

A. 0 K
B. vacuum
C. zero pressure
D. space
ANSWER: C

143. A platinum resistance thermometer has a resistance of 2 ohm at 0° C and 3 ohm at 100° C. What will be the temperature when resistance indicates 5 ohm?
A. 200° C
B. 300° C
C.400° C
D. 500° C
ANSWER: B

144. Heat flow is a quantity of heat transfer
A. within definite time
B. within definite cross-sectional area
C. within definite volume of the system
D. within definite space of the system
ANSWER: A

145. Heat transfer is
A. a point function
B. a path function
C. a transverse function
D. a transfer function
ANSWER: A

146. The amount of heat required to raise a unit mass of substance through a unit rise in temperature is called as
A. heat capacity of a substance
B. specific heat capacity of a substance
C. latent heat of a substance
D. sensible heat of a substance
ANSWER: B

147. The amount of heat transferred to convert unit mass of solid to vapour or vice versa is called as
A. latent heat of vaporization
B. latent heat of fusion
C. latent heat of sublimation
D. specific heat
ANSWER: C

148. A cyclic heat engine operates between a source temperature of 1200 K and a sink temperature of 300 K. What will be the maximum efficiency of the heat engine?

A. 100 percentage
B. 85 percentage
C. 75 percentage
D. 65 percentage
ANSWER: C

149. PMM2 is the machine which violates
A. Joules statement
B. Clausius statement
C. Weins statement
D. Newtons law of cooling
ANSWER: B

150. What does the exergy principle state ?
A. The exergy of an isolated system can never decreases, but always increases
B. The exergy of an isolated system can never increases, but always decreases
C. The exergy of an isolated system can either increase or decrease
D. The exergy of an isolated system can neither increase nor decrease
ANSWER: B

151. The dryness (x) fraction of superheated steam is taken as
A. 0
B. 0.9
C. 1
D. infinity
ANSWER: C

152. Energy can neither be created nor be destroyed, but it can be transformed from one form to another. This statement is known as
A. Zeroth law of thermodynamics
B. First law of thermodynamics
C. Second law of thermodynamics
D. Third law of thermodynamics
ANSWER: B

153. The_____ states that the change in internal energy of a perfect gas is directly proportional to change in temperature.
A. Boyles law
B. Charles law
C. Gay-Lucas law
D. Joules law
ANSWER: D

154. A Bomb calorimeter is used to find the _____ calorific value of solid and liquid fuels.
A. lowest
B. lower

C. average
D. higher
ANSWER: D

155. An open cycle gas turbine works on
A. Carnot cycle
B. Stirling cycle
C. Joule cycle
D. Otto cycle
ANSWER: C

156. Heat engine cycle has a maximum efficiency for
A. Petrol engine
B. Diesel engine
C. Reversible engine
D. Irreversible engine
ANSWER: C

157. The working fluid of Rankine cycle is
A. gas
B. steam
C. petrol
D. hydrogen
ANSWER: B

158. Degree of sub-cooling is :
A. the difference between saturation temperature of liquid and actual temperature of liquid
B. the difference between saturation temperature of vapour and actual temperature of liquid
C. the difference between saturation temperature of liquid and actual temperature of vapour
D. the difference between saturation temperature of vapour and actual temperature of vapour
ANSWER: A

159. Dalton's law of partial pressure states that
A. the total pressure of a mixture of ideal gases is equal to the sum of the partial pressures of individual gases divided by number of gases mixed
B. the total pressure of a mixture of ideal gases is equal to the partial pressure of any individual gas in the mixture
C. the total pressure of a mixture of ideal gases is equal to the sum of the partial pressures of individual gases
D. the total pressure of a mixture of ideal gases is equal to the product of the partial pressures of individual gases
ANSWER: C

160. Reversed Joule cycle is known as
A. Carnot cycle
B. Rankine Cycle

C. Bell-Coleman cycle
D. Stirling cycle
ANSWER: C

161. Stirling cycle consists of
A. two constant volume and two isentropic process
B. two constant volume and two isothermal process
C. two constant volume and two isobaric process
D. two constant volume and two isochoric process
ANSWER: B

162. Throttling is a
A. quasi-static process
B. reversible process
C. irreversible process
D. isobaric process
ANSWER: C

163. The increase in entropy of a system represents
A. increase in availability of energy
B. increase in temperature
C. decrease in pressure
D. degradation of energy
ANSWER: D

164. A reversible process in which there is no heat transfer between system and surrounding is called
A. adiabatic process
B. isentropic process
C. isothermal process
D. polytrophic process
ANSWER: B

165. A hyperbolic process is governed by
A. Boyles law
B. Charles law
C. Gay-Lucas law
D. Joules law
ANSWER: A

166. The gas constant is the _____ of two specific heats.
A. sum
B. difference
C. product
D. ratio
ANSWER: B

167. The specific heat at constant pressure is always _____ specific heat at constant volume
A. less
B. equal
C. greater
D. less or greater
ANSWER: C

168. _____ is a device that increases the pressure of a fluid at the expense of kinetic energy
A. Nozzle
B. Diffusor
C. Compressor
D. Heat exchanger
ANSWER: B

169. Which is not a cause of irreversibility?
A. friction
B. fast process
C. quasi-static processs
D. spontaneous process
ANSWER: C

170. Irreversibility is defined by
A. Carnot theorem
B. Joule theorem
C. Goudy-Stodola theorem
D. Clausius theorem
ANSWER: C

171. In binary vapour cycle, the cycle which is operated in high pressure ratio is called as
A. upper cycle
B. lower cycle
C. topping cycle
D. bottoming cycle
ANSWER: C

172. The gas-refrigeration system is
A. more heavy and bulky than the vapour compression cycle
B. less heavy and bulky than the vapour compression cycle
C. same in construction with the vapour compression cycle
D. cannot compare to the vapour compression cycle
ANSWER: B

173. The capacity of vapour power plant is expressed in terms of
A. heat rate
B. steam rate

C. work output
D. condenser work
ANSWER: B

174. To maximize the work output at the turbine, the specific volume should be
A. constant thought the cycle
B. as small as possible
C. as large as possible
D. negligible
ANSWER: C

175. Work output of turbine is ____ the work input to the pump.
A. much larger
B. much smaller
C. equal to
D. almost equal to
ANSWER: A

176. During throttling process
A. internal energy does not change
B. pressure does not change
C. entropy does not change
D. enthalpy does not change
ANSWER: D

177. If the dryness fraction of a sample by throttling calorimeter is 0.8 and by separating calorimeter is 0.8, then the actual dryness fraction of sample is
A. 0.8
B. 1
C. 0.64
D. 0.5
ANSWER: C

178. When a gas is to be stored, the type of compression which is ideal is
A. adiabatic
B. isothermal
C. polytropic
D. isochoric
ANSWER: B

179. In Rankine cycle, the work output from the turbine is given by
A. change in internal energy between inlet and outlet
B. change in temperature between inlet and outlet
C. change in enthalpy between inlet and outlet
D. change in entropy between inlet and outlet
ANSWER: C

180. One Horse Power is equal to
A. 100 W
B. 573.2 W
C. 684.2 W
D. 746.2 W
ANSWER: D

181. Maxwells equation consists of _____ equations.
A. 1
B. 2
C. 3
D. 4
ANSWER: D

182. Work done in a reversible isothermal compression is _____ the work done in reversible adiabatic compression.
A. less than
B. greater than
C. equal to
D. less than or equal to
ANSWER: A

183. Which of the following compression process requires minimum work ?
A. Adiabatic
B. Isothermal
C. Polytrophic
D. Isochoric
ANSWER: B

184. When a gas undergoes continuous throttling process by a vane and its pressure and temperature are plotted, then we get a
A. isotherm
B. isenthalpe
C. adiabatic
D. isobar
ANSWER: B

185. At the inversion curve, Joule-Kelvin coefficient is
A. negative
B. zero
C. positive
D. infinity
ANSWER: B

186. For magnetic cooling, the salt used is

A. ferromagnet
B. diamagnet
C. paramagnet
D. both diamagnet and paramagnet
ANSWER: C

187. All gasses at N.T.P occupies a volume of
A. 0.224 liters
B. 2.24 liters
C. 22.4 liters
D. 224 liters
ANSWER: C

188. The value of universal gas constant is ____ kJ / kgmoleK.
A. 287
B. 8.314
C. 273
D. 1.4
ANSWER: B

189. The specific heat of water is
A. 1.817 kJ/kgK
B. 2.512kJ/kgK
C. 4.187kJ/kgK
D. 6.135kJ/kgK
ANSWER: C

190. SI unit of energy is
A. Joule
B. Watt
C. Joule per meter
D. Columb
ANSWER: A

191. What is the purpose of reheat cycle?
A. to limit the pump work
B. to decrease heat input in the Rankine cycle
C. to limit the quality of steam to 0.85 at the turbine exhaust
D. to produce wet steam at exit
ANSWER: C

192. The cycle efficiency in a single reheat plant is influenced by
A. pressure at tubine inlet
B. pressure at which steam is reheated
C. temperature at which steam is reheated
D. temperature at tubine inlet

ANSWER: B

193. Ideal regenerative rankine cycle
A. Increases efficiency
B. Increases work output
C. Increases the heat supplied
D. does not effect efficiency
ANSWER: A

194. In a mercury-steam cycle, mercury cycle is called ____ and steam cycle is called ____
A. bottoming cycle, topping cycle
B. topping cycle, bottoming cycle
C. both are called bottoming cycle
D. both are called topping cycle
ANSWER: B

195. According to kinetic theory of heat
A. temperature should rise during boiling
B. temperature should fall during freezing
C. at low temperature all bodies are in solid state
D. at absolute zero there is absolutely no vibration of molecules
ANSWER: D

196. When a process becomes irreversible due to heat interaction between system and surrounding at the boundary due to finite temperature gradient, then the irreversibility is
A. internal irreversibility
B. external irreversibility
C. mechanical irreversibility
D. chemical irreversibility
ANSWER: B

197. Assume that a reversible heat engine is operating between a source at T1 and a sink at T2. If T2 decreases, the efficiency of the heat engine
A. decreases
B. increases
C. remains constant
D. decreases exponentially
ANSWER: B

198. To achieve a definite zero point on the Kelvin scale, we have to violate
A. first law of thermodynamics
B. second law of thermodynamics
C. both first law and second law of thermodynamics
D. no law has to be violated
ANSWER: B

199. The thermocouple circuit which is used to measure temperature works on
A. Thomson effect
B. Peltier effect
C. Seebeck effect
D. webber effect
ANSWER: C

200. What is the entropy of the system at equilibrium state?
A. zero
B. minimum
C. maximum
D. constant but not maximum
ANSWER: C

201. An isolated thermodynamic system executes a process. Choose the correct statement from the following

A. No heat is transferred
B. No work is done
C. No mass flows across the boundary of the system
D. All of these

ANSWER: D

202. A manometer shows a pressure difference of 1 m of liquid mercury (ρ = 13,580 kg/Cu.m). Find ΔP in kPa.

(A) 133.2 kPa
(B) 333.2 kPa
(C) 113.2 kPa
(D) 133.2 Pa

Answer: A

203. You dive 5 m down in the ocean. What is the absolute pressure there?

(A) 48.9 kPa
(B) 150 kPa
(C) 101.1 kPa
(D) 101.1 Pa

Answer:B

204. What pressure difference does a 10 m column of atmospheric air show?

(A) 0.12 kPa
(B) 12 kPa
(C) 0.012 kPa
(D) 12 Pa

Answer: A

205. What is a temperature of –5ºC in degrees Kelvin?

(A) 268.15 K
(B) 278.15 K
(C) 270.15 K
(D) 273.15 K

Answer: A

206. An apple "weighs" 80 g and has a volume of 100 cm3 in a refrigerator at 8oC. What is the apple density? List three intensive and two extensive properties of the apple.

(A) ρ=800 kg/m^3, v= 0.00125 m^3/ kg, T = 8°C, m=0.08kg, V=0.0001m^3
(B) ρ=800 g/m^3, v= 0.0125 m^3/ kg, T = 8°C, m=0.8kg, V=0.001m^3
(C) ρ=80 g/m^3, v= 0.00125 m^3/ kg, T = 8°C, m=0.8kg, V=0.0005m^3
(D) v=800 kg/m^3, ρ = 0.00125 m^3/ kg, T = 8°C, m=0.08kg, V=0.0001m^3
Answer: A

207. The "standard" acceleration (at sea level and 45° latitude) due to gravity is 9.80665 m/s^2. What is the force needed to hold a mass of 2 kg at rest in this gravitational field? How much mass can a force of 1 N support?

(A) F=19.613 kN, m=0.102 g
(B) F=19.613 N, m=0.102 kg
(C) F=19.613 N, m=0.102 g
(D) F=19.613 kN, m=0.102 kg
Answer: B

208. A force of 125 N is applied to a mass of 12 kg in addition to the standard gravitation. If the direction of the force is vertical up find the acceleration of the mass.

(A) a=0.61 ms^{-2}
(B) a=0.61 m^2s
(C) a=0.061 ms^{-2}
(D) a=0.61 ms^{-1}
Answer: B

209. When you move up from the surface of the earth the gravitation is reduced as g =9.807 − 3.32 × 10^{-6} z, with z as the elevation in meters. How many percent is the weight of an airplane reduced when it cruises at 11000 m?

(A) 0.037%
(B) 3.7%
(C) 0.37%
(D) 37%
Answer: C

210. A car drives at 60 km/h and is brought to a full stop with constant deceleration in 5 seconds. If the total car and driver mass is 1075 kg find the necessary force.

(A) 3583 kN
(B) 3583 N
(C) 3.583 N
(D) 35.83 kN
Answer: B

211. Which of the following items is a path function?

(A) work and heat
(B) heat and thermal conductivity
(C) work thermal conductivity
(D) electrical resistivity and thermal conductivity

Answer: A

212. If the work done on a closed system is 15 kJ/kg, and 40 kJ/kg heat is rejected from the system, its internal energy decreases by

(A) 25 kJ/kg
(B) 55 kJ/kg
(C) □25 kJ/kg
(D) □60 kJ/kg

Answer: C

213. Which of the following variable controls the physical properties of a perfect gas?

(A) pressure
(B) temperature
(C) volume
(D) all of these

Answer: D

214. Which of the following not represents an open thermodynamic system?

(A) turbine
(B) centrifugal pump
(C) nozzle
(D) bomb calorimeter

Answer:D

215. Absolute zero will occur

(A) at temperature of 273.13 K
(B) at temperature of -273.13º C
(C) at temperature of -273.13 K

(D) at temperature of 0° C

Answer: B

216. Three engine A, B and C operating on Carnot cycle use working substance as Argon, Oxygen and Air respectively. Which engine will have lower efficiency?

(A) all engines have same efficiency

(B) engine B
(C) engine C
(D) engine A
Answer: A

217. The basis for measuring thermodynamic property of temperature is given by

(A) first law of thermodynamics
(B) second law of thermodynamics
(C) third law of thermodynamics

(D) zeroth law of thermodynamics

Answer: D

218. Work done is zero for the following process

(A) isochoric
(B) free expansion
(C) isenthalpic
(D) all of these

Answer: D

219. The property of a working substance which increases or decreases as the heat is supplied or removed in a reversible manner, is known as

(A) enthalpy
(B) internal energy
(C) entropy
(D) external energy

Answer: C

220. If the equation $PV^n = C$, the value of $n = \infty$, then the process is called

(A) isochoric process
(B) isobaric process
(C) adiabatic process
(D) isothermal process

Answer: A

221. The maximum theoretical work obtainable when a system interacts with a reference environment, is called

(A) entropy
(B) enthalpy
(C) lethargy
(D) exergy

Answer:D

222. The increase in entropy of a system represents

(A) decrease in availability
(B) increase in temperature
(C) decrease in pressure
(D) decrease in temperature

Answer: D

223.The internal energy of an ideal gas is a function of

(A) temperature and pressure
(B) volume and pressure
(C) entropy and pressure
(D) temperature only

Answer: D

224. Which of the following is a reversible non-flow process?

(A) isochoric process
(B) isobaric process
(C) hyperbolic process
(D) all of these

Answer: D

225. The heat removal rate from a refrigerated space and the power input to the compressor are 10 kW and 2 kW, respectively. The coefficient of performance (COP) of the refrigerator is

(A) 0.5
(B) 5
(C) 0.2
(D) 2

Answer: B

226. Temperature lines in the superheated region of the T-S diagram will have
(A) a positive slope
(B) a negative slope
(C) zero slope

(D) both positive and negative slope

Answer: A

227. Temperature lines in the saturated region of the T-S diagram will have
(A) a positive slope
(B) a negative slope
(C) zero slope
(D) both positive and negative slope

Answer: C

228. In a Carnot cycle heat is added

(A) isentropic expansion
(B) isothermal expansion
(C) isothermal compression
(D) isentropic compression

Answer: B

229. During which of the following process does heat rejection takes place in Carnot cycle?

(A) isothermal expansion
(B) isentropic expansion
(C) isothermal compression
(D) isentropic compression

Answer: C

230. For a given set of operating pressure limits of a Rankine cycle the highest efficiency occur for

(A) saturated cycle
(B) superheated cycle
(C) reheat cycle
(D) regenerative cycle

Answer: D

231. The behaviour of super-heated vapour is similar to that of

(A) perfect gas
(B) air
(C) steam
(D) ordinary gas

Answer: A

232. Second law of thermodynamics defines the concept of

(A) heat
(B) work

(C) internal energy
(D) entropy

Answer:D

233. Exergy is a concept based on

(A) first and second law of thermodynamics
(B) second and third law of thermodynamics
(C) zeroth and second law of thermodynamics
(D) zeroth and first law of thermodynamics

Answer: A

234. Heat and work are

(A) intensive properties
(B) extensive properties
(C) point function
(D) path function

Answer: D

235. If a closed system is undergoing an irreversible process, the entropy of the system

(A) must increase
(B) always remains constant
(C) must decrease
(D) can increase, decrease or remain constant

Answer: D

236. Mixture of ice and water form a

(A) closed system
(B)open system
(C)isolated system
(D) heterogeneous system

Answer: D

237. A reversible heat transfer demands:

(A) The temperature difference causing heat transfer tends to zero
(B) The system receiving heat must be at constant temperature
(C) The system transferring out heat must be at a constant temperature
(D) Both interacting systems must be at constant temperatures

Answer: A

238. A flow of air at 1000 kPa, 300 K is throttled to 500 kPa. What is the irreversibility? What is the drop in flow availability?

(A) 59.6 kJ/kg

(B) 5.96 kJ/kg
(C) 596 J/kg
(D) 696 J/kg

Answer: A

239. A steam turbine inlet is at 1200 kPa, 500°C. The actual exit is at 300 kPa with an actual work of 407 kJ/kg. What is its second law efficiency?

(A) 98%

(B) 90%
(C) 36%
(D) 100%

Answer: A

240. A heat exchanger increases the availability of 3 kg/s water by 1650 kJ/kg using 10kg/s air coming in at 1400 K and leaving with 600 kJ/kg less availability. What are the irreversibility and the second law efficiency?

(A) i=1050 kW,η_{II}= 0.825 %

(B) i=105.0 kW,η_{II}= 8.25%
(C) i=1050 kW,η_{II}= 82.5 %
(D) i=1.050 kW,η_{II}= 8.25 %

Answer: C

241. A heat engine receives 1 kW heat transfer at 1000 K and gives out 600 W as work with the rest as heat transfer to the ambient. What are the fluxes of exergy in and out?

(A) Ex_{in} = 0.702 kW, Ex_{out} = 0

(B) Ex_{in} = 1 kW, Ex_{out} = 0
(C) Ex_{in} = 0.702 kW, Ex_{out} = 0.4 kW
(D) Ex_{in} = 1 kW, Ex_{out} = 0.4 kW

Answer: A

242. A heat engine receives 1 kW heat transfer at 1000 K and gives out 600 W as work with the rest as heat transfer to the ambient. Find its first and second law efficiencies.

(A) η_I= 60 %, η_{II}= 85.5 %

(B) η_I= 85.5 %, η_{II}= 60 %
(C) η_I= 8.5 %, η_{II}= 60 %
(D) η_I= 6.0 %, η_{II}= 8.55 %

Answer: A

243. A heat pump has a coefficient of performance of 2 using a power input of 2 kW. Its low temperature is To and the high temperature is 80°C, with an ambient at T_o. Find the fluxes of exergy associated with the energy fluxes in and out.

(A) Ex_{in} = 2 kW, Ex_{out} = 0.623 kW

(B) Ex_{in} = 0 kW, Ex_{out} = 0.623 kW
(C) Ex_{in} = 2 kW, Ex_{out} = 4 kW
(D) Ex_{in} = 0 kW, Ex_{out} = 4 kW

Answer:A

244. A heat pump has a coefficient of performance of 2 using a power input of 2 kW. Its low temperature is To and the high temperature is 80°C, with an ambient at T_o. Find the exergy efficiency.

(A) η_{II}= 0.50

(B) η_{II}= 3.10
(C) η_{II}= 0.31
(D) η_{II}= 2.00

Answer: C

245. Find the availability of 100 kW delivered at 500 K when the ambient is 300 K.

(A) Φ= 40kW

(B) Φ= 0
(C) Φ= 100kW
(D) Φ= 10kW

Answer: A

246. A control mass gives out 10 kJ of energy in the form of Electrical work from a battery and Heat transfer at 500°C at STP condition

(A) ΔΦa =-1.0kJ, ΔΦb= -61.4kJ

(B) ΔΦa=-1.0kJ, ΔΦb -614kJ
(C) ΔΦa=-1.0kJ, ΔΦb -6.14kJ
(D) ΔΦa=-10kJ, ΔΦb -6.14kJ

Answer: D

247. A 2-kg piece of iron is heated from room temperature 25°C to 400°C by a heat source at 600°C. What is the irreversibility in the process?

(A) 96.4 J

(B) 0.32 kJ
(C) 9.64 kJ
(D) 96.4 kJ

Answer: D

248. A rock bed consists of 6000 kg granite and is at 70°C. A small house with lumped mass of 12000 kg wood and 1000 kg iron is at 15°C. They are now brought to a uniform final temperature by circulating water between the rock bed and the house. Find the final temperature

(A) 302.2 K

(B) 302.2 ^{o}C
(C) 30.2 ^{o}C
(D) 30.2 K

Answer: A

249. Nitrogen flows in a pipe with velocity 300 m/s at 500 kPa, 300°C. What is its availability with respect to an ambient at 100 kPa, 20°C?

(A) 27.2 kJ/kg

(B) 272 J/kg
(C) 2.72 kJ/kg
(D) 272 kJ/kg

Answer: D

250. The mass of flue gas per kg of fuel is the ratio of the

(A) mass of oxygen in 1 kg of flue gas to the mass of oxygen in 1 kg of fuel
(B) mass of oxygen in 1 kg of fuel to the mass of oxygen in 1 kg of flue gas
(C) mass of carbon in 1 kg of flue gas to the mass of carbon in 1 kg of fuel
(D) mass of carbon in 1 kg of fuel to the mass of carbon in 1 kg of flue gas

Answer: C

251. The calorific value of gaseous fuel is expressed in

(A) kJ
(B) kJ/kg
(C) kJ/m^2
(D) kJ/m^3
Answer: D

252. The natural unprocessed solid fuel is

(A) anthracite coal
(B) coke
(C) wood
(D) pulverised coal

Answer: C

253. In Rankine cycle, regeneration results in higher efficiency because

(A) pressure inside the boiler increases
(B) heat is added before steam enters the low pressure turbine
(C) average temperature of heat addition in the boiler increases
(D) total work delivered by the turbine increases

Answer: C

254. When a system is taken from state '*x*' to state '*y*', 30 kJ of heat flows into the system and the system does 10 kJ of work. When the system is returned from '*y*' to '*x*' along another path, work done on the system is 8 kJ. What is the amount of heat liberated or absorbed?

(A) 12 kJ of the heat liberated
(B) 28 kJ of heat liberated
(C) 12 kJ of the heat absorbed
(D) 28 kJ of heat absorbed

Answer: B

255. A closed gaseous system undergoes a reversible constant pressure process at 2 bar in which 100 kJ of heat is rejected and the volume change from 0.2 m^3 to 0.1 m^3. The change in the internal energy of the system is

(A) -100 kJ
(B) -80 kJ
(C) -60 kJ
(D) -40 kJ

Answer: B

256. A Carnot engine receives 100 kJ of heat and rejects 50 kJ of heat at 600 K and 300 K respectively. The displacement volume is 0.2 m^3. The mean effective pressure is

(A) 2 bar
(B) 2.5 bar
(C) 3 bar
(D) 3.5 bar
Answer: B

257. Which of the following statements is correct regarding availability?

(A) It is generally conserved
(B) It is the maximum theoretical work obtainable
(C) It can be destroyed in irreversibility
(D) either (B) and (C)
Answer: D

258. During a thermodynamic process, 100 kJ of heat is transferred from a reservoir at 800 K to a sink at 400 K. The ambient temperature is 300 K. The loss of available energy is

(A) 27.5 kJ
(B) 32.5 kJ

(C) 37.5 kJ
(D) 62.5 kJ

Answer: C

259. A refrigerator that operates on a Carnot cycle is required to transfer 2000 kJ/min to the atmosphere at 27º C, where the low temperature reservoir is a 0º C. What is the power required?

(A) 200 W
(B) 32.93 kW
(C) 200 kW
(D) 3.33 kW

Answer: D

260. The vapour pressure of a liquid at any arbitrary temperature can be estimated approximately with the help of

(A) Gibbs equation
(B) Joule-Kelvin equation
(C) Clausius-Clapeyron equation
(D) Gibbs-Duhem equation

Answer:C

261. Liquid water at 15ºC flows out of a nozzle straight up 15 m. What is nozzle Vexit?

(A) 1.715 m/s
(B) 0.175 km/s
(C) 17.15 m/s
(D) 1.75km/s

Answer: C

262. R-134a at 30ºC, 800 kPa is throttled so it becomes cold at –10ºC. What is exit P?

(A) 210.7 kPa
(B) 21.7 kPa
(C) 0.2107 kPa
(D) 210.7 Pa

Answer: A

263. Air at 500 K, 500 kPa is expanded to 100 kPa in two steady flow cases. Case one is a throttle and case two is a turbine. Which has the highest exit T?

(A) Throttle
(B) Turbine
(C) Throttle and Turbine
(D) Temperature of Throttle and Turbine decreases

Answer: A

264. In a boiler you vaporize some liquid water at 100 kPa flowing at 1 m/s. What is the velocity of the saturated vapor at 100 kPa if the pipe size is the same?

(A) 1624 m/s
(B) 16.24 km/s
(C) 162.4 m/s
(D) 1.624 m/s

Answer: A

265. In a co-flowing (same direction) heat exchanger 1 kg/s air at 500 K flows into one channel and 2 kg/s air flows into the neighboring channel at 300 K. If it is infinitely long what is the exit temperature? Sketch the variation of T in the two flows.

(A) 367 K
(B) 36.7^{o}C
(C) 367^{o}C
(D) 3670K

Answer: A

266. Air at 600 K flows with 3 kg/s into a heat exchanger and out at 100^{o}C. How much (kg/s) water coming in at 100 kPa, 20oC can the air heat to the boiling point?

(A) 0.27kg/s

(B) 2.7kg/s
(C) 27kg/s
(D) 0.27g/s

Answer: A

267. Air at 20 m/s, 260 K, 75 kPa with 5 kg/s flows into a jet engine and it flows out at 500 m/s, 800 K, 75 kPa. What is the change (power) in flow of kinetic energy?

(A) 624kJ

(B) 624W
(C) 624hP
(D) 624kW

Answer: D

268. An initially empty cylinder is filled with air from 20^{o}C, 100 kPa until it is full. Assuming no heat transfer is the final temperature larger, equal to or smaller than 20^{o}C?

(A) T_1 is higher

(B) $T_1 > T_2$
(C) $T_2 = T_1$
(D) $T_2 > T_1$

Answer: D

269. A cylinder has 0.1 kg air at 25ºC, 200 kPa with a 5 kg piston on top. A valve at the bottom is opened to let the air out and the piston drops 0.25 m towards the bottom. What is the work involved in this process?

(A) -0.0245W

(B) -0.0245J
(C) -0.0245kW
(D) -0.0245kJ

Answer: D

270. Air at 35°C, 105 kPa, flows in a 100 mm × 150 mm rectangular duct in a heating system. The volumetric flow rate is 0.015 m^3/s. What is the velocity of the air flowing in the duct.

(A) 1.0m^2/s

(B) 1.0m/s^2
(C) 1.0m/s
(D) 1.0km/s

Answer: C

271. Air at 35°C, 105 kPa, flows in a 100 mm × 150 mm rectangular duct in a heating system. The volumetric flow rate is 0.015 m^3/s. what is the mass flow rate?

(A) 178kg/s

(B) 0.0178mg/s
(C) 0.0178kg/s
(D) 0.0178g/s

Answer: C

272. Nitrogen gas flowing in a 50-mm diameter pipe at 15°C, 200 kPa, at the rate of 0.05 kg/s, encounters a partially closed valve. If there is a pressure drop of 30 kPa across the valve and essentially no temperature change, what are the velocities upstream and downstream of the valve?

(A) 10.9 m/s and 12.8 m/s

(B) 10.9 km/s and 12.8 m/s
(C) 10.9 m/s and 12.8 km/s
(D) 10.9 m/s^2 and 12.8 m/s^2

Answer: A

273. Saturated vapor R-134a leaves the evaporator in a heat pump system at 10°C, with a steady mass flow rate of 0.1 kg/s. What is the smallest diameter tubing that can be used at this location if the velocity of the refrigerant is not to exceed 7 m/s?

(A) 30mm

(B) 3.0mm
(C) 30cm
(D) 30m

Answer: A

274. A hot air home heating system takes 0.25 m^3/s air at 100 kPa, 17°C into a furnace and heats it to 52°C and delivers the flow to a square duct 0.2 m by 0.2 m at 110 kPa. What is the velocity in the duct?

(A) 6.36m/s

(B) $6.36m/s^2$
(C) 6.36mm/s
(D) 6.36cm/s

Answer: A

275. Nitrogen gas flows into a convergent nozzle at 200 kPa, 400 K and very low velocity. It flows out of the nozzle at 100 kPa, 330 K. If the nozzle is insulated find the exit velocity.

(A) 381.9cm/s

(B) 381.9m/s
(C) 381.9mm/s
(D) $381.9m/s^2$

Answer: B

276. In order to determine the quality of wet steam by a separating and throttling calorimeter, the steam should be first separated and then throttled such that the final state is

(A) Saturated vapour only
(B) Superheated vapour only
(C) At a pressure higher than the original pressure
(D) A mixture of saturated liquid and vapour

Answer: B

277. The value of Joule-Kelvin coefficient for an ideal gas is

(A) 1
(B) -1
(C) 0
(D) may have any value

Answer: C

278. On a pressure volume diagram, the process line $PV^n = C$ (as the value of n increases) will

(A) come closer to y-axis
(B) come closer to x-axis

(C) remain in same position
(D) come closer to 45º inclined line

Answer: A

279. Steam flow through a nozzle is considered as

(A) constant flow
(B) isothermal flow
(C) adiabatic flow
(D) constant volume flow

Answer: C

280. The work given out during expansion process in a closed system will increase when the value of *n* (the index of compression)

(A) increases
(B) decreases
(C) remains same
(D) first increases and then decreases

Answer: B

281. An engine is supplied with 1130 kcal/ml of heat, the heat source and sink being maintained at 565 K and 315 K respectively. If heat rejected is 630 kcal/ml, then applying Clausius inequality, determine, whether the process is

(A) reversible
(B) irreversible
(C) impossible
(D) imaginary

Answer: A

282. Carnot cycle efficiency is maximum when

(A) initial temperature is 0 K
(B) final temperature is 0 K
(C) final temperature is 0ºC
(D) difference between initial and final temperature is 0 K

Answer: B

283. All of the following statements are correct, except

(A) entropy is a measure of the level of irreversibility associated with process
(B) during a reversible process, the total entropy of the interacting bodies remain constant
(C) entropy of the universe is continuously decreasing
(D) entropy is a property and as such it is a point function

Answer: C

284. Triple point of a pure substance on P-V diagram is represented by a

(A) point
(B) line
(C) curve
(D) triangle

Answer: B

285. Which of the following is the unit of entropy

(A) J/kg-K
(B) J/K
(C) Nm/kg-sec
(D) J/kg

Answer: A

286. Bomb calorimeter is used to measure the calorific value of

(A) solid fuels
(B) liquid fuels
(C) solid or liquid fuel
(D) gaseous fuels

Answer: C

287. A process occurs spontaneously if its entropy

(A) increases
(B) decreases
(C) remain same
(D) becomes zero

Answer: A

288. Change in internal energy in a closed system is equal to heat transferred if the reversible process take place at constant

(A) pressure
(B) volume
(C) temperature
(D) entropy

Answer: B

289. Choose the incorrect statement

(A) calculation can be made for the entropy change and not for the absolute value of entropy
(B) the freezing of water is accompanied by an increase in entropy
(C) the entropy increase is proportional to energy degradation.
(D) entropy is a point function

Answer: B

290. Which of the followings is a correct statement?

(A) a reversible adiabatic process is an isentropic process
(B) an irreversible adiabatic process is a constant entropy process
(C) entropy decreases during an irreversible adiabatic process
(D) an isentropic process is an adiabatic process

Answer: A

291. For fixed quantity of heat added to a system under specific conditions, the entropy change will be maximum in case of

(A) isentropic process
(B) isobaric process
(C) isothermal process
(D) isochoric process

Answer: C

292. Air is being forced by the bicycle pump into a tyre against a pressure of 4.5 bar. A slow downward movement of the piston can be approximated as

(A) isobaric process
(B) adiabatic process
(C) throttling process
(D) isothermal process

Answer: C

293. Triple point of water is

(A) 54.35 K
(B) 113.84 K
(C) 216.55 K
(D) 273.16 K

Answer: D

294. The heat absorbed by water at its saturation temperature to get converted in to dry steam at the same temperature is called

(A) sensible heat
(B) specific heat
(C) total heat
(D) latent heat

Answer: D

295. Mollier diagram is a plot of

(A) temperature and entropy
(B) enthalpy and entropy

(C) pressure and enthaply
(D) pressure and volume

Answer: B

296. Name the parameter that decreases with an increase in steam pressure

(A) sensible heat
(B) latent heat of vaporisation
(C) specific entropy
(D) boiling point

Answer: B

297. At critical point, the enthalpy of vaporisation is

(A) zero
(B) maximum
(C) minimum
(D) dependent on temperature only

Answer: A

298. The efficiency of a Carnot cycle engine depends on

(A) speed of the engine
(B) working fluid; whether gas or vapour
(C) temperature at which heat is supplied and at which it is rejected
(D) temperature of ambient air

Answer: C

299. The Carnot cycle is impracticable because it

(A) requires a prefect gas as the working fluid
(B) necessitates all processes comprising the cycle to be reversible
(C) demands high speeds for its working
(D) involves greater pressures and volumes

Answer: D

300. Identify the process which can approach reversibility

(A) throttling
(B) combustion of fuel
(C) dissolvation of solids in a solvent
(D) controlled expansion or compression of gases

Answer: D

301. A thermodynamic system is considered to be an open one if

(A) mass transfer and energy exchange are zero
(B) entropy change and energy transfer are zero
(C) transfer of energy and mass is non-zero
(D) mass transfer and volume change are zero

Answer: C

302. A thermodynamic system is considered to be an isolated one if

(A) mass transfer and entropy change are zero
(B) entropy change and energy transfer are zero
(C) transfer of energy and mass is zero
(D) mass transfer and volume change are zero

Answer: C

303. A thermodynamic system is considered to be a closed one if

(A) mass transfer and entropy change are zero
(B) entropy change and energy transfer are zero
(C) energy transfer is zero
(D) mass transfer is zero

Answer: C

304. Which of the following items is not a path function?

(A) pressure
(B) temperature
(C) thermal conductivity
(D) density

Answer: C

305. Which of the following represents open thermodynamic system?

(A) manual ice cream freezer
(B) centrifugal pump
(C) pressure cooker
(D) bomb calorimeter

Answer: B

306. The basis for measuring thermodynamic property of temperature is given by

(A) zeroth law of thermodynamics
(B) first law of thermodynamics
(C) second law of thermodynamics
(D) third law of thermodynamics

Answer:A

307. Work done is zero for the following process

(A) constant volume
(B) free expansion
(C) throttling
(D) constant pressure

Answer: A

308. Heat and work are

(A) intensive properties
(B) extensive properties
(C) point function
(D) path function

Answer: (D)

309. Path functions are

(A) intensive properties
(B) extensive properties
(C) exact differential function
(D) inexact differential function

Answer: D

310. Heat and work are

(A) intensive properties
(B) extensive properties
(C) point function
(D) path function

Answer: D

311. If the work done on a closed system is 20 kJ/kg, and 40 kJ/kg heat is rejected from the system, its internal energy decreases by

(A) 20 kJ/kg
(B) 60 kJ/kg
(C) □20 kJ/kg
(D) □60 kJ/kg

Answer: C

312. If the equation $PV^n = C$, the value of $n = \infty$, then the process is called

(A) isochoric process
(B) isobaric process
(C) adiabatic process
(D) isothermal process

Answer: A

313. If the equation $PV^n = C$, the value of $n = 0$, then the process is called

(A) isochoric process
(B) isobaric process
(C) adiabatic process
(D) isothermal process

Answer: B

314. If the equation $PV^n = C$, the value of $n = 1$, then the process is called

(A) isochoric process
(B) isobaric process
(C) adiabatic process
(D) isothermal process

Answer: (D)

315. If the equation $PV^n = C$, the value of $n = \gamma$, then the process is called

(A) isochoric process
(B) isobaric process
(C) adiabatic process
(D) isothermal process

Answer: (C)

316. The internal energy of an ideal gas is a function of

(A) temperature and pressure
(B) volume and pressure
(C) entropy and pressure
(D) temperature only

Answer: (D)

317. When a system is taken from state '*x*' to state '*y*', 30 kJ of heat flows into the system and the system does 10 kJ of work. When the system is returned from '*y*' to '*x*' along another path, work done on the system is 8 kJ. What is the amount of heat liberated or absorbed?

(A) 12 kJ of the heat liberated
(B) 28 kJ of heat liberated
(C) 12 kJ of the heat absorbed
(D) 28 kJ of heat absorbed

Answer: (B)

318. A closed gaseous system undergoes a reversible constant pressure process at 2 bar in which 100 kJ of heat is rejected and the volume change from 0.2 m^3 to 0.1 m^3. The change in the internal energy of the system is

(A) -100 kJ
(B) -80 kJ
(C) -60 kJ
(D) -40 kJ

Answer: (B)

319. Steam flow through a nozzle is considered as

(A) constant flow
(B) isothermal flow
(C) adiabatic flow
(D) constant volume flow

Answer: (C)

320. The work given out during expansion process in a closed system will increase when the value of *n* (the index of compression)

(A) increases
(B) decreases
(C) remains same
(D) first increases and then decreases

Answer: (B)

321. Three engine A, B and C operating on Carnot cycle use working substance as Argon, Oxygen and Air respectively. Which engine will have higher efficiency?

(A) engine A
(B) engine B
(C) engine C
(D) all engines have same efficiency

Answer: (D)

322. The heat removal rate from a refrigerated space and the power input to the compressor are 7.2 kW and 1.8 kW, respectively. The coefficient of performance (COP) of the refrigerator is

(A) 0.4
(B) 4
(C) 2
(D) 0.2

Answer: (B)

323. Second law of thermodynamics defines

(A) heat
(B) work
(C) internal energy
(D) entropy

Answer: (D)

324. A Carnot engine receives 100 kJ of heat and rejects 50 kJ of heat at 600 K and 300 K respectively. The displacement volume is 0.2 m^3. The mean effective pressure is

(A) 2 bar
(B) 2.5 bar
(C) 3 bar
(D) 3.5 bar
Answer: (B)

325. A refrigerator that operates on a Carnot cycle is required to transfer 2000 kJ/min to the atmosphere at 27º C, where the low temperature reservoir is a 0º C. What is the power required?

(A) 200 W
(B) 32.93 kW
(C) 200 kW
(D) 3.33 kW

Answer: (D)

326. An engine is supplied with 1130 kcal/ml of heat, the heat source and sink being maintained at 565º K and 315º K respectively. If heat rejected is 630 kcal/mt, then applying Clausius inequality, determine, whether the process is

(A) reversible
(B) irreversible
(C) impossible
(D) imaginary

Answer: (A)

327. Carnot cycle efficiency is maximum when

(A) initial temperature is 0º K
(B) final temperature is 0º K
(C) final temperature is 0º C
(D) difference between initial and final temperature is 0º K

Answer: (B)

328. Work done during a process can be determined by $\int pdV$ when the process is

(A) isentropic
(B) adiabatic
(C) isothermal
(D) quasi-static

Answer: (D)

329. For a given temperature T_1, as the difference between T_1 and T_2 increase, the COP of a Carnot heat pump

(A) increases
(B) decreases
(C) does not change
(D) first decrease, then increases

Answer: (B)

330. For steady flow through an insulated horizontal constant diameter pipe, this property remains constant

(A) enthalpy
(B) internal energy
(C) entropy
(D) volume

Answer: (A)

331. Isentropic flow is

(A) irreversible adiabatic flow
(B) ideal fluid flow
(C) frictionless reversible flow
(D) reversible adiabatic flow

Answer: (D)

332. If the temperature of the source is increased, the efficiency of the Carnot engine

(A) decreases
(B) increases
(C) does not change
(D) depends on other factors

Answer: (B)

333. Kelvin-Planck's law deals with

(A) conservation of energy
(B) conservation of heat
(C) conservation of mass
(D) conversion of heat into work

Answer: (D)

334. The property of a working substance which increases or decreases as the heat is supplied or removed in a reversible manner is known as

(A) enthalpy
(B) internal energy
(C) entropy
(D) external energy

Answer: (C)

335. The change of entropy, when heat is absorbed by the gas is

(A) positive
(B) negative
(C) positive or negative
(D) none of above
Answer: (A)

336. In an irreversible process there is a

(A) loss of heat
(B) no loss of work
(C) gain of heat
(D) no gain of heat

Answer: (A)

337. The main cause for the irreversibility is

(A) mechanical and fluid friction
(B) unrestricted expansion
(C) heat transfer with a finite temperature difference
(D) all of the above

Answer: (D)

338. Which of the following is the correct statement ?

(A) All the reversible engines have the same efficiency
(B) All the reversible and irreversible engines have the same efficiency
(C) Irreversible engines have maximum efficiency
(D) All engines are designed as reversible in order to obtain maximum efficiency

Answer: (A)

339. For steady flow through an insulated throttle valve, this property remains constant

(A) enthalpy
(B) internal energy
(C) entropy
(D) volume

Answer: (A)

340. According to Kelvin-Planck's statement of second law of thermodynamics

(A) It is impossible to construct an engine working on a cyclic process, whose sole purpose is to convert heat energy into work
(B) internal energy
(C) entropy
(D) volume

Answer: (A)

341. The property of a working substance which increases or decreases as the heat is supplied or removed in a reversible manner, is known as

(A) enthalpy
(B) internal energy
(C) entropy
(D) external energy

Answer: (C)

342. When a system executes an irreversible cycle

(A) $\oint \frac{\partial Q}{T} < 0$

(B) $\oint dS > 0$

(C) $\oint dS = 0$

(D) $\oint \frac{\partial Q}{T} > 0$

Answer: (A)

343. The maximum theoretical work obtainable when a system interacts to equilibrium with a reference environment, is called

(A) entropy
(B) enthalpy
(C) exergy
(D) rothalpy

Answer: (C)

344. The increase in entropy of a system represents

(A) increase in availability of energy
(B) increase in temperature
(C) decrease in pressure
(D) degradation of energy

Answer: (D)

345. During a thermodynamic process, 100 kJ of heat is transferred from a reservoir at 800 K to a sink at 400 K. The ambient temperature is 300 K. The loss of available energy is

(A) 27.5 kJ
(B) 32.5 kJ

(C) 37.5 kJ
(D) 62.5 kJ

Answer: (C)

346. All of the following statements are correct, except

(A) entropy is a measure of the level of irreversibility associated with process
(B) during a reversible process, the total entropy of the interacting bodies remain constant
(C) entropy of the universe is continuously decreasing
(D) entropy is a property and as such it is a point function

Answer: (C)

347. A process occurs spontaneously if its entropy

(A) increases
(B) decreases
(C) remain same
(D) becomes zero

Answer: (A)

348. For fixed quantity of heat added to a system under specific conditions, the entropy change will be maximum in case of

(A) isentropic process
(B) isobaric process
(C) isothermal process
(D) isochoric process

Answer: (C)

349. The efficiency of a Carnot cycle engine depends on

(A) speed of the engine
(B) working fluid; whether gas or vapour
(C) temperature at which heat is supplied and at which it is rejected
(D) temperature of ambient air

Answer: (C)

350. If a closed system is undergoing an irreversible process, the entropy of the system

(A) must increase
(B) always remains constant
(C) must decrease
(D) can increase, decrease or remain constant

Answer: (D)

351. When wet steam flows through a throttle valve and remain wet at exit

(A) its temperature and quality increase
(B) its temperature decreases but quality increases
(C) its temperature increases but quality decreases
(D) its temperature and quality decrease

Answer: (B)

352. Constant pressure lines in the superheated region of the Mollier diagram will have
(A) a positive slope
(B) a negative slope
(C) zero slope
(D) both positive and negative slope

Answer: (A)

353. Triple point of a pure substance on P-V diagram is represented by a

(A) point
(B) line
(C) curve
(D) triangle

Answer: (B)

354. Triple point of water is

(A) 54.35 K
(B) 113.84 K
(C) 216.55 K
(D) 273.16 K

Answer: (D)

355. Mollier diagram is a plot of

(A) temperature and entropy
(B) enthalpy and entropy
(C) pressure and enthaply
(D) pressure and volume

Answer: (B)

356. At critical point, the enthalpy of vaporisation is

(A) zero
(B) maximum
(C) minimum
(D) dependent on temperature only

Answer: (A)

357. With the increase in pressure

(A) boiling point of water increases and enthalpy of evaporation increases
(B) boiling point of water increases and enthalpy of evaporation decreases
(C) boiling point of water decreases and enthalpy of evaporation increases
(D) none of above

Answer: (B)

358. The specific volume of water when heated at 0°C

(A) first increases and then decreases
(B) first decreases and then increases
(C) increases steadily
(D) decreases steadily

Answer: (B)

359. The latent heat of vapourisation at critical point is

(A) less than zero
(B) greater than zero
(C) equal to zero
(D) none of above

Answer: (C)

360. Dryness fraction of steam is defined as

(A) mass of water vapour in suspension/(mass of water vapour in suspension + mass of dry steam)
(B) mass of dry steam/mass of water vapour in suspension
(C) mass of dry steam/(mass of dry steam + mass of water vapour in suspension)
(D) mass of water vapour in suspension/mass of dry steam.
Answer: (C)

361. In a Rankine cycle heat is added

(A) reversibly at constant volume
(B) reversibly at constant temperature
(C) reversibly at constant pressure and temperature
(D) reversibly at constant pressure

Answer: (D)

362. For a given set of operating pressure limits of a Rankine cycle the highest efficiency occur for

(A) saturated cycle
(B) superheated cycle
(C) reheat cycle

(D) regenerative cycle

Answer: (D)

363. In Rankine cycle, regeneration results in higher efficiency because

(A) pressure inside the boiler increases
(B) heat is added before steam enters the low pressure turbine
(C) average temperature of heat addition in the boiler increases
(D) total work delivered by the turbine increases

Answer: (C)

364. The work done in a steady flow process is equal to $-\int vdp$. In the Rankine cycle, the turbine work is much greater than the pump work because

(A) The specific volume of water is much higher than that of steam
(B) The specific volume of steam is much higher than that of water
(C) The pressure drop in the turbine is much higher than that in the pump
(D) There is less irreversibility in the turbine than in the pump

Answer: (B)

365. Which of the following statements regarding a Rankine cycle with reheating is TRUE?

(A) increase in average temperature of heat addition
(B) reduction in thermal efficiency
(C) drier steam at the turbine exit
(D) both (A) and (C)

Answer: (D)

366. A Carnot heat pump works between 27°C and 327°C. What will be its COP?

(A) 0.09
(B) 1.00
(C) 1.09
(D) 2.0

Answer: (D)

367. Rankine cycle efficiency of a good steam power plant may be in the range of

(A) 15 to 20%
(B) 35 to 45%
(C) 70 to 80%
(D) 90 to 95%

Answer: (B)

368. Rankine efficiency of a steam power plant

(A) improves in summer as compared to that in winter

(B) improves in winter as compared to that in summer
(C) is unaffected by climatic conditions
(D) none of the above

Answer: (B)

369. In Rankine cycle the work output from the turbine is given by

(A) change of internal energy between inlet and outlet
(B) change of enthalpy between inlet and outlet
(C) change of entropy between inlet and outlet
(D) change of temperature between inlet and outlet

Answer: (B)

370. In a regenerative feed heating cycle, the greatest economy is affected

(A) when steam is extracted from only one suitable point of steam turbine
(B) when steam is extracted from several places in different stages of steam turbine
(C) when steam is extracted only from the last stage of steam turbine
(D) when steam is extracted only from the first stage of steam turbine

Answer: (B)

371. Which gas shows a heating effect in the Joule-Thomson experiment, while undergoing throttling process through a porous plug of cotton wool?

(A) carbon dioxide
(B) hydrogen
(C) oxygen
(D) nirtrogen

Answer: (B)

372. The value of Joule-Kelvin coefficient for an ideal gas is

(A) 1
(B) -1
(C) 0
(D) may have any value

Answer: (C)

373. The slope of constant pressure line on temperature entropy diagram is given by

(A) $\frac{C_p}{T}$

(B) $\frac{T}{C_p}$

(C) $\frac{T}{S}$

(D) $\frac{S}{T}$

Answer: (B)

374. Pick up the correct relationship from the following

(A) $Tds = dH - Vdp$
(B) $Tds = dH + Vdp$
(C) $Tds = dH - Pdv$
(D) $Tds = dU + Vdp$

Answer: (A)

375. Following relationship defines Gibb's free energy *G*

(A) $G = H + TS$
(B) $G = H - TS$
(C) $G = U + TS$
(D) $G = U + PV$

Answer: (B)

376. Following relationship defines Heltzm

(A) $G = H + TS$
(B) $G = H - TS$
(C) $G = U + TS$
(D) $G = U + PV$

Answer: (B)

377. Maxwell's Equation is comprised of how many equations

(A) 1
(B) 2
(C) 3
(D) 4

Answer: (D)

378. du = Tds – pX, where X is

(A) dP
(B) dV
(C) dS
(D) dH

Answer: (B)

379. dh = Tds + vX, where X is

(A) dP
(B) dV
(C) dS
(D) dH

Answer: (A)

380. $\left(\frac{\partial T}{\partial v}\right)_S = -\left(\frac{\partial p}{\partial S}\right)_X$ where X is

(A) V
(B) P
(C) T
(D) S

Answer: (A)

381. Absolute zero pressure will occur

(A) at sea level
(B) under vacuum condition
(C) when molecular momentum of the system becomes zero
(D) at temperature of -273 K

Answer: (C)

382. The vapour pressure of a liquid at any arbitrary temperature can be estimated approximately with the help of

(A) Gibbs equation
(B) Joule-Kelvin equation
(C) Clausius-Clapeyron equation
(D) Gibbs-Duhem equation

Answer: (C)

383. The Vander Waals equation of state is $\left(p + \frac{a}{v^2}\right)(v - b) = RT$, where p is pressure, v is specific volume, T is temperature and R is characteristics gas constant. The SI unit of 'a' is

(A) J/kg-K
(B) m^3/kg
(C) $m^5/kg\text{-}s^2$
(D) Pa/kg

Answer: (C)

384. In a real gas equation $pv = zRT$, depending on the values of pressure and temperature of the real gas, the value of z

(A) should always be less than 1
(B) may be less than 1, may be greater than 1 or equal to 1

(C) should always be greater than 1
(D) should always be equal to 1

Answer: (A)

385. Joule-Thomson coefficient is the slope of

(A) constant enthalpy lines on *T*-*s* diagram
(B) constant enthalpy lines on *T*-*p* diagram
(C) inversion curve on *T*-*s* diagram
(D) inversion curve on *T*-*p* diagram

Answer: (D)

386. The equation of state of an ideal gas is a relationship between the variables

(A) pressure and volume

(B) pressure and temperature
(C) pressure, volume and temperature
(D) none of the above

Answer: (C)

387. Joule's law states that the specific internal energy of a gas depends only on

(A) the pressure of the gas
(B) the volume of the gas
(C) the temperature of the gas
(D) none of above

Answer: (D)

388. Charle's law states that if any gas is heated at constant pressure, its volume

(A) changes directly as it absolute temperature
(B) changes inversely as its absolute temperature
(C) changes as square of the absolute temperature
(D) does not change with absolute temperature

Answer: (A)

389. Boyle's law states that, when temperature is constant, the volume of a given mass of a perfect gas

(A) varies directly as the absolute pressure
(B) varies inversely as the absolute pressure
(C) varies as square of the absolute pressure
(D) does not vary with the absolute pressure

Answer: (B)

390. One kg of carbon produces..... kg of carbon dioxide.

(A) 3/7
(B) 7/3
(C) 11/3
(D) 3/11

Answer: (C)

391. The mass of flue gas per kg of fuel is the ratio of the

(A) mass of oxygen in 1 kg of flue gas to the mass of oxygen in 1 kg of fuel
(B) mass of oxygen in 1 kg of fuel to the mass of oxygen in 1 kg of flue gas
(C) mass of carbon in 1 kg of flue gas to the mass of carbon in 1 kg of fuel
(D) mass of carbon in 1 kg of fuel to the mass of carbon in 1 kg of flue gas

Answer: (C)

392. The calorific value of gaseous fuel is expressed in

(A) kJ
(B) kJ/kg
(C) kJ/m^2
(D) kJ/m^3

Answer: (D)

393. In order to determine the quality of wet steam by a separating and throttling calorimeter, the steam should be first separated and then throttled such that the final state is

(A) Saturated vapour only
(B) Superheated vapour only
(C) At a pressure higher than the original pressure
(D) A mixture of saturated liquid and vapour

Answer: (B)

394. Which of the following gases possesses maximum heat content at 100^o C

(A) O_2
(B) CO_2
(C) H_2
(D) C_2H_2

Answer: (D)

395. Bomb calorimeter is used to measure the calorific value of

(A) solid fuels
(B) liquid fuels
(C) solid or liquid fuel
(D) gaseous fuels

Answer: (C)

396. When a hydrocarbon fuel burns in insufficient air, the Orsat apparatus for flue gas analysis will show which of the following sets of gases?

(A) CO2, N2, O2 and H2 O
(B) CO, CO2 and N2
(C) CO, CO2, N2 and H2O
(D) CO, CO2, N2 and O2

Answer: (D)

397. Heat released in a reaction at constant pressure is called?

(A) entropy change
(B) enthalpy of reaction
(C) internal energy of reaction
(D) none of the above

Answer: (B)

398. When the fuel is burned and the water appears in the vapour phase, the heating value of fuel is called?

(A) enthalpy of formation
(B) lower heating value
(C) higher heating value
(D) none of the above

Answer: (B)

399. When the fuel is burned and water is released in the liquid phase, the heating value of fuel is called?

(A) higher heating value
(B) lower heating value
(C) enthalpy of formation
(D) none of the above

Answer: (A)

400. Which of the following variable controls the physical properties of a perfect gas?

(A) pressure
(B) temperature
(C) volume
(D) all of these

Answer: (D)

401.Work done in a constant volume process is
A. Negative
B. Zero

C. Positive
D. None of the above
ANSWER: B

402.The equation for calculating amount of heat transfer through a system boundary when, T is temperature, an intensive property X is an extensive property which is result of heat transfer is
A. $Q_{1\text{-}2} = {}_1\int^2 T\, dX$
B. $Q_{1\text{-}2} = {}_1\int^2 X\, dT$
C. $Q_{1\text{-}2} = {}_1\int^2 (1/T)\, dX$
D. None of the above
ANSWER: A

403.Heat transfer is
A. A point function
B. A path function
C. A transfer function
D. None of the above
ANSWER: B

404.The process in which no heat transfer takes place through boundaries is called as
A. Isothermal process
B. Adiabatic process
C. Isochoric process
D. None of the above
ANSWER: B

405.Heat flow is a quantity of heat transfer
A. Within definite time
B. Within definite cross-sectional area
C. Within definite volume of the system
D. None of the above
ANSWER: A

406.Heat is transferred across a boundary by virtue of a temperature difference. The heat is transferred, that means
A. Force transfer takes place
B. Energy transfer takes place
C. Temperature transfer takes place
D. All of the above
ANSWER: B

407.In free expansion of gas, the work transfer is
A. Negative
B. Zero
C. Positive
D. None of the above

ANSWER: B

408.Which among the following systems undergoes work transfer?
A. Current flowing through the resistor
B. A shaft rotated by a motor
C. Both a. and b
D. None of the above
ANSWER: C

409.Work involved in a thermodynamic process is
A. A path function
B. A point function
C. A transfer function
D. None of the above
ANSWER: A

410.The thermodynamic work done by the system on the surrounding is considered as ____.
A. Positive
B. Negative
C. Neutral
D. None of the above
ANSWER: A

411.A quasi-static process has main characteristics as it is
A. A stationary process
B. An infinitely slow process
C. A random process
D. A spontaneous process
ANSWER: B

412.A machine which can supply mechanical work continuously without consumption of any energy is called as
A. Perpetual Motion Machine of the First kind (PMM1)
B. Perpetual Motion Machine of the Second kind (PMM2)
C. Perpetual Motion Machine of the Third kind (PMM3)
D. None of the above
ANSWER: A

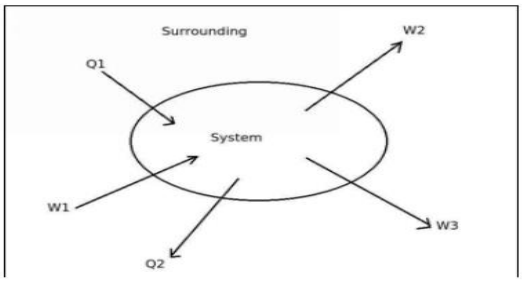
413.Total amount of energy in the universe is
A. Increasing
B. Decreasing
C. Constant
D. None of the above
ANSWER: C

414.Which of the following is/are mode/s of storage of internal energy in a system?

A. Macroscopic energy mode
B. Microscopic energy mode
C. Both a. and b
D. None of the above
ANSWER: C

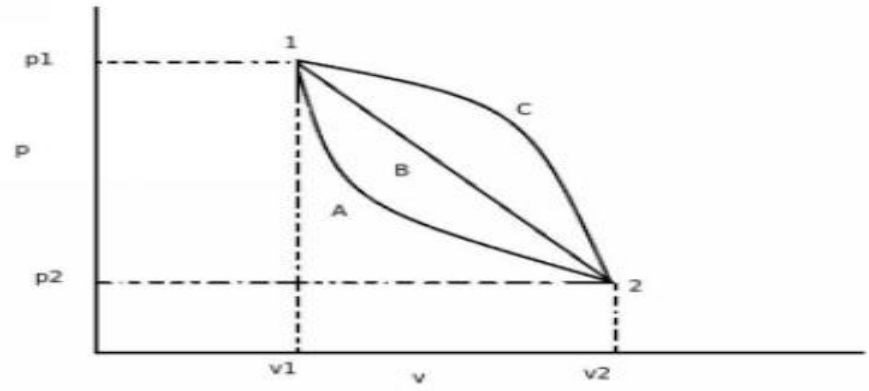
415.Which of the following is NOT a path function?
A. Internal energy
B. Heat energy
C. Work energy
D. None of the above
ANSWER: A

416.Consider the below diagram of heat transfer and work transfer for a system, What will be the first law equation for the below system?



A. (Q1 – Q2) = ΔE – (W2 + W3 – W1)
B. (Q1 + Q2) = ΔE + (W2 – W3 + W1)
C. (Q1 – Q2) = ΔE + (W2 + W3 – W1)
D. None of the above
ANSWER: C

417.A system changes its state from state 1 to state 2 through path A and returns from state 2 to state 1 through path B, Path C is also an alternate returning path from state 2 to state 1 as shown in figure, What will be the effect on change in internal energy of the system(ΔE), if the system undergoes these different paths A, B and C?



A. ΔE of path C will be greater than ΔE of path B and path A
B. ΔE of path A and path C are equal but ΔE of path B is different than rest
C. ΔE of all the paths are equal
D. None of the above
ANSWER: C

418. When the heat transfer into a system is more than the work transfer out of the system, then
A. The internal energy of the system remains constant
B. The internal energy of the system decreases
C. The internal energy of the system increases
D. None of the above
ANSWER: C

419.The first law of thermodynamics for steady flow
A. Accounts for all energy entering and leaving a control volume
B. Is an energy balance for a specified mass of fluid
C. Is an expression of the conservation of linear momentum
D. Is primarily concerned with heat transfer
E. Is restricted in its application to perfect gases
ANSWER: A

420. In reversible polytropic process
A. True heat transfer occurs
B. The entropy remains constant
C. The enthalpy remains constant
D. The internal energy remains constant
E. The temperature remains constant.
ANSWER: A

421. Efficiency of heat engine cycle is the ratio of
A. Total heat input to the cycle (Qin) to net work output of the cycle (Wnet)
B. Net work output of the cycle (Wnet) to total heat input to the cycle (Qin)
C. Net work output of the cycle (Wnet) to heat rejected from the system (Qout)
D. None of the above
ANSWER: A

422. PMM2 is the machine which violates _____
A. Kelvin-Planck statement
B. Clausius statement
C. Both Kelvin-Planck and Clausius statement
D. None of the above
ANSWER: C

423. A cyclic heat engine operates between a source temperature of 927ºC and a sink temperature of 27ºC, What will be the maximum efficiency of the heat engine?
A. 100 %

B. 80 %
C. 75 %
D. 70 %
ANSWER: C

424. When a process becomes irreversible due to heat interaction between system and surrounding at the boundary due to finite temperature gradient, then the irreversibility is_____
A. Internal irreversibility
B. External irreversibility
C. Mechanical irreversibility
D. Chemical irreversibility
ANSWER: B

425. The irreversibility in the system caused by friction is an example of
A. Internal irreversibility
B. External irreversibility
C. Frictional irreversibility
D. Chemical irreversibility
ANSWER: A

426. Assume that a reversible heat engine is operating between a source at T1 and a sink at T2, If T2 decreases, the efficiency of the heat engine _____
A. Decreases
B. Increases
C. Remains constant
D. None of the above
ANSWER: B

427. Any attainable value of absolute temperature is _____
A. Always less than zero
B. Always equals to zero
C. Always greater than zero
D. None of the above
ANSWER: C

428. The temperature at which a system undergoes a reversible isothermal process without transfer of heat is called as _____
A. Critical temperature
B. Kelvin temperature
C. Absolute zero temperature
D. Reversible temperature
ANSWER: C

429. To achieve a definite zero point on the Kelvin scale, we have to violate
A. First law of thermodynamics
B. Second law of thermodynamics

C. Both first law and second law of thermodynamics
D. No law has to be violated
ANSWER: B

430. The efficiency of the Carnot cycle is the function of
A. Temperatures (T1, T2) between which the Carnot cycle operates
B. Net work done (Wnet)
C. Heat supplied (Q1) and heat rejected (Q2)
D. All of the above
ANSWER: A

431.If a reversible heat engine A is operating between the temperature levels T1 and T2 and another reversible heat engine B of different capacity is also operating between the same temperature difference T1 and T2, then the efficiency of reversible heat engine B is
A. Greater than efficiency of the reversible heat engine A
B. Less than the efficiency of the reversible heat engine A
C. Equal to the efficiency of the reversible heat engine A
D. Cannot say
ANSWER: C

432. According to the Carnot's theorem, the efficiency of a reversible heat engine operating between a same given constant temperature source and a given constant temperature sink is
A. Higher than any other irreversible heat engine
B. Less than any other irreversible heat engine
C. Equal to any other irreversible heat engine
D. None of the above
ANSWER: A

433. Which of the following is a reversed heat engine?
A. Heat pump
B. Refrigerator
C. Heat pump and Refrigerator
D. None of the above
ANSWER: C

434. A process of application of brakes in a vehicle is
A. A reversible process
B. An irreversible process
C. A quasi-static process
D. None of the above
ANSWER: B

435. Free expansion of gas within a system is
A. A reversible process
B. An irreversible process
C. A quasi-static process

D. None of the above
ANSWER: B

436. If temperature difference between two bodies in which heat transfer takes place increases, the irreversibility of the process
A. Increases
B. Decreases
C. Does not change
D. Approaches towards reversibility
ANSWER: A

437. The irreversibility of a process occurs due to
A. Lack of equilibrium during the process
B. Involvement of dissipative effects
C. Lack of equilibrium and Involvement of dissipative effects
D. None of the above
ANSWER: C

438. All spontaneous processes are
A. Reversible
B. Irreversible
C. Quasi-static
D. None of the above
ANSWER: B

439. Which among the following is correct relation between COP of heat pump and COP of refrigerator?
A. [COP]H.P.= 1 + [COP]ref
B. [COP]H.P.= 1 – [COP]ref
C. [COP]H.P.= [COP]ref
D. None of the above
ANSWER: A

440. It is impossible to produce a heat engine, whose sole effect is to absorb energy in the form of heat from a heat source and produce an equal amount of work, This statement is
A. Kelvin-Planck statement
B. Clausius statement
C. Third law of thermodynamics
D. None of the above
ANSWER: A

441. The degree of disorder of a mixture of two gases
A. Is always less than the degrees of disorder of individual gases
B. Is always greater than the degrees of disorder of individual gases
C. Is always equals the degrees of disorder of individual gases
D. None of the above

ANSWER: B

442. What is the equation for entropy of a system if two parts 1 and 2 having entropies S1 and S2 are considered in equilibrium?
A. S = S1 – S2
B. S = S1 + S2
C. S = (S1 + S2) / 2
D. S = √S1 S2
ANSWER: B

443. At the most probable state of a system the entropy of the system is
A. Minimum
B. Maximum
C. Constant
D. None of the above
ANSWER: B

444. When a process followed by a system is irreversibilities, then what is the entropy generation of the system?
A. Less than zero
B. Equals to zero
C. Greater than zero
D. None of the above
ANSWER: C

445. The entropy generation
A. Does not depend upon path followed by a system
B. Depends upon path followed by a system
C. Takes place in reversible process
D. None of the above
ANSWER: B

446. The availability(A) of a given system is defined as the ____ work that is obtainable in a process in which system comes to equilibrium with its surroundings.
A. Useful work
B. Maximum useful work
C. Minimum useful work
D. None of the mentioned
ANSWER: B

447. Availability function for a steady flow system is given by
A. H+TS+(m*V*V/2)+(m*g*z)
B. H-TS+(m*V*V/2)+(m*g*z)
C. H-TS-(m*V*V/2)-(m*g*z)
D. H-TS-(m*V*V/2)+(m*g*z)
ANSWER: B

448. Availability function for a closed system is given by
A. U-pv-Ts
B. U+pv+Ts
C. U-pv+Ts
D. U+pv-Ts
ANSWER: D

449. Find the availability when 100 kW is delivered at 500 K when the ambient temperature is 300 K.
A. 20 kW
B. 30 kW
C. 40 kW
D. 50 kW
ANSWER: C

450. A control mass gives out 10 kJ of energy in the form of heat transfer at 500°C. Find the change in availability of the control mass
A. −4.14 kJ
B. −5.14 kJ
C. −6.14 kJ
D. −7.14 kJ
ANSWER: C

451. Which is a state of a substance from which a phase change occurs without a change of pressure or temperature?
A. Pure state
B. Phase state
C. Saturation state
D. Critical state
ANSWER: C

452. What is the state, at which saturated liquid line with respect to vaporisation and saturated vapour line on p-v diagram of pure substance, meet called?
A. Saturation state
B. Critical state
C. Vaporisation state
D. Superheated vapour state
ANSWER: B

453. The temperature of a substance at which the vapour pressure is equal to 760 mm Hg is called as
A. Normal vapour point
B. Normal boiling point
C. Normal pressure point
D. None of the above

ANSWER: B

454. What is the dryness fraction (x) for saturated water, when water just starts boiling?
A. X = 0
B. X = 1
C. X = 0.9
D. X = 0.5
ANSWER: A

455. What is the dryness fraction (x) on saturated vapour line?
A. X = 0
B. X = 1
C. X = 0.9
D. X = 0.5
ANSWER: B

456. The perfect example of an ideal gas is
A. Air
B. Hydrogen
C. Water vapour
D. None of the above
ANSWER: D

457. In high pressure condition, the real gases conform more closely with
A. Van der Waals equation
B. Ideal gas equation
C. Both a. and b.
D. None of the above
ANSWER: A

458. Dalton's law of partial pressure states that
A. The total pressure of a mixture of ideal gases is equal to the sum of the partial pressures of individual gases divided by number of gases mixed
B. The total pressure of a mixture of ideal gases is equal to the partial pressure of any individual gas in the mixture
C. The total pressure of a mixture of ideal gases is equal to the sum of the partial pressures of individual gases
D. None of the above
ANSWER: C

459. Joule-Kelvin effect can be carried out by
A. Throttling process of gas
B. Joule-Thomson expansion of gas
C. Both Throttling process and Joule-Thomson expansion of gas.
D. None of the above
ANSWER: C

460. The region at which the Joule-Kelvin coefficient is negative is called as
A. Cooling region
B. Heating region
C. Negative region
D. Positive region
ANSWER: B

461. What is the relation between efficiency of Rankine cycle ($\eta_{Rankine}$) and efficiency of actual vapour power cycle ($\eta_{Actual\ Cycle}$)?
A. (ηRankine) = (ηActual Cycle)
B. (ηRankine) > (ηActual Cycle)
C. (ηRankine) < (ηActual Cycle)
D. None of the above
ANSWER: B

462. How can we differentiate Rankine cycle from Carnot cycle?
A. Heat addition process of Rankine cycle is reversible isothermal whereas heat addition process of Carnot cycle is reversible isobaric
B. Heat addition process of Rankine cycle is reversible isobaric whereas heat addition process of Carnot cycle is reversible isothermal
C. Heat addition process of Rankine cycle is reversible isentropic whereas heat addition process of Carnot cycle is reversible isothermal
D. Both cycles are identical except the working fluid used
ANSWER: B

463. What is the purpose of reheat cycle?
A. To limit the pump work
B. To decrease heat input in the Rankine cycle
C. To limit the quality of steam to 0.85 at the turbine exhaust
D. None of the above
ANSWER: C

464. The reheat cycle allows steam power plant
A. To use higher pressure ratio
B. To maintain required quality of steam at the exit of the turbine
C. To increase the turbine work
D. All of the above
ANSWER: D

465. The mean temperature of heat addition (T_m) in the Rankine cycle can be increased by
A. Reheating the steam
B. Increasing superheat
C. Increasing pressure ratio between which the cycle works
D. All of the above
ANSWER: D

466. What is the reason behind the fact that the ideal regenerative cycle is practically not possible?
A. The reversible heat transfer takes infinite time
B. It is mechanically impossible to exchange heat in the turbine
C. The moisture content of the steam in the turbine will be high
D. All of the above
ANSWER: D

467. At ideal condition of vapour power cycle, reversible constant pressure heat rejection is carried out at
A. Boiler
B. Turbine
C. Condenser
D. Feed pump
ANSWER: C

468. Which processes do the Rankine cycle contain?
A. Two isothermal and two isochoric processes
B. Two isentropic and two isobaric processes
C. Two isentropic and two isothermal processes
D. Two isothermal and two isobaric processes
ANSWER: B

469. Sometimes the pump work in vapour power cycle is neglected because
A. The pump work in not considered in efficiency of vapour power cycle
B. The pump work is very small compared to the heat addition
C. The pump work is very small compared to the turbine work
D. None of the above
ANSWER: B

470. When the pressure at which heat is added in Rankine cycle increases, the moisture content at the turbine exhaust
A. Increases
B. Decreases
C. Remains same
D. Cannot say
ANSWER: A

471. If a relation exists among variables x,y,z then z may be expressed as a function of x and y as, dz=Mdx+Ndy
A. True
B. False
C. Cannot be expressed
D. Inexact equation
ANSWER: A

472. A pure substance which exists in a single phase has ____ independent variables
A. Zero
B. One
C. Two
D. Three
ANSWER: C

473. Which of the following relation is correct?
A. DU=TdS-pdV
B. DH=TdS+Vdp
C. DG=Vdp-SdT
D. All of the mentioned
ANSWER: D

474. Maxwell's equations consists of ____ equations
A. Four
B. Three
C. Two
D. One
ANSWER: A

475. Which of the following is not a Maxwell equation?
A. $(\partial T/\partial V) = -(\partial p/\partial S)$
B. $(\partial T/\partial p) = -(\partial V/\partial S)$
C. $(\partial p/\partial T) = (\partial S/\partial V)$
D. $(\partial V/\partial T) = -(\partial S/\partial p)$
ANSWER: B

476. The condition for exact differential is
A. $(\partial N/\partial y) = (\partial M/\partial x)$
B. $(\partial M/\partial y) = (\partial N/\partial x)$
C. $(\partial M/\partial y) = -(\partial N/\partial x)$
D. All of the mentioned
ANSWER: B

477. The first TdS equation is
A. $TdS=Cv*dT + T(\partial T/\partial p)dV$
B. $TdS=Cv*dT - T(\partial p/\partial T)dV$
C. $TdS=Cv*dT + T(\partial p/\partial T)dV$
D. $TdS=Cv*dT - T(\partial T/\partial p)dV$
ANSWER: C

478. The second TdS equation is
A. $TdS=Cp*dT + T(\partial V/\partial T)dp$
B. $TdS=Cp*dT - T(\partial V/\partial T)dp$

C. TdS=Cp*dT + T(∂T/∂V)dp
D. TdS=Cp*dT – T(∂T/∂V)dp
ANSWER: B

479. Which of the following is true?
A. (∂p/∂V)*(∂V/∂T)*(∂T/∂p)= infinity
B. (∂p/∂V)*(∂V/∂T)*(∂T/∂p)= 0
C. (∂p/∂V)*(∂V/∂T)*(∂T/∂p)= 1
D. (∂p/∂V)*(∂V/∂T)*(∂T/∂p)= -1
ANSWER: D

480. For getting TdS equations, we assume entropy to be a function of T and V and also of T and p
A. True
B. False
C. No assumption
D. Function of P and T only
ANSWER: A

481. For each mole of oxygen, number of moles of nitrogen required for complete combustion of carbon are
A. 20/21
B. 2/21
C. 77/21
D. 79/21.
ANSWER: D

482. Stoichiometric air-fuel ratio by mass for combustion of petrol is
A. 5
B. 10
C. 12
D. 15.05
ANSWER: D

483. An analysis which includes the steam in the exhaust is called
A. Dry analysis
B. Wet analysis
C. Dry and wet analysis
D. None of the above.
ANSWER: B

484. Enthalpy of formation is defined as enthalpy of compounds at
A. 25°C and 10 atmospheres
B. 25°C and 1 atmosphere
C. 0°C and 1 atmosphere
D. 100°C and 1 atmosphere.

ANSWER: B

485. Bomb calorimeter is used to find the calorific value of ..... fuels.
A. Solid
B. Gaseous
C. Solid and gaseous
D. None of the above.
ANSWER: A

486. When the fuel is burned and the water appears in the vapour phase, the heating value of fuel is called
A. Enthalpy of formation
B. Lower heating value
C. Higher heating value
D. None of the above.
ANSWER: B

487. Heat released in a reaction at constant pressure is called
A. Entropy change
B. Enthalpy of reaction
C. Internal energy of reaction
D. None of the above
E. All of the above.
ANSWER: B

488. When the fuel is burned and water is released in the liquid phase, the heating value of fuel is called
A. Higher heating value
B. Lower heating value
C. Enthalpy of formation
D. None of the above.
ANSWER: A

489. Modern practice is to use ..... excess air
A. 5 to 10 per cent
B. 15 to 20 per cent
C. 20 to 25 per cent
D. 25 to 50 per cent
ANSWER: D

490. Choose the correct statement :
A. Number of atoms of each constituent are not conserved in a chemical reaction.
B. The mass of all the substances on one side of the equation may not be equal to the mass of all the substances on the other side.
C. The number of atoms of each constituent are conserved in a chemical reaction.

D. The number of moles of the reactants in a chemical equation are equal to the number of moles of the products.
ANSWER: C

491. According to the Avogadro's law, what is the relation between volume of 1 kg mol of oxygen and volume of 1 kg mol of nitrogen, at normal pressure and temperature? (Mass of 1 kg mol of oxygen is 32 kg and mass of 1 kg mol of nitrogen is 28 kg)

A. Volume of 1 kg mol of oxygen is greater than that of nitrogen
B. Volume of 1 kg mol of oxygen is less than that of nitrogen
C. Volume of 1 kg mol of oxygen is same as that of nitrogen
D. None of the above
ANSWER: C

492. What is reduced property of a substance?
A. Critical property of a substance minus existing property of the same substance
B. Existing property of a substance minus critical property of the same substance
C. Ratio of critical property to existing property of the same substance
D. Ratio of existing property to critical property of the same substance
ANSWER: D

493. The equation pv=RT is used for ideal gases. The right equation for real gases is van der Waals equation. What is the correct formula for the van der Waals equation?where*(a/v^2)= force of cohesion,b= coefficient related to volume of molecules*
A. $(p+(a/v^2))\ (v + b) = RT$
B. $(p – (a/v^2))\ (v – b) = RT$
C. $(p + (a/v^2))\ (v – b) = RT$
D. $(p – (a/v^2))\ (v + b) = RT$
ANSWER: C

494. A gas being the best behaved thermodynamics substance, what is the relation between the ratio of pressure (p) of a gas at any temperature to pressure (p_t) of same gas at triple point temperature and the nature of gas?
A. The ratio (p/p_t) approaches a constant value which is dependent of nature of gas
B. The ratio (p/p_t) approaches a constant value which is independent of nature of gas
C. The ratio (p/p_t) approaches a various values which are dependent of nature of gas
D. None of the above
ANSWER: B

495. What is the volume of a gram mole of hydrogen at 760 mm Hg and 0 °C ?
A. 22.4 cm^3
B. 22.4 liters
C. 22.4 m^3
D. None of the above
ANSWER: B

496. When a gas is cooled or compressed it becomes a
A. Solid
B. Gas
C. Liquid
D. Semi-solid
ANSWER: C

497. On cooling, a liquid will be changed into
A. Dense
B. Solid
C. Liquid
D. Semi-solid
ANSWER: B

498. The volume occupied by one number of unit mol of gas is called as
A. Molecular volume
B. Mol volume
C. Molar volume
D. None of the above
ANSWER: C

499. What is an ideal gas?
A. Which obeys the law pv = RT
B. Which obeys the law p = vR / T
C. Which obeys the law pv = R / T
D. None of the above
ANSWER: A

500. What is the partial volume of a gas in a mixture?
A. Volume occupied by a single gas alone of a mixture at the same temperature and pressure of the mixture
B. Total volume of the mixture at a certain pressure and temperature divided number of gases mixed in the mixture
C. Sum of partial volume and total volume.
D. None of the above
ANSWER: A

501. The stoichiometric air fuel ratio of a fuel is 14.7:1. If 50% excess air is used, and the fuel undergoes complete combustion, what is the mass fraction of oxygen in the exhaust gas.
A. 0.073
B. 0.1
C. 0.3
D. 0.01
ANSWER: A

502. The stoichiometric air fuel ratio of a fuel is 12:1. If 25% excess air is used, and the fuel undergoes complete combustion, what is the mass fraction of Nitrogen in the exhaust gas.
A. 0.921
B. 1.00
C. 0.684
D. 0.502
ANSWER: C

503. If the exhaust gas consists of oxygen and unburned hydrocarbons, it indicates possibility of
A. Complete combustion
B. Incomplete combustion
C. High temperature combustion
D. Low temperature combustion
ANSWER: B

504. How many number of moles of air are required for complete burning of 20 kg of Carbon?
A. 10
B. 12
C. 5
D. 8
ANSWER: D

505. Determine the amount of oxygen required for stoichiometric combustion of 0.25 kg of diesel ($C_{12}H_{24}$)
A. 5.02
B. 1.05
C. 0.134
D. 0.857
ANSWER: D

506. Determine the amount of air required for stoichiometric combustion of 5 gm of diesel ($C_{12}H_{24}$)
A. 0.5 gm
B. 5 gm
C. 74.5 gm
D. 20 gm
ANSWER: C

507. In a combustion process, 0.15 kg of fuel and 0.30 kg of oxygen are used. Calculate air-fuel ratio for this application.
A. 8.667
B. 10.97
C. 5.07
D. 12.06
ANSWER: A

508. What is the approximate composition of automobile exhaust gas? From below choices, choose the closest one. 'Y' indicates mass fraction of the species
A. $Y_{HC} = 0.01$, $Y_{CO2} = 0.17$, $Y_{H2O} = 0.09$, $Y_{O2} = 0.02$, $Y_{N2} = 0.71$
B. $Y_{HC} = 0.30$, $Y_{CO2} = 0.17$, $Y_{H2O} = 0.30$, $Y_{O2} = 0.02$, $Y_{N2} = 0.23$
C. $Y_{HC} = 0.10$, $Y_{CO2} = 0.20$, $Y_{H2O} = 0.15$, $Y_{O2} = 0.40$, $Y_{N2} = 0.15$
D. $Y_{HC} = 0.15$, $Y_{CO2} = 0.15$, $Y_{H2O} = 0.10$, $Y_{O2} = 0.10$, $Y_{N2} = 0.5$
ANSWER: A

509. In the combustion of hydrocarbon fuels, in majority of the case, Nitrogen in the air is
A. Participating species in the combustion
B. Participate in the combustion as a catalyst
C. Non-participating species in the combustion
D. Participating species and catalyst
ANSWER: C

510. Stoichiometric air-fuel ratio of the gasoline (C_8H_{18}) is
A. 14.7
B. 15.25
C. 8.05
D. 13.07
ANSWER: B

511. If 20% of excess air is used for burning of 40 mg of gasoline (C_8H_{18}), what is the volume of air at 27ºC and 1.05 bar
A. 0.6 ltr
B. 0.9 ltr
C. 0.5 ltr
D. 1,5lt
ANSWER: A

512. When 30 mg of Methane (CH_4) undergoes complete combustion under stoichiometric conditions, what is the mass fraction of CO_2 in the exhaust
A. 0.0
B. 0.573
C. 0.2
D. 0.235
ANSWER: D

513. When 60 mg of gasoline (C_8H_{18}) undergoes complete combustion under stoichiometric conditions, what is the mass fraction of Oxygen in the exhaust
A. 0.2
B. 0.05
C. 0.23
D. 0
ANSWER: D

514. When 30 mg of Methane (CH_4) undergoes complete combustion under stoichiometric conditions, what is the mass fraction of H_2O in the exhaust
A. 0.1
B. 0.192
C. 0.573
D. 0.35
ANSWER: B

515. The volume ratios and mole fractions of the species in the exhaust gas are
A. Mole fraction of i^{th} species = Volume ratio of i^{th} species * total number of moles
B. Mole fraction of i^{th} species = Volume of i^{th} species * gas constant of the species
C. Mole fraction of i^{th} species = Volume ratio of i^{th} species
D. Mole fraction of i^{th} species = Volume ratio of i^{th} species * mass fraction of i^{th} species
ANSWER: C

516. The ignition temperature of an ideal fuel should be
A. High
B. Low
C. Moderate
D. It's not a property of ideal fuel
ANSWER: C

517. With the increase in ignition temperature, the ignition energy required for the combustion of a fuel
A. Increases
B. Decreases
C. Initially increases and attains a maximum value and thereafter remains constant.
D. Initially decreases and attains a minimum value and thereafter remains constant.
ANSWER: B

518. The calorific value of the liquid fuel is --------- than that of a solid fuel
A. Higher
B. Lower
C. Same
D. None of the above
ANSWER: A

519. Which of the following fuel can be generated from cow dung and municipal wastes
A. Biodiesel
B. Biogas
C. Benzol
D. Methanol
ANSWER: B
520. The following data refers to alcohol as an alternative fuel for automobile applications. I. Lower calorific value II. Lower knock resistance III. Higher corrosive IV. Limited resources for generation. Choose the correct combination that represent alcohols disadvantage.

A. I, IV
B. II, III
C. I, III
D. II, IV
ANSWER: C

521. The following data refers to hydrogen engine (automobile) I. Engine becomes heavier II. Thermal efficiency increases III. Nitric oxide production will be higher. IV. Knocking tendency is reduced. Choose the combination which are correct for Hydrogen engine
A. IV, II
B. I, II, III, IV
C. II, IV, III
D. I, II, III
ANSWER: C

522. LPG (Liquefied Petroleum Gas) is composed of
A. Propane and Methanol
B. Butane and Vegetable oil.
C. Bio-gas and Bio-diesel
D. Butane and Propane
ANSWER: D

523. The flammability limits of hydrogen as compared to gasoline are ------
A. Narrower
B. Wider
C. Approximately same
D. cannot be compared as it is function of operating temperature
ANSWER: B

524. Combustion predominantly ---------- reaction
A. Endothermic
B. Exothermic
C. Adiabatic
D. Combination of endothermic and exothermic
ANSWER: B

525. Bio-diesel mainly consist of
A. Methane and Butane
B. Alkyl esters
C. vegetable oil and natural gas
D. Benzol
ANSWER: B
526. During a combustion reaction, 2.8 kJ of heat is released. The mass of the air and fuel mixture is 950 mg, and specific heat at constant pressure of the mixture is 1.005 kJ/kgK. If the initial temperature of mixture is 300 K, what is adiabatic flame temperature
A. 1500 K

B. 2000 K
C. 2500 K
D. 3235 K
ANSWER: D

527. In an experiment, the adiabatic flame temperature found to be 2000 K, and mass of gasoline burned is 30 mg. If combustion occurred under stoichiometric condition, C_P of the air-fuel mixture is 1.2 k J/kg K, and the initial temperature of the mixture before combustion is 300 K, determine the heat liberated during the combustion
A. 2 k J
B. 1.014 k J
C. 5 k J
D. 3 k J
ANSWER: B

528. The effect of dissociation of a non-participating species on adiabatic flame temperature is
A. To increase the adiabatic flame temperature
B. No effect on adiabatic flame temperature
C. Change in adiabatic temperature depends on turbulence levels also
D. To reduce the adiabatic flame temperature
ANSWER: D

529. Adiabatic flame temperature will be highest for
A. Marginally rich mixture
B. Very high rich mixture
C. Very high lean mixture
D. Marginally lean mixture
ANSWER: A

530. Bomb calorimeter is used to measure the calorific value of the
A. Gaseous and liquid fuels
B. Liquid and solid fuels
C. Only solid fuels
D. Only liquid fuels.
ANSWER: B

531. Choose the correct statement with reference to bomb calorimeter.
A. Constant volume combustion process
B. Constant pressure combustion process
C. Adiabatic combustion process
D. Combustion process is described by polytrophic process
ANSWER: A

532. In case of a bomb calorimeter, the calorific value of fuel is proportional to
A. Temperature rise of the water
B. mass of the fuel burned

C. Adiabatic flame temperature
D. Pressure of the combustion products
ANSWER: A

533. Choose the correct statement w.r.to measurement of calorific value of fuel
A. Heat losses should be minimized
B. Stoichiometric air-fuel ratio should be used.
C. Complete combustion should be ensured
D. All of them.
ANSWER: C

534. In a calorimeter testing of coal, the mass of water is 2500 gm, coal burned was 0.825 gm, and temperature increase in water was 2.145^{o}C. Taking Cp of water as 4.187 k J/kg K, determine the CV of the coal
A. 27.20 MJ/kg
B. 40 MJ/kg
C. 27.20 k J/kg
D. 40 k J/kg
ANSWER: A

535. The aim of the ultimate analysis of coal is to determine
A. Calorific value
B. Composition
C. formation enthalpy
D. All of the above
ANSWER: B

536. The amount of heat liberated when 1 kg of fuel burned is equivalent to
A. Formation enthalpy of fuel
B. Calorific value of fuel
C. Heat of reaction of the fuel
D. Latent heat of the fuel
ANSWER: B

537. When 0.25 ml of gasoline is burned in a calorimeter, increase in water temperature observed to be 2^{o}C. In the same calorimeter, if 0.5 ml of gasoline is burned, how much is increase in temperature of water?
A. 5^{o}C
B. 2 ^{o}C
C. 8 ^{o}C
D. 4 ^{o}C
ANSWER: D
538. The air-fuel ratio in the homogeneous air-fuel mixture is
A. Constant
B. Will be different at different locations
C. Gradually decreases as combustion takes place

D. Gradually increases as combustion takes place
ANSWER: A

539. Existence of a definite flame is a characteristic of
A. heterogeneous combustion
B. Homogeneous charge compression ignition combustion
C. Homogeneous combustion
D. Low temperature combustion
ANSWER: C

540. In case of homogeneous combustion, the combustion is initiated by
A. Glow plug
B. Fuel injector
C. Temperature of compressed air
D. Ignition source
ANSWER: D

541. 20 mg of gasoline (C_8H_{18}) and 100 mg of air are supplied to an engine. The combustion of gasoline will
A. Sustain
B. Not sustain
C. Lead to the detonation
D. Lead to incomplete combustion.
ANSWER: B

542. Which of the following parameter has relatively less effect on homogeneous combustion?
A. Viscosity of the fuel
B. Flammability limits of fuel
C. Specific heat of the fuel
D. Calorific value of the fuel.
ANSWER: A

543. In a heterogeneous combustion usually a --------- compression ratio is desired.
A. Lower
B. Higher
C. Moderate
D. Very high
ANSWER: B

544. The purpose of swirl in heterogeneous combustion is
A. To reduce the mixing time between fuel and air
B. To increase the mixing time between fuel and air
C. To generate additional turbulence
D. To reduce the self-ignition temperature of the fuel.
ANSWER: A

545. The main disadvantage of heterogeneous combustion is
A. Higher HC and CO emissions
B. Formation of soot particles
C. Knocking
D. Higher fuel injection pressures
ANSWER: B

546. The combustion noise is relatively lower in
A. Low temperature combustion
B. Stratified charge combustion
C. Homogeneous combustion
D. Heterogeneous combustion.
ANSWER: C

547. As the fuel injection pressure increases, the penetration length of the fuel spray
A. Decreases
B. Remains constant
C. Increases
D. Not affected by the injection pressure.
ANSWER: C

548. In diesel combustion, the increase in mixing rate between fuel and air can lead to
A. Increase in unburned hydrocarbons
B. Increase in NO_X emission
C. Increase soot levels
D. All of above
ANSWER: B

549. In case of diesel engine, the piston bowl should be designed to
A. To have higher in-bowl swirl and squish flow
B. To have higher tumble and swirl flow levels
C. To have higher squish and tumble levels
D. To have higher tumble, squish and in-bowl swirl
ANSWER: A

550. If the injection timing is advanced (fuel is injected progressively before TDC)
A. HC increases and NO_X decreases
B. CO increases and NO_X increases
C. HC increases and soot decreases
D. NO_X increases and soot decreases
ANSWER: D

551. If the injection timing is advanced (fuel is injected progressively before TDC)
A. Peak temperature of cycle decreases
B. Peak temperature of the cycle is not influenced by injection timing
C. Peak temperature of the cycle increases

D. Peak temperature of the cycle will be attained at TDC
ANSWER: C

552. If the ignition timings is advanced (ignition timing is activated progressively before TDC)
A. Knocking tendency decreases
B. Knocking tendency increases
C. Knocking tendency is not influenced.
D. Can cause pre-ignition at the exhaust valve
ANSWER: B

553. For a SI engine, compression ratio is limited by
A. Soot emissions
B. NO_X emissions
C. Knocking
D. Heat losses
ANSWER: C

554. For a CI engine compression ratio is limited by
A. Soot emissions
B. NO_X emissions
C. Knocking
D. Heat losses
ANSWER: B

555. For a CI engine, the peak torque is limited by
A. Knocking
B. NO_X emissions limit
C. Coolant flow rate
D. Smoke limit
ANSWER: D

556. In case of CI engine, when the piston starts moving from TDC to BDC, what kind of flow is predominantly desired to reduce emission
A. Swirling flow
B. Tumble flow
C. Squish flow
D. All of them
ANSWER: C

557. Heat released in a reaction at constant pressure is called

A. Internal energy of the reaction
B. Entropy change of reaction
C. Heat of reaction
D. None of the above. ANSWER: C

558. Which of the following equations will describe about the phase change of a substance

A. Tds equations
B. Maxwell's equation
C. Clausius-Clapeyron equation
D. All of them

ANSWER: C

559. One kg-mole of a gas at NTP conditions will occupy

A. 22.41 m^3
B. 22.41 liter
C. 22.41 cc
D. 22.41 ml

ANSWER: A

560. Phase change process on T-P coordinates will be represented by

A. Horizontal line
B. Vertical line
C. Inclined line with positive slope
D. Single point

ANSWER: D

561. The Orsat apparatus gives

A. The volumetric analysis of combustion products including H_2O
B. The volumetric analysis of dry combustion products
C. The gravimetric analysis of combustion products
D. The gravimetric analysis of combustion products including H_2O

ANSWER: B

562. The intersection of two reversible adiabatic curves indicates, violation of

A. First law of thermodynamics
B. Carnot theorem
C. Second law of thermodynamics
D. All of them

ANSWER: C

563. Which is more effective way of increasing the efficiency of a Carnot engine (T_1 isheat source temperature and T_2 is heat sink temperature)

A. Reducing T_2 and keeping T_1 constant
B. Increasing T_1 and keeping T_2 constant
C. Increasing T_2 and keeping T_1 constant
D. Decreasing T_1 and keeping T_2 constant
ANSWER: A

564. An inventor claims to have developed an engine that takes in 105 MJ at a temperature of

400 K, rejects 42 MJ at a temperature of 200 K, and delivers 15 kWh of mechanical work. Does the statement correct ?

A. Yes
B. No
B. Sufficient data is not provided
D. Partially true

ANSWER: B

565. Using an engine of 30% thermal efficiency to drive a refrigerator having a COP of 5, what is the heat input into the engine for each MJ removed from the cold body by the refrigerator ?

A. 200 k J
B. 500 k J
C. 600 k J
D. 666.67 k J

ANSWER: D

566. The efficiency of Carnot engine depends on following factor

A. Heat supplied
B. Heat rejected
C. Operating temperatures
D. All of the above

ANSWER: C

567. The Carnot cycle has following process

A. Two reversible adiabatic process and two reversible isothermal process
B. Two reversible isobars and two reversible isothermal process
C. Two reversible isothermal process and two constant volume process
D. Two reversible isobars and two constant volume process

ANSWER: A

568. A domestic food freezer maintains a temperature of -15 ^{o}C. The ambient air temperature is 30 ^{o}C. If heat leaks into the freezer at the continuous rate of 1.75 k J/s what is the least power necessary to pump this heat out continuously

A. 1 kW
B. 0.5 kW
C. 2 kW
D. 0.31 kW

ANSWER: D

569. As per the Clausisu's theorem, a reversible process can be replaced with

A. Two reversible isotherms and one reversible adiabatic
B. Two reversible adiabatics and one reversible isotherm
C. One reversible adiabatic and one reversible isotherm
D. One reversible isobar and one reversible isotherm

ANSWER: B

570. A reversible cycle can be approximated by

A. It will be unique and cannot be approximated by any other cycle
B. Depending upon the individual process it can be approximated by combination of Rankine and Carnot cycle
C. Large number of Carnot cycles
D. Large of Rankine cycles

ANSWER: C

571. On a T-S plane, area under a curve represents

A. Heat transfer
B. Work transfer
C. Internal energy
D. All of the above

ANSWER: A

572. At standard temperature and pressure, 8.4 liters of oxygen and 14 liters of hydrogen mix with each other completely in an insulating chamber. What is the entropy change for the process assuming both gases behave as ideal gases

A. 7 J/K
B. 4 J/K
C. 9 J/K
D. 5.49 J/K
ANSWER: D

573. A fluid undergoes a reversible adiabatic compression from 0.5 MPa, 0.2 m^3 to 0.05 m^3 according to the law, $pv^{1.3}$ = constant. What is the pressure at the end of compression?

A. 4.07 MPa
B. 2.38 MPa
C. 3.03 MPa
D. 5.07 MPa

ANSWER: C

574. On a T-S plane, how many reversible adiabatic curves can be drawn through a point

A. One
B. Zero
C. Infinite
D. Depends on the whether the point falls on reversible cycle or not

ANSWER: A

575. Two kg of water at 80^{o}C are mixed adiabatically with 3 kg of water at 30 ^{o}C in a constant pressure process of 1 bar. Find the increase in the entropy of the total mass of water due to the mixing process, Cp of water is 4.187 k J/kg K

A. 0.78 k J/K
B. 0.0576 k J/K
C. 0.025 k J/K
D. 0.086 k J/K

ANSWER: B

576. Which of the following property of the system is related to entropy
A. Cohesive forces among molecules
B. Viscosity of the molecules
C. Intermolecular spacing
D. Molecular disorder
ANSWER: D

577. A steam power plant with a power output of 100 MW, consumes coal at a rate of 40 tonnes/hr. If the calorific value of coal 30 MJ/kg, determine the thermal efficiency of this plant.
A. 0.35

B. 0.2
C. 0.3
D. 0.5
ANSWER: C

578. A refrigerator is working between reservoirs of -13°C and 34°C. If the refrigerator COP is 75
% of the Carnot refrigerator operating at identical temperature limits, estimate the refrigerating effect per kW of power consumption.
A. 6.234 k W
B. 4.149 k W
C. 7.05 k W
D. 3.06 k W
ANSWER: B

579. One kg of air at pressure 2 bar and temperature 300 K is isothermally compressed until its volume is halved. What is the work required in k J
A. 59.7
B. 77.57
C. 34. 56
D. 23.56
ANSWER: A

580. Compression stroke in an internal combustion engine represents
A. Open system
B. Isolated
C. Closed system
D. Combination of open and closed system
ANSWER: C

581. Exhaust stroke in an internal combustion engine represents
A. Open system
B. Isolated
C. Closed system
D. Combination of open and closed system
ANSWER: A

582. Which of the following is not part of internal energy of substance
A. Vibrational energy
B. Electronic energy
C. Nuclear energy
D. Chemical energy
ANSWER: D

583. Energy of isolated system
A. Fluctuates with time

B. Continuously decreases
C. Always remains constant
D. Continuously increases
ANSWER: C

584. 1.5 kg of liquid having a constant specific heat of 2.5 k J/kg K is stirred in a well-insulated chamber causing the temperature to rise by 15 o C. For this process, change in internal energy and work transfer are
A. -25.72 k J, 25.72 k J
B. 56.25k J, -56.25 k J
C. -56.25k J, 56.25 k J
D. 25.72 k J, -25.72 k J
ANSWER: B

585. Which of the following is not an energy interaction
A. Work transfer
B. Heat transfer
C. Enthalpy transfer
D. Entropy transfer
ANSWER: D

586. Fill the remaining term in the Maxwell equation d G = V dp + ----
A. P dv
B. –S d T
C. – T ds
D. V dp
ANSWER: B

587. Slope of the sublimation curve at the triple point is --------than that of the vaporization curve
A. Equal
B. Lesser
C. Greater
D. None of the above
ANSWER: C

588. An isenthalpic curve on a T-P plane
A. Will contain one minimum
B. Will contain multiple minima's
C. Will contain multiple maxima's
D. Will one contain one maxima
ANSWER: D

589. For an ideal gas during throttling process which property will remain constant
A. pressure
B. Enthalpy
C. Entropy

D. Internal energy
ANSWER: B

590. On a p-v diagram, the slope of isentrope is ------ that that of isotherm.
A. Lesser
B. Same
C. Greater
D. Cannot be compared
ANSWER: C

591. Avogadro's law relates following
A. Number of moles and volumes of the gas
B. Number of moles and pressure of gas
C. Molecular weight and volume of gas
D. Molecular weight and temperature of gas
ANSWER: A

592. Clausius-Clapeyron equation can be used to estimate the
A. Partial pressure of a species in a mixture of gases
B. Temperature of boiling liquid
C. Dryness fraction of vapour-liquid mixture
D. Vapor pressure of a liquid
ANSWER: D

593. For an ideal gas, the slope of constant volume line on the T-S diagram is ----- that that of constant pressure line
A. Cannot be compared
B. More
C. Less
D. Equal
ANSWER: B

594. A mixture of ideal gases consist of 3 kg of nitrogen and 5 kg of carbon dioxide at pressure of 300 k Pa. What is the equivalent molecular weight of the mixture?
A. 28 kg/kg-mole
B. 34 kg/kg-mole
C. 36.25 kg/kg-mole
D. 28 kg/kg-mole
ANSWER: C

595. Find the increase in entropy when 2 kg of oxygen at 60 ^{o} C are mixed with 6 kg of nitrogen at the same temperature. The initial pressure of each constituent is 103 kPa and is the same as the that of mixture.
A. 2.05 k J/kgK
B. 4.56 k J/kgK
C. 0.85 k J/kgK

D. 1.231 k J/kgK
ANSWER: D

596. Which is the more efficient way of compression
A. Isentropically
B. Isothermally
C. Adiabatically
D. None of the above
ANSWER: A

597. For a gas as Pressure tends to zero product of pressure and specific volume approaches to
A. Zero
B. Infinite
C. Product of universal gas constant and Temperature
D. Product of gas constant and Temperature
ANSWER: C

598. Specific gas constant for Oxygen is
A. 0.287 k J/kgK
B. 0.262 k J/kgK
C. 0.195 k J/kgK
D. 0.345 k J/kgK
ANSWER: B

599. The polytrophic coefficient is given by
A. $(\log p_1+\log p_2) / (\log v_2+\log v_1)$
B. $(\log p_2-\log p_1) / (\log v_2-\log v_1)$
C. $(\log T_1-\log T_2) / (\log v_2-\log v_1)$
D. $(\log p_1-\log p_2) / (\log v_2-\log v_1)$
ANSWER: D

600. The exergy of fluid increases as temperature
A. Increases to certain range and decreases thereafter
B. Will remain constant with respect to temperature
C. Increases
D. Decreases
ANSWER: C

601. If all the variables of a stream are independent of time it is said to be in
A. Steady flow
B. Unsteady flow
C. Uniform flow
D. Closed flow
ANSWER: A

602. A control volume refers to

A. A fixed region in space
B. A specified mass
C. An isolated system
D. A reversible process only
ANSWER: A

603. Internal energy of a perfect gas depends on
A. Temperature, specific heats and pressure
B. Temperature, specific heats and enthalpy
C. Temperature, specific heats and entropy
D. Temperature only
ANSWER: D

604. In reversible polytropic process
A. True heat transfer occurs
B. The entropy remains constant
C. The enthalpy remains constant
D. The internal energy remains constant
ANSWER: A

605. An isentropic process is always
A. Irreversible and adiabatic
B. Reversible and isothermal
C. Frictionless and irreversible
D. Reversible and adiabatic
ANSWER: D

006. A reversible process requires that
A. There be no heat transfer
B. Newton's law of viscosity be satisfied
C. Temperature of system and surroundings be equal
D. There be no viscous or coloumb friction in the system
ANSWER: D

607. The first law of thermodynamics for steady flow
A. Accounts for all energy entering and leaving a control volume
B. Is an energy balance for a specified mass of fluid
C. Is an expression of the conservation of linear momentum
D. Is primarily concerned with heat transfer
ANSWER: A

608. The characteristic equation of gases $pV = mRT$ holds good for
A. Monoatomic gases
B. Diatomic gas
C. Real gases
D. Ideal gases

ANSWER: C

609. A gas which obeys kinetic theory perfectly is known as
A. Monoatomic gas
B. Diatomic gas
C. Real gas
D. Perfect gas
ANSWER: D

610. Work done in a free expansion process is
A. Zero
B. Minimum
C. Maximum
D. Positive
ANSWER: A

611. Which of the following is not a property of the system?
A. Temperature
B. Pressure
C. Specific volume
D. Heat
ANSWER: D

612. In the polytropic process equation PV^n= constant, if n = 0, the process is termed as
A. Constant volume
B. Constant pressure
C. Constant temperature
D. Adiabatic
ANSWER: B

613. In the polytropic process equation PV^n = constant, if n is infinitely large, the process is termed as
A. Constant volume
B. Constant pressure
C. Constant temperature
D. Adiabatic
ANSWER: A

614. The processes or systems that do not involve heat are called
A. Isothermal processes
B. Equilibrium processes
C. Thermal processes
D. Adiabatic processes
ANSWER: D

615. In isothermal process

A. Temperature increases gradually
B. Volume remains constant
C. Pressure remains constant
D. Change in internal energy is zero
ANSWER: D

616. During throttling process
A. Internal energy does not change
B. Pressure does not change
C. Entropy does not change
D. Enthalpy does not change
ANSWER: D

617. When a gas is to be stored, the type of compression that would be ideal is
A. Isothermal
B. Adiabatic
C. Polytropic
D. Constant volume
ANSWER: A

618. If a process can be stopped at any stage and reversed so that the system and surroundings are exactly restored to their initial states, it is known as
A. Adiabatic process
B. Isothermal process
C. Ideal process
D. Frictionless process
ANSWER: C

619. The state of a substance whose evaporation from its liquid state is complete, is known as
A. Vapour
B. Perfect gas
C. Air
D. Steam
ANSWER: B

620. In SI units, the value of the universal gas constant is
A. 0.8314 J/mole/K
B. 8.314 J/mole/K
C. 83.14 J/mole/K
D. 8314 J/mole/K
ANSWER: D

621. When the gas is heated at constant pressure, the heat supplied
A. Increases the internal energy of the gas
B. Increases the temperature of the gas
C. Does some external work during expansion

D. Both B. and C
ANSWER: D

622. The gas constant (R) is equal to the
A. Sum of two specific heats
B. Difference of two specific heats
C. Product of two specific heats
D. Ratio of two specific heats
ANSWER: B

623. According to Kelvin-Planck's statement of second law of thermodynamics
A. It is impossible to construct an engine working on a cyclic process, whose sole purpose is to convert heat energy into work
B. It is possible to construct an engine working on a cyclic process, whose sole purpose is to convert the heat energy into work
C. It is impossible to construct a device which while working in a cyclic process produces no effect other than the transfer of heat from a colder body to a hotter body
D. None of the above
ANSWER: D

624. The property of a working substance which increases or decreases as the heat is supplied or removed in a reversible manner is known as
A. Enthalpy
B. Internal energy
C. Entropy
D. External energy
ANSWER: C

625. The entropy may be expressed as a function of
A. Pressure and temperature
B. Temperature and volume
C. Heat and work
D. all of the above
ANSWER: A

626. The change of entropy, when heat is absorbed by the gas is
A. positive
B. Negative
C. positive or negative
ANSWER: A

627. Which of the following statements is correct?
A. The increase in entropy is obtained from a given quantity of heat at a low temperature
B. The change in entropy may be regarded as a measure of the rate of the availability of heat for transformation into work

C. The entropy represents the maximum amount of work obtainable per degree drop in temperature
D. All of the above
ANSWER: D

628. The condition for the reversibility of a cycle is
A. The pressure and temperature of working substance must not differ, appreciably from those of the surroundings at any stage in the process
B. All the processes taking place in the cycle of operation, must be extremely slow
C. The working parts of the engine must be friction free
D. All of the above
ANSWER: D

629. In an irreversible process there is a
A. Loss of heat
B. No loss of work
C. Gain of heat
D. No gain of heat
ANSWER: A

630. The main cause for the irreversibility is
A. Mechanical and fluid friction
B. Unrestricted expansion
C. Heat transfer with a finite temperature difference
D. All of the above
ANSWER: D

631. The efficiency of the Carnot cycle may be increased by
A. Increasing the highest temperature
B. Decreasing the highest temperature
C. Increasing the lowest temperature
D. Decreasing the lowest temperature
ANSWER: D

632. Which of the following is the correct statement?
A. All the reversible engines have the same efficiency
B. All the reversible and irreversible engines have the same efficiency
C. Irreversible engines have maximum efficiency
D. All engines are designed as reversible in order to obtain maximum efficiency
ANSWER: A

633. Second law of thermodynamics defines
A. Heat
B. Work
C. Enthalpy
D. Entropy

ANSWER: D

634. For a reversible adiabatic process, the change in entropy is
A. Zero
B. Minimum
C. Maximum
D. Infinite
ANSWER: A

635. For any reversible process, the change in entropy of the system and surroundings is
A. Zero
B. Unity
C. Negative
D. Positive
ANSWER: A

636. For any irreversible process the net entropy change is
A. Zero
B. Positive
C. Negative
D. Infinite
ANSWER: B

637. The processes of a Carnot cycle are
A. Two adiabatic and two constant volume
B. One constant volume and one constant pressure and two isentropics
C. Two adiabatics and two isothermals
D. Two isothermals and two isentropics
ANSWER: D

638. Isentropic flow is
A. Irreversible adiabatic flow
B. Ideal fluid flow
C. Perfect gas flow
D. Reversible adiabatic flow
ANSWER: D

639. In a Carnot engine, when the working substance gives heat to the sink
A. The temperature of the sink increases
B. The temperature of the sink remains the same
C. The temperature of the source decreases
D. The temperatures of both the sink and the source decrease
ANSWER: B

640. If the temperature of the source is increased, the efficiency of the Carnot engine
A. Decreases

B. Increases
C. Does not change
D. Will be equal to the efficiency of a practical engine
ANSWER: B

641. The efficiency of an ideal Carnot engine depends on
A. Working substance
B. on the temperature of the source only
C. On the temperature of the sink only
D. On the temperatures of both the source and the sink
ANSWER: D

642. In a reversible cycle, the entropy of the system
A. Increases
B. Decreases
C. Does not change
D. First increases and then decreases
ANSWER: C

643. A frictionless heat engine can be 100% efficient only if its exhaust temperature is
A. Equal to its input temperature
B. less than its input temperature
C. 0°C
D. 0°K
ANSWER: D

644. Kelvin-Planck's law deals with
A. Conservation of energy
B. Conservation of heat
C. Conservation of mass
D. Conversion of heat into work
ANSWER: D

645. Which of the following statements is correct according to Clausius statement of second law of thermodynamics?
A. It is impossible to transfer heat from a body at a lower temperature to a body at a higher temperature
B. It is impossible to transfer heat from a body at a lower temperature to a body at a higher temperature, without the aid of an external source
C. It is possible to transfer heat from a body at a lower temperature to a body at a higher temperature by using refrigeration cycle
D. None of the above
ANSWER: B

646. Heat is transferred to a heat engine from a furnace at a rate of 80 MW. If the rate of waste heat rejection to a nearby river is 50 MW, determine the net power output for this heat engine

A. 30 MW
B. 40 MW
C. 50 MW
D. 60 MW
ANSWER: A

647. Heat is transferred to a heat engine from a furnace at a rate of 80 MW. If the rate of waste heat rejection to a nearby river is 50 MW, determine the thermal efficiency for this heat engine.
A. 47.5 %
B. 27.5 %
C. 37.5 %
D. none of the mentioned
ANSWER: C

648. A car engine with a power output of 50 kW has a thermal efficiency of 24 percent. Determine the fuel consumption rate of this car if the fuel has a heating value of 44,000 kJ/kg .
A. 0.00273 kg/s
B. 0.00373 kg/s
C. 0.00473 kg/s
D. 0.00573 kg/s
ANSWER: C

649. The food compartment of a refrigerator is maintained at 4°C by removing heat from it at a rate of 360 kJ/min. If the required power input to the refrigerator is 2kW, determine the coefficient of performance of the refrigerator.
A. 4
B. 3
C. 2
D. 1
ANSWER: B

650. The food compartment of a refrigerator is maintained at 4°C by removing heat from it at a rate of 360 kJ/min. If the required power input to the refrigerator is 2kW, determine the rate of heat rejection to the room that houses the refrigerator.
A. 450 kJ/min
B. 460 kJ/min
C. 470 kJ/min
D. 480 kJ/min
ANSWER: D

651. A heat pump is used to meet the heating requirements of a house and maintain it at 20°C. On a day when the outdoor air temperature drops to 2°C, the house is estimated to lose heat at a rate of 80,000 kJ/h. If the heat pump under these conditions has a COP of 2.5, determine the power consumed by the heat pump.
A. 32000 kJ/h
B. 33000 kJ/h

C. 34000 kJ/h
D. 35000 kJ/h
ANSWER: A

652. A heat pump is used to meet the heating requirements of a house and maintain it at 20°C. On a day when the outdoor air temperature drops to 2°C, the house is estimated to lose heat at a rate of 80,000 kJ/h. If the heat pump under these conditions has a COP of 2.5, determine the rate at which heat is absorbed from the cold outdoor air.
A. 32000 kJ/h
B. 48000 kJ/h
C. 54000 kJ/h
D. 72000 kJ/h
ANSWER: B

653. An air-conditioner provides 1 kg/s of air at 15°C cooled from outside atmospheric air at 35°C. Estimate the amount of power needed to operate the air-conditioner.
A. 1.09 kW
B. 1.19 kW
C. 1.29 kW
D. 1.39 kW
ANSWER: D

654. A cyclic machine, as shown below, receives 325 kJ from a 1000 K energy reservoir. It rejects 125 kJ to a 400 K energy reservoir and the cycle produces 200kJ of work as output. Is this cycle reversible, irreversible, or impossible?
A. reversible
B. Irreversible
C. Impossible
D. None of the mentioned
ANSWER: C

655. In a cryogenic experiment you need to keep a container at -125°C although it gains 100 W due to heat transfer. What is the smallest motor you would need for a heat pump absorbing heat from the container and rejecting heat to the room at 20°C?
A. 97.84 kW
B. 98.84 kW
C. 99.84 kW
D. 95.84 kW
ANSWER: A

656. A car engine operates with a thermal efficiency of 35%. Assume the air-conditioner has a coefficient of performance of 3 working as a refrigerator cooling the inside using engine shaft work to drive it. How much fuel energy should be spend extra to remove 1 kJ from the inside?
A. 0.752 kJ
B. 0.952 kJ
C. 0.852 kJ

D. None of the mentioned
ANSWER: B

657. According to Joule's experiments
A. Heat can be completely converted into work
B. Work can be completely converted into heat
C. Both heat and work are completely interchangeable
D. all of the mentioned
ANSWER: B

658. Which of the following is true?
A. Work is a high grade energy
B. Heat is a low grade energy
C. Complete conversion of low grade energy into high grade energy in a cycle is impossible
D. all of the mentioned
ANSWER: D

659. In a cyclic heat engine there is
A. Net heat transfer to the system and net work transfer from the system
B. Net heat transfer from the system and net work transfer to the system
C. Depends on the conditions of cycle
D. None of the mentioned
ANSWER: A

660. In a heat engine cycle, which of the following process occurs?
A. Heat is transferred from furnace to boiler
B. Work is produced in turbine rotor
C. Steam is condensed in condenser
D. all of the mentioned
ANSWER: D

661. The function of a heat engine cycle is to _____ continuously at the expense of _____ to the system.
A. Heat input, produce work
B. Produce work, heat input
C. Can be both of the mentioned
D. None of the mentioned
ANSWER: B

662. Efficiency of a heat engine is defined as
A. Total heat output / net work input
B. Total heat input / net work output
C. net work output / total heat input
D. net work input / total heat output
ANSWER: C

663. A thermal energy reservoir is a large body of
A. small heat capacity
B. large heat capacity
C. infinite heat capacity
D. none of the mentioned
ANSWER: C

664. A TER which transfers heat to system is called ____ and one which receives heat is called ___
A. Source, sink
B. Sink, source
C. Sink, sink
D. Source, source
ANSWER: A

665. Which if the following statements are true for a mechanical energy reservoir (MER)?
A. It is a large body enclosed by an adiabatic impermeable wall
B. Stores work as KE or PE
C. All processes within an MER are quasi-static
D. all of the mentioned
ANSWER: D

666. According to Kelvin-Planck statement, it is ____ for a heat engine to produce net work in a complete cycle if it exchanges heat only with bodies at ____.
A. impossible, single fixed temperature
B. possible, changing temperature
C. impossible, changing temperature
D. possible, single fixed temperature
ANSWER: A

667. If heat rejected from the system Q2 is zero, then
A. net work=Q1 and efficiency=100%
B. heat is exchanged only with one reservoir
C. it violates the Kelvin-Planck statement
D. all of the mentioned
ANSWER: D

668. A heat engine has to exchange heat with ___ energy reservoir at ___ different temperatures to produce net work in a complete cycle.
A. one, one
B. one, two
C. two, two
D. none of the mentioned
ANSWER: C

669. The continual operation of a machine that creates its own energy and thus violates the first law is called
A. PMM2
B. PMM1
C. PMM0
D. none of the mentioned
ANSWER: B

670. Which of the following is true?
A. heat always from a high temperature body to a low temperature body
B. heat always from a low temperature body to a high temperature body
C. heat can flow from both low to high and high to low temperature body
D. none of the mentioned
ANSWER: A

671. According to Clausius statement
A. It is impossible to construct a device than can transfer heat from a cooler body to a hotter body without any effect
B. It is impossible to construct a device than can transfer heat from a hotter body to a cooler body without any effect
C. It is possible to construct a device than can transfer heat from a cooler body to a hotter body without any effect
D. None of the mentioned
ANSWER: A

672. If the second law were not true
A. A ship could be driven by extracting heat from the ocean
B. Run a power plant by extracting heat from the air
C. Both of the mentioned
D. None of the mentioned
ANSWER: C

673. The operation of a machine that utilizes the internal energy of only one TER, thus violating second law is called
A. PMM0
B. PMM1
C. PMM2
D. None of the mentioned
ANSWER: B

674. Which device maintains a body at a temperature lowers than the temperature of the surroundings?
A. PMM1
B. PMM2
C. Refrigerator
D. Heat pump

ANSWER: C

675. What does a refrigerant do?
A. Absorbs the heat leakage into body from surroundings
B. Evaporates in the evaporator
C. Absorbs latent heat of vaporization form the body which is cooled
D. all of the mentioned
ANSWER: D

676. Coefficient of performance (COP) is defined as
A. Heat leakage/work input
B. Work input/heat leakage
C. Latent heat of condensation/work input
D. Work input/latent heat of condensation
ANSWER: A

677. Which device maintains a body at a temperature higher than the temperature of the surroundings?
A. PMM1
B. PMM2
C. Refrigerator
D. Heat pump
ANSWER: D

678. What is the relation between COP of heat pump and refrigerator?
A. COP of pump=COP of refrigerator – 1
B. COP of pump=COP of refrigerator + 1
C. COP of pump=COP of refrigerator – 2
D. COP of pump=COP of refrigerator + 2
ANSWER: B

679. Which of the following statements are true?
A. A heat pump provides a thermodynamic advantage over direct heating
B. COP for both refrigerator and pump cannot be infinity
C. Work input for both refrigerator and pump is greater than zero
D. all of the mentioned
ANSWER: D

680. Kelvin-Planck's and Clausius' statements are
A. Not connected to each other
B. Virtually two parallel statements of second law
C. Violation of one doesn't violate the other
D. None of the mentioned
ANSWER: B

681. In Rankine Cycle, water is converted to saturated liquid in _____

A. Evaporator
B. Economizer
C. Superheater
D. Preheater
ANSWER: B

682. Rankine cycle efficiency of a good Steam Power Plant may be in the range of?
A. 15 to 20%
B. 35 to 45%
C. 70 to 80%
D. 90 to 95%
ANSWER: B

683. A simple Rankine cycle operates the Boiler at 3 MPa with an outlet temperature of 350°C and the Condenser at 50 kPa. Assuming ideal operation and processes, what is the thermal efficiency of this cycle?
A. 7.7
B. 17.7
C. 27.7
D. 37.7
ANSWER: C

684. A simple Rankine cycle produces 40 MW of power, 50 MW of process heat and rejects 60 MW of heat to the surroundings. What is the utilization factor of this co generation cycle neglecting the pump work?
A. 50
B. 60
C. 70
D. 80
ANSWER: B

685. Heat rate is given by (in kJ/kWh)is
A. Cycle efficiency
B. 3600 / cycle efficiency
C. Cycle efficiency / 3600
D. Cycle efficiency * 3600
ANSWER: B

686. Work output of turbine is ____ the work input to the pump
A. Much larger
B. Much smaller
C. Equal to
D. Smaller
ANSWER: A

687. What is the effect of reheat on steam quality?

A. Increases
B. Decreases
C. Does not change
D. Depends on several parameters
ANSWER: A

688. Working fluid of Rankine cycle usually _____
A. Water
B. Methane
C. Hard water
D. None of the mentioned
ANSWER: A

689. Reheat temperatures are very close to _____ temperature
A. Inlet
B. Outlet
C. Intermediate
D. Both inlet and intermediate
ANSWER: A

690. How many types of feedwater heaters are present?
A. One
B. Two
C. Three
D. Four
ANSWER: B

691. Phase change at constant pressure takes place in?
A. Economiser
B. Evaporator
C. Superheater
D. Air-Preheater
ANSWER: C

692. Reheating of steam
A. Decreases steam rate
B. Increases steam rate
C. No effect on steam rate
D. None of the mentioned
ANSWER: A

693. Efficiency of cycle will increase due to Reheating if
A. Mean temperature of heat addition in boiler is higher than in reheat process
B. Mean temperature of heat addition in boiler is lower than in reheat process
C. It will increase without any conditions
D. It will not increase

ANSWER: A

694. The efficiency of an ideal regenerative cycle is given by
A. 1 – (T1/T2)
B. 1 – (T2/T1)
C. 1 – (Q1/Q2)
D. None of the mentioned
ANSWER: B

695. The efficiency of an ideal regenerative cycle is ____ the Carnot cycle efficiency.
A. Greater than
B. Equal to
C. Less than
D. None of the mentioned
ANSWER: B

696. The efficiency of regenerative cycle will be ____ the efficiency of the Rankine cycle
A. Greater than
B. Equal to
C. Less than
D. None of the mentioned
ANSWER: A

697. For which of the following substances, the internal energy and enthalpy are the functions of temperature only
A. Any gas
B. Saturated steam
C. Water
D. Perfect gas
ANSWER: D

698. In a free expansion process
A. work done is zero
B. heat transfer is zero
C. both A. and B. above
D. work done is zero but heat increases
ANSWER: C

699. If a gas vapour is allowed to expand through a very minute aperture, then such a process is known as
A. free expansion
B. hyperbolic expansion
C. adiabatic expansion
D. throttling
ANSWER: E

700. The specific heat of air increases with increase in
A. temperature
B. pressure
C. both pressure and temperature
D. variation of its constituents
ANSWER: A

701. If a fluid expands suddenly into vacuum through an orifice of large dimension, then such a process is called
A. free expansion
B. hyperbolic expansion
C. adiabatic expansion
D. parabolic expansion
ANSWER: A

702. Which of the following processes are thermodynamically reversible?
A. throttling
B. free expansion
C. constant volume and constant pressure
D. Isothermal and adiabatic
ANSWER: E

703. Which of the following processes is irreversible process?
A. isothermal
B. adiabatic
C. throttling
D. all of the above
ANSWER: C

704. The more effective way of increasing efficiency of Carnot engine is to
A. increase higher temperature
B. decrease higher temperature
C. increase lower temperature
D. decrease lower temperature
ANSWER: D

705. Entropy change depends on
A. heat transfer
B. mass transfer
C. change of temperature
D. thermodynamic state
ANSWER: A

706. For reversible adiabatic process, change in entropy is
A. maximum
B. minimum

C. zero
D. unpredictable
ANSWER: C