Thermodynamics

1. Thermodynamics is the study of:

(A) Energy and its transformations

(B) Fluid mechanics

(C) Heat transfer only

(D) Material science

Answer: A) Energy and its transformations

2. Zeroth law of thermodynamics deals with:

(A) Entropy

(B) Energy

(C) Temperature equilibrium

(D) Pressure

Answer: C) Temperature equilibrium

3. The property which is not intensive is:

(A) Temperature

(B) Pressure

(C) Volume

(D) Density

Answer: C) Volume

4. The first law of thermodynamics is based on:

(A) Conservation of mass

(B) Conservation of energy

(C) Conservation of temperature

(D) Conservation of pressure

Answer: B) Conservation of energy

5. The unit of entropy is:

(A) kJ

(B) kJ/kg

(C) kJ/K

(D) kJ/kg K

Answer: D) kJ/kg K

6. The process that occurs at constant pressure is called:

(A) Isothermal

(B) Isochoric

(C) Isobaric

(D) Adiabatic

Answer: C) Isobaric

7. Heat is:

(A) a property

(B) form of energy transfer

(C) measured in Watt

(D) always positive

Answer: B) form of energy transfer

8. Specific heat is:

(A) The heat required to raise the temperature of 1 kg of substance by 1 K

(B) The heat required to raise temperature of entire system by 1 K

(C) The heat transferred at constant volume

(D) The heat transferred at constant pressure only

Answer: A) The heat required to raise the temperature of 1 kg of substance by 1 K

9. The amount of heat needed to change unit mass from solid to liquid at constant temperature is called:

(A) Specific heat

(B) Latent heat of fusion

(C) Sensible heat

(D) Latent heat of vaporization

Answer: B) Latent heat of fusion

10. The working fluid in Rankine cycle is:

(A) Refrigerant

(B) Steam

(C) Air

(D) Water

Answer: B) Steam

11. In Carnot cycle, all the processes are:

(A) Reversible

(B) Irreversible

(C) Isobaric

(D) Adiabatic only

Answer: A) Reversible

12. The efficiency of Carnot engine depends on:

(A) Temperature of source and sink

(B) Working substance

(C) Pressure ratio

(D) Volume ratio

Answer: A) Temperature of source and sink

13. The second law of thermodynamics deals with:

(A) Direction of heat flow

(B) Conservation of energy

(C) Pressure

(D) Volume

Answer: A) Direction of heat flow

14. Entropy is a measure of:

(A) Energy transfer

(B) Disorder or randomness

(C) Pressure

(D) Temperature difference

Answer: B) Disorder or randomness

15. What is the relation between Kelvin and Celsius scale?

(A) K = °C + 247

(B) K = °C + 273

(C) K = °C + 100

(D) K = °C + 212

Answer: B) K = °C + 273

16. The law which relates pressure, volume, and temperature is:

(A) Boyle’s Law

(B) Charles’ Law

(C) Ideal Gas Law

(D) Dalton’s Law

Answer: C) Ideal Gas Law

17. What does adiabatic process mean?

(A) No heat exchange

(B) No change in pressure

(C) Constant volume

(D) Constant temperature

Answer: A) No heat exchange

18. In a throttling process, enthalpy:

(A) Increases

(B) Decreases

(C) Remains constant

(D) Is zero

Answer: C) Remains constant

19. Which cycle is used in gas turbines?

(A) Carnot cycle

(B) Otto cycle

(C) Brayton cycle

(D) Diesel cycle

Answer: C) Brayton cycle

20. What is the effect of adding heat to a closed system?

(A) Increase in internal energy or work done

(B) Always increases pressure

(C) Always increases volume

(D) Always increases temperature

Answer: A) Increase in internal energy or work done

21. The efficiency of a Carnot engine is maximum when:

(A) Sink temperature is zero K

(B) Source temperature is zero K

(C) Both are equal

(D) Sink temperature is negative

Answer: A) Sink temperature is zero K

22. The change in entropy during a reversible adiabatic process is:

(A) Maximum

(B) Minimum

(C) Zero

(D) Infinite

Answer: C) Zero

23. Internal energy is a function of:

(A) Temperature only

(B) Pressure only

(C) State only

(D) Process only

Answer: C) State only

24. Work done in an isochoric process is:

(A) Maximum

(B) Minimum

(C) Zero

(D) Infinite

Answer: C) Zero

25. The steam at 100°C is called:

(A) Dry steam

(B) Wet steam

(C) Saturated steam

(D) Superheated steam

Answer: C) Saturated steam

26. Enthalpy is defined as:

(A) Internal energy + PV

(B) Internal energy - PV

(C) PV/Temperature

(D) PV - Internal energy

Answer: A) Internal energy + PV

27. The enthalpy of evaporation at atmospheric pressure is:

(A) 2257 kJ/kg

(B) 100 kJ/kg

(C) 4186 kJ/kg

(D) 500 kJ/kg

Answer: A) 2257 kJ/kg

28. The process of removing heat at constant pressure is called:

(A) Isobaric cooling

(B) Isochoric cooling

(C) Isothermal cooling

(D) Adiabatic cooling

Answer: A) Isobaric cooling

29. What is the gas constant R for air?

(A) 221 J/kg K

(B) 287 J/kg K

(C) 500 J/kg K

(D) 273 J/kg K

Answer: B) 287 J/kg K

30. Boyle's law states:

(A) PV = constant at constant temperature

(B) P/T = constant at constant volume

(C) V = constant at constant pressure

(D) p + 1/v = constant

Answer: A) PV = constant at constant temperature

31. The specific heat at constant pressure for air is approximately:

(A) 1.005 kJ/kg K

(B) 2.05 kJ/kg K

(C) 0.5 kJ/kg K

(D) 2.5 kJ/kg K

Answer: A) 1.005 kJ/kg K

32. Efficiency of a reversible engine can never be:

(A) 100%

(B) Below 0%

(C) More than 100%

(D) Less than Carnot efficiency

Answer: C) More than 100%

33. Polytropic process has the equation:

(A) PV = constant

(B) PV^n = constant

(C) P = constant

(D) V = constant

Answer: B) PV^n = constant

34. A process during which temperature does not change is:

(A) Isobaric

(B) Isochoric

(C) Isothermal

(D) Adiabatic

Answer: C) Isothermal

35. The process when ice melts at 0°C, entropy:

(A) Increases

(B) Decreases

(C) Remains constant

(D) becomes zero

Answer: A) Increases

36. In SI units, the unit of heat is:

(A) kcal

(B) kJ

(C) J

(D) BTU

Answer: C) J

37. The amount of heat required to raise the temperature of 1 kg of water by 1°C is:

(A) 1 kJ

(B) 4.186 kJ

(C) 10 kJ

(D) 100 kJ

Answer: B) 4.186 kJ

38. The internal energy of an ideal gas depends upon its:

(A) Pressure

(B) Temperature

(C) Volume

(D) Density

Answer: B) Temperature

39. The process in which no heat is added or removed from the system is called:

(A) Isothermal

(B) Isochoric

(C) Adiabatic

(D) Isobaric

Answer: C) Adiabatic

40. Which of the following is a path function?

(A) Heat

(B) Temperature

(C) Pressure

(D) Density

Answer: A) Heat

41. The first law of thermodynamics for a cycle can be written as:

(A) Q = W

(B) Q - W = 0

(C) ΔE = Q - W

(D) Q + W = 0

Answer: B) Q - W = 0

42. Isochoric process has:

(A) Constant pressure

(B) Constant volume

(C) Constant temperature

(D) Constant entropy

Answer: B) Constant volume

43. The area under PV diagram represents:

(A) Work done

(B) Heat added

(C) Entropy change

(D) Pressure difference

Answer: A) Work done

44. The law relating volume and temperature of gas is:

(A) Charles' Law

(B) Boyle's Law

(C) Avogadro's Law

(D) Gay-Lussac’s Law

Answer: A) Charles’ Law

45. The phase change from vapor to liquid is called:

(A) Sublimation

(B) Melting

(C) Condensation

(D) Freezing

Answer: C) Condensation

46. The pressure exerted by one mole of an ideal gas at STP is:

(A) 1 atm

(B) 101.325 kPa

(C) 760 mmHg

(D) All of these

Answer: D) All of these

47. An isolated system can exchange:

(A) Only energy

(B) Only matter

(C) Neither energy nor matter

(D) Both energy and matter

Answer: C) Neither energy nor matter

48. For a perfect gas, internal energy is a function of:

(A) Pressure only

(B) Volume only

(C) Temperature only

(D) All of these

Answer: C) Temperature only

49. A Carnot engine working between 500 K and 300 K has efficiency:

(A) 40%

(B) 60%

(C) 30%

(D) 33.33%

Answer: D) 33.33%

50. The universe is an example of:

(A) Open system

(B) Closed system

(C) Isolated system

(D) Steady flow system

Answer: C) Isolated system

51. The process of evaporation is:

(A) Isothermal

(B) Adiabatic

(C) Isobaric

(D) None

Answer: A) Isothermal

52. A heat engine converts:

(A) Mechanical energy to heat

(B) Heat energy to mechanical energy

(C) Work to heat

(D) Heat to cold

Answer: B) Heat energy to mechanical energy

53. The process in which work itself is converted completely into heat is called:

(A) Adiabatic

(B) Isothermal

(C) Joule’s experiment

(D) Isobaric

Answer: C) Joule’s experiment

54. In Rankine cycle, the process of steam generation takes place in:

(A) Boiler

(B) Turbine

(C) Condenser

(D) Pump

Answer: A) Boiler

55. Superheated steam is steam at:

(A) Greater pressure only

(B) Greater volume

(C) Temperature above saturation

(D) None

Answer: C) Temperature above saturation

56. Diesel cycle consists of:

(A) 2 adiabatic + 2 isochoric processes

(B) 2 adiabatic + 2 isobaric processes

(C) 2 isothermal + 2 adiabatic processes

(D) 2 isobaric + 2 isochoric processes

Answer: B) 2 adiabatic + 2 isobaric processes

57. Heat transfer between two bodies can occur when there is:

(A) Difference in pressure

(B) Difference in temperature

(C) Difference in entropy

(D) Mechanism for work

Answer: B) Difference in temperature

58. Specific heat of water at normal atmospheric pressure is:

(A) 4.186 kJ/kg K

(B) 1 kJ/kg K

(C) 0.4 kJ/kg K

(D) 10 kJ/kg K

Answer: A) 4.186 kJ/kg K

59. The process that is reversible and comes back to initial state is called:

(A) Irreversible

(B) Reversible

(C) Polytropic

(D) Cyclic

Answer: D) Cyclic

60. Throttling calorimeter is used to measure:

(A) Pressure

(B) Temperature

(C) Dryness fraction of steam

(D) Enthalpy

Answer: C) Dryness fraction of steam

61. Which of the following cycle offers highest efficiency?

(A) Carnot cycle

(B) Rankine cycle

(C) Otto cycle

(D) Brayton cycle

Answer: A) Carnot cycle

62. Boiling occurs at:

(A) Constant temperature

(B) Variable pressure

(C) Increasing temperature

(D) Decreasing pressure

Answer: A) Constant temperature

63. The efficiency of a Carnot engine is:

(A) Always less than unity

(B) Always more than unity

(C) Always zero

(D) Least possible

Answer: A) Always less than unity

64. The temperature at which water boils is:

(A) 273 K

(B) 373 K

(C) 273°C

(D) 373°C

Answer: B) 373 K

65. An isobaric process in steam power plant is:

(A) Boiler

(B) Pump

(C) Turbine

(D) Condenser

Answer: A) Boiler

66. For a steam engine, the cycle followed is:

(A) Carnot cycle

(B) Rankine cycle

(C) Otto cycle

(D) Brayton cycle

Answer: B) Rankine cycle

67. The value of gas constant for universal gases is:

(A) 8.314 kJ/kg mol K

(B) 287 J/kg K

(C) 0.287 kJ/kg K

(D) 1 kJ/kg K

Answer: A) 8.314 kJ/kg mol K

68. Which is not a gas law?

(A) Boyle's Law

(B) Charles' Law

(C) Newton's Law

(D) Avogadro's Law

Answer: C) Newton's Law

69. The phase change from liquid to vapor is called:

(A) Boiling

(B) Condensation

(C) Fusion

(D) Sublimation

Answer: A) Boiling

70. Heat cannot itself pass from a colder to a hotter body is:

(A) Kelvin-Planck statement

(B) Clausius statement

(C) First law

(D) Zeroth law

Answer: B) Clausius statement

71. Steam is generated in a:

(A) Boiler

(B) Turbine

(C) Engine

(D) Condenser

Answer: A) Boiler

72. The dryness fraction of wet steam varies between:

(A) 0 and 1

(B) 1 and 2

(C) -1 and 0

(D) 1 and infinity

Answer: A) 0 and 1

73. Junker’s calorimeter measures:

(A) Calorific value of fuels

(B) Pressure

(C) Temperature

(D) Humidity

Answer: A) Calorific value of fuels

74. Carnot cycle consists of:

(A) Two isothermal and two adiabatic processes

(B) All isobaric

(C) Three isochoric

(D) All adiabatic

Answer: A) Two isothermal and two adiabatic processes

75. Sensible heat is:

(A) Heat required to change temperature

(B) Heat required for phase change

(C) Heat lost in work

(D) Heat transfer by conduction

Answer: A) Heat required to change temperature

76. The metallic body which is used to transfer heat is called:

(A) Radiator

(B) Absorber

(C) Condenser

(D) Heat Exchanger

Answer: D) Heat Exchanger

77. Most efficient cycle for a reciprocating engine is:

(A) Otto cycle

(B) Diesel cycle

(C) Carnot cycle

(D) Rankine cycle

Answer: C) Carnot cycle

78. Dryness fraction of steam is measured by:

(A) Separating calorimeter

(B) Junker’s calorimeter

(C) Gas calorimeter

(D) Bomb calorimeter

Answer: A) Separating calorimeter

79. If a system absorbs 100 kJ heat and does 40 kJ work, change in internal energy is:

(A) 60 kJ

(B) 140 kJ

(C) 100 kJ

(D) 40 kJ

Answer: A) 60 kJ

80. For an isolated system:

(A) No heat or work crosses boundary

(B) Only heat can cross boundary

(C) Only work can cross boundary

(D) System is always at equilibrium

Answer: A) No heat or work crosses boundary

81. Which one is not an intensive property?

(A) Pressure

(B) Temperature

(C) Volume

(D) Density

Answer: C) Volume

82. The PV diagram for isothermal process is:

(A) Straight line

(B) Parabola

(C) Hyperbola

(D) Circle

Answer: C) Hyperbola

83. Which cycle is used in internal combustion engines?

(A) Brayton cycle

(B) Diesel cycle

(C) Otto cycle

(D) Rankine cycle

Answer: C) Otto cycle

84. The refrigerant commonly used in refrigerator is:

(A) Ammonia

(B) CO_2

(C) Nitrogen

(D) Water

Answer: A) Ammonia

85. The maximum possible work in a cycle is done in:

(A) Carnot cycle

(B) Otto cycle

(C) Diesel cycle

(D) Rankine cycle

Answer: A) Carnot cycle

86. The process used for liquefying air is:

(A) Joule-Thomson process

(B) Carnot process

(C) Brayton process

(D) Otto process

Answer: A) Joule-Thomson process

87. Freezing point of water is:

(A) 0°C

(B) 100°C

(C) 273 K

(D) Both A and C

Answer: D) Both A and C

88. Work done in adiabatic process is:

(A) PV

(B) ΔU

(C) Q

(D) Change in enthalpy

Answer: B) ΔU

89. The unit of gas constant is:

(A) J/kg K

(B) J/K

(C) kJ/kg K

(D) BTU/kg K

Answer: A) J/kg K

90. Carnot efficiency depends on:

(A) Difference in temperature

(B) Ratio of temperature

(C) Amount of fuel

(D) Working substance

Answer: B) Ratio of temperature

91. Which process occurs in compressor of ideal gas turbine cycle?

(A) Isothermal compression

(B) Adiabatic compression

(C) Isobaric compression

(D) Isochoric compression

Answer: B) Adiabatic compression

92. Boyle temperature is the temperature at which:

(A) Real gases behave like ideal gases

(B) Gases liquefy

(C) Gases solidify

(D) Gases boil

Answer: A) Real gases behave like ideal gases

93. The absolute pressure is always:

(A) Equal to gauge pressure

(B) Less than atmospheric pressure

(C) Greater than gauge pressure

(D) Negative

Answer: C) Greater than gauge pressure

94. Heat engine operates between source and sink. Work output is:

(A) Equal to heat absorbed

(B) Less than heat absorbed

(C) Greater than heat absorbed

(D) Zero

Answer: B) Less than heat absorbed

95. An isolated system exchanges:

(A) Only heat

(B) Only work

(C) Neither heat nor work

(D) Both heat and work

Answer: C) Neither heat nor work

96. In a cyclic process, change in internal energy is:

(A) Zero

(B) Equal to heat supplied

(C) Equal to work done

(D) Equal to pressure change

Answer: A) Zero

97. When a substance changes from liquid to vapor, entropy:

(A) Increases

(B) Decreases

(C) Zero

(D) Negative

Answer: A) Increases

98. Absolute zero refers to:

(A) 0°C

(B) -273°C

(C) 273 K

(D) 100 K

Answer: B) -273°C

99. The heat supplied to change solid to liquid is called:

(A) Latent heat of fusion

(B) Latent heat of vaporization

(C) Sensible heat

(D) Superheat

Answer: A) Latent heat of fusion

100. The value of Universal Gas Constant R is:

(A) 8.314 J/mol K

(B) 2.87 J/mol K

(C) 1.00 J/mol K

(D) 287 J/kg K

Answer: A) 8.314 J/mol K

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