Thermodynamics Objective Questions

12. 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
Ans (a) Absolute pressure=Gauge pressure + Atmospheric pressure

13. The standard value of atmospheric pressure taken at sea level is
(a) 1.013 bar
(b) 760 mm of Hg
(c) 1013 x $10^{2}$ N/m
(d) all of the
Ans (d) all of the

14. The value of one bar (in S. I. units) is equal to

(a) 1 x $10^2$ N/m²
(b) 1 x $10^3$ N/m²
(c) 1x $10^4$ N/m²
(d) (c) 1x $10^5$ N/m²
Ans(d) 1x $10^5$ N/m²

15. The value of 1 mm of Hg is equal to
(a) 1.333 N/m²
(b) 13.33 N/m²
(c ) 133.3 N/m²
(d) 1333 N/m²
Ans (c ) 133.3 N/m²

16. The reading of the pressure gauge fitted on a vessel is 25 bar. The atmospheric pressure is 1.03 bar and the value of "g' is 9.81 m/s². The absolute pressure in the vessel is

(a) 23.97 bar
(b) 25 bar
(c) 26.03 bar
(d) 34.81 bar

Ans (c) 26.03 bar

20. One kilowatt is equal to
(a) 1 N-m/s
(b) 100 N-m
(c) 1000 N-m/s
(d) 1 x $10^6$ N-m/s
Ans(c) 1000 N-m/s

21. One Joule (J) is equal to
(a) 1 N-m
(b) 1 kN-m
(c) 10 N-m/s
(d) 10 kN-m/s
Ans(a) 1 N-m

22. The specific heat of water is
(a) 1.817
(b) 2.512
(c) 4.187
(d) none of these
Ans(c) 4.187

24 The heat and mechanical energies are mutually convertible. This statement was established by
(a) Boyle
(b) Charles
(c) Joule
(d) none of these
Ans(c) Joule

25 Which of the following statement is correct?
(a) The heat and work are boundary phenomena.
(b) The heat and work represent the energy crossing
(c) The heat and work are path functions.
(d) all of the above
Ans(d) all of the above

26 When two bodies are in thermal equilibrium with a third body, they are also in thermal equilibrium with each other. This statement is called
(a)Zeroth law of thermodynamics
(b) First law of thermodynamics

(c) Second law of thermodynamics
(d) Kelvin Planck's law
Ans(a)Zeroth law of thermodynamics

27. First law of thermodynamics deals with
(a) conservation of heat
(b) conservation of momentum
(c) conservation of mass
(d) conservation of energy
Ans (d) conservation of energy

30. Kelvin-Planck's law deals with
(a) conservation of work
(b) conservation of heat
(c) conversion of heat into work
(d) conversion of work into heat
Ans(c) conversion of heat into work

32. The measurement of a thermodynamic property known as temperature is based on
(a) Zeroth law of thermodynamics
(b) First law of thermodynamics
(c) Second law of thermodynamics
(d) none of these
Ans(a) Zeroth law of thermodynamics

36. Which of the following statement is correct according to Clausis statement of second law of thermodynamics?
(a) It is possible 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
Ans(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.

37. 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 soleis to convert heat energy into work
(b) it is possible to construct an engine working on a cyclic process, whose sole to convert heat energy into work

(c) it is impossible to construct a device which operates in a cycle process and prod effect other than the transfer of heat from a cold body to a hot body
(d) none of the above
Ans(a) it is impossible to construct an engine working on a cyclic process, whose sole is to convert heat energy into work

39. The heat flows from a cold body to a hot body with the aid of an external source. The statement is given by
(a) Kelvin
(b) Joule
(c) Clausis
(d) Gay-Lussac
Ans(c) Clausis

44. 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
Ans(b) perfect gas

46. The behaviour of super-heated vapour is similar to that of
(a) perfect gas
(b) air
(c) steam
(d) ordinary gas
Ans(a) perfect gas

47. The variables which control the physical properties of a perfect gas are
(a) pressure exerted by the gas
(b) volume occupied by the gas
(c) temperature of the gas
(d) all of these
Ans(d) all of these

48. The behaviour of a perfect gas, undergoing any change in the variables which control physical properties, is governed by
(a) Boyle's law
(b) Charles' law
(c) Gay-Lussac law

(d) all of these
Ans(d) all of these

51. All perfect gases change in volume by 1/273th of its original volume at 0°C for every 1°C change in temperature, when the pressure remains constant. This statement is called
(a) Boyle's law
(b) Charles' law
(c) Gay-Lussac law
(d) Joule's law
Ans(b) Charles' law

53. The ..... states that change of internal energy of a perfect gas is directly proportional to the change of temperature.
(a) Boyle's law
(b) Charle's law
(c) Gay-Lussac law
(d) Joule's law
Ans(d) Joule's law

55. For a perfect gas, according to Boyle's law
(a) pv = constant, if T is kept constant
(b) v/T = constant, if p is constant
(c) p/T = constant, if v is kept constant
(d) T/p = constant, if v is kept constant
Ans(a) pv = constant, if T is kept constant

56. Select the correct statement as per Charles' law
(a) p.v = constant, if T is kept constant
(b) v/T = constant, if p is kept constant
(b) v/T = constant, if p is kept constant
(d) T/p = constant, if v is kept constant
Ans(b) v/T = constant, if p is kept constant

58. The temperature at which the volume of a gas becomes zero is called
(a) absolute scale of temperature
(b) absolute zero temperature
(c) absolute temperature
(d) none of these
Ans(b) absolute zero temperature

62. Charles law states that all perfect gases change in volume by .....of its original volume at 0° C for every 1°C change in temperature, when pressure remains constant
(a) 1/27th
(b) 1/93th
(c) 1/173th
(d)1/ 273th
Ans(d)1/ 273th

65. The value of gas constant (R) in S. I. units is

(a) 0.287J/kg K
(b) 2.87J/kg K
(c) 28.7J/kg K
(d) 287J/kg K
Ans(d) 287J/kg K

66. According to Avogadro's law
(a) the product of the gas constant and the molecular mass of an ideal gas is constant
(b) the sum of partial pressure of the mixture of two gases is sum of the two
(c) equal volumes of all gases, at the same temperature and pressure, contain equal number of molecules
(d) all of the above
Ans(c) equal volumes of all gases, at the same temperature and pressure, contain equal number of molecules

67. The molecular mass expressed in gram (i.e.1g-mole) of all gases, at N. T. P., occupies a volume of
(a) 0.224 litres
(b) 2.24 litres
(c) 22.4 litres
(d) 224 litres
Ans(c) 22.4 litres

68. Which of the following gas has a minimum molecular mass?
(a) Oxygen
(b) Nitrogen
(C) Hydrogen
(d) Methane
Ans (C) Hydrogen

69. According to Avogadro's law, the density of any two gases is ..... their molecular mass if the gases are at the same temperature and pressure,

(a) equal to
(b) directly proportional to
(c) inversely proportional to
(d) none of the above
Ans(b) directly proportional to

70. The universal gas constant (or molar constant) of a gas is the product of
(a) molecular mass of the gas and the gas constant
(b) atomic mass of the gas and the gas constant
(c) molecular mass of the gas andthe specific heat at constant pressure
(d) molecular mass of the gas and the specific heat at constant volume
Ans (a) molecular mass of the gas and the gas constant

71. In S. 1. units, the value of the universal gas constant is

(a) 8.314J/kg mole-K
(b) 83.14J/kg mole-K
(c) 831.4J/kg mole-K
(d) 8314 J/kg mole- K
Ans(d) 8314 J/kg mole- K

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3.
73. The amount of heat required to raise the temperature of the unit mass of gas through one degree at constant volume, is called
(a) specific heat at constant volume
(b) specific heat at constant pressure
(c) kilo Joule
(d) none of these
Ans(a) specific heat at constant volume

74.The amount of heat required to raise the temperature of 1 kg of water through one kelvin is called

(a) specific heat at constant volume
(b) specific heat at constant pressure
(c) kilo-Joule
(d) none of these
Ans(a) specific heat at constant volume

76. The specific heat atconstant volume is
(a) the amount of heat required to raise the temperature of unit mass of gas through one degree, at constant pressure
(b) the amount of heat required to raise the temperature of unit mass of gas through one degree, at constant volume
(c) the amount of heat required to raise the temperature of 1 kg of water through one degree
(d) any one of the above
Ans(b) the amount of heat required to raise the temperature of unit mass of gas through one degree, at constant volume

78. When the gas is heated at constant volume, 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) all of these
Ans (a) increases the internal energy of the gas
(b) increases the temperature of the gas

79. 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) all of these
Ans (b) increases the temperature of the gas
(C) does some external work during expansion

81. The amount of heat required to raise the temperature of……. water through one degree is called kilojoule.
(a) 1 g
(b) 10 g
(c) 100 g
(d) 1000g
Ans (d) 1000g

83. The ratio of specific heat at constant pressure and specific heat at constant volume is always……one.
(a) equal to
(b) less than
(c) Greater than
(d) none of these
Ans (c) Greater than

84. The heat supplied to the gas at constant volume is
(a) $mR(T_2-T_1)$
(b) $mc_v (T_2-T_1)$
(c) $mc_p (T_2-T_1)$

(c) $mc_p (T_2+T_1)$

Ans (b) $mc_v (T_2-T_1)$

85. The sum of internal energy (U) and the product of pressure and volume (p. V) is known as

(a) workdone
(b) entropy
(c) enthalpy
(d) none of these
Ans (c) enthalpy

86. The volumetric or molar specific heat at constant pressure is the product of
(a) molecular mass of the gas and the specific heat at constant volume
(b) atomic mass of the gas and the gas constant
(c) molecular mass of the gas and the gas constant
(d) none of the above
Ans (d) none of the above

87. The ratio of specific heat at constant pressure ($c_p$) and specific heat at constant volume ($c_v$) is
(a) equal to one
(b) less than one
(c) greater than one
(d) none of these
Ans (c) greater than one

88. The general gas energy equation is
(a) $Q_{1-2}=dU+W_{1-2}$
(b) $Q_{1-2}=dU-W_{1-2}$
(c) $Q_{1-2}=dU/W_{1-2}$
(d) $Q_{1-2}=dUxW_{1-2}$
Ans (a) $Q_{1-2}=dU+W_{1-2}$

90. Relation between $c_p$ and $c_v$ is given by
(a) $c_v/_c p=R$
(b) $c_p-c_v= R$
(c) $c_v =R/(\gamma-1)$
(d) all of the above
Ans (b) $c_p-c_v= R$
(c) $c_v =R/(\gamma-1)$

91. 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
Ans (b) difference of two specific heats

92. The value of $c_p/c_v$ for air is
(a) 1
(b) 1.4
(c) 1.8
(d) 2.3
Ans (b) 1.4

94. When a system changes its state from one equilibrium state to another equilibrium state, then the path of successive states through which the system has passed, is known as
(a) thermodynamic law
(b) thermodynamic process
(c) thermodynamic cycle
(d) none of these
Ans (b) thermodynamic process

95 The processes occurring in open system which permit the transfer of mass to and from the system, are known as
(a) flow processes
(b) non-flow processes
(c) adiabatic processes
(d) none of these
Ans (a) flow processes

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

(a) Isochoric process
(b) Isobaric process
(c) Hyperbolic process
(d) all of these
Ans (d) all of these

100. The heat energy stored in the gas and used for raising the temperature of the gas is known
(a) external energy
(b) internal energy
(c) kinetic energy
(d) molecular energy
Ans (b) internal energy

101. When a gas is heated, change takes place in
(a) pressure
(b) volume
(c) temperature
(d) all of these
Ans (d) all of these

102. When a gas is heated at constant volume

(a) its temperature will increase
(b) its pressure will increase
(c) both temperature and pressure will increase
(d) neither temperature nor pressure will increase
Ans (c) both temperature and pressure will increase

103. When a gas is heated at constant pressure

(a) its temperature will increase
(b) its volume will increase
(c) both temperature and pressure will increase

(d) neither temperature not volume will increase
Ans (c) both temperature and pressure will increase
104 The heating of gas at constant volume is governed by

(a) Boyle's law
(b) Charles law
(c) Gay-Lussac law
(d) Avogadro's law
Ans (c) Gay-Lussac law

105. The heating of a gas at constant pressure is governed by
(a) Boyle's law
(b) Charles' law
(c) Gay-Lussac law
(d) Avogadro's law
Ans (b) Charles' law

106. When gas is heated at constant pressure, the heat supplied is utilized in

(a) increasing the internal energy of gas
(b) doing some external work
(c) increasing the internal energy of gas and also for doing some external work
(d) none of the above
Ans: (c) increasing the internal energy of gas and also for doing some external work

108. The gas constant (R) is equal to the……. of two specific heats
(a) sum
(b) difference
(c) product
(d) ratio
Ans: (b) difference

110. When the gas is cooled at constant pressure,

(a) its temperature increases but volume decreases
(b) its volume increases but temperature decreases
(c) both temperature and volume increases
(d) both temperature and volume decreases
Ans: (d) both temperature and volume decreases

111. A process, in which the gas is heated or expanded in such a way that the product of its pressure and volume remains constant, is called

(a) isothermal process
(b) hyperbolic process
(c) adiabatic process
(d) polytropic process
Ans: (b) hyperbolic process

112. The hyperbolic process is governed by
(a) Boyle's law
(b) Charles' law
(c) Gay-Lussac law
(d) Avogadro's law
Ans (a) Boyle's law

113. A process, in which the temperature of the working substance remains constant during its expansion or compression, is called
(a) isothermal process
(b) hyperbolic process
(c) adiabatic process
(d) polytropic process
Ans (a) isothermal process

116. In an isothermal process,

(a) there is no change in temperature
(b) there is no change in enthalpy
(c) there is no change in internal energy
(d) all of these
Ans (d) all of these

117. An isothermal process is governed by
(a) Boyle's law
(b) Charles' law

(c) Gay-Lussac law
(d) Avogadro's law
Ans (a) Boyle's law

118. The expansion ratio (r) is the ratio of

(a) $v_1/v_2$
(b) $v_2/v_1$
(c) $v_1+v_2/v_1$
(d) $v_1+v_2/v_2$
Ans (b) $v_2/v_1$

119. A process, in which the working substance neither receives nor gives out heat to itssurroundings during its expansion or compression, is called
(a) isothermal process
(b) hyperbolic process
(c) adiabatic process
(d) polytropic process
Ans (c) adiabatic process

123.When the expansion or compression takes place according to the law $pv^n = C$, the process is known as
(a) isothermal process
(b) adiabatic process
(c) hyperbolic process
(d) polytropic process
Ans (d) polytropic process

124. An adiabatic process is one
(a) no beat enters or leaves the gas
(b) the temperature of the gas changes
(c) the change in internal energy is equal to the mechanical work done
(d) all of the above
Ans (d) all of the above

125. The heat absorbed during a polytropic process is

(a) $\frac{\gamma - n}{\gamma - 1}$ xWorkdone
(b) $\frac{\gamma - n}{\gamma - 1} X \frac{p_1 v_1 - p_2 v_2}{(n-1)}$

(c) $\frac{\gamma - n}{\gamma - 1} X \frac{mR(T_1 - T_2)}{(n-1)}$

(d) all of these

Ans (d) all of these

126. The polytropic index (n) is given by

(a) $\frac{\log(p_1 p_2)}{\log(v_1 v_2)}$

(b) $\frac{\log(p_2 / p_1)}{\log(v_1 / v_2)}$

(c) $\frac{\log(v_1 / v_2)}{\log(p_1 / p_2)}$

(d) $\log(\frac{p_1 v_1}{p_2 v_2})$

Ans: (b) $\frac{\log(p_2 / p_1)}{\log(v_1 / v_2)}$

129. In a free expansion process,

(a) $W_{1\text{-}2}=0$

(b) $Q_{1\text{-}2}=0$

(c) dU=0

(d) all of these

Ans: (d) all of these

132. In a reversible adiabatic process, the ratio of $T_1/T_2$ is equal to

(a) $(p_2/p_1)^{\gamma^{-1}/\gamma}$

(b) $(p_1/p_2)^{\gamma^{-1}/\gamma}$

(c) $(v_2/v_1)^{\gamma^{-1}/\gamma}$

(d) $(v_1/v_2)^{\gamma^{-1}/\gamma}$

Ans: (b) $(p_1/p_2)^{\gamma^{-1}/\gamma}$

135. The process is adiabatic, if the value of n in the equation$pv^n=C$, is

(a) 0

(b) 1

(c) γ

(d) ∞

Ans (c) γ