PHYSICS

BOOKS - TARGET PHYSICS (HINGLISH)

KINETIC THEORY OF GASES AND RADIATION

Classical Thinking

1. A gas is not an ideal gas

A. in which there is impurity

B. which does not obey Boyle's law and Charles's law.

C. whose molecules are not point masses

D. whose molecules interact with each other

Answer: B

Watch Video Solution

2. Ideal gas equation strictly obeys gas laws under all conditions of

A. pressure only

B. volume only

C. temperature only

D. temperature and pressure

Answer: D

Watch Video Solution

3. A gas behaves more closely as an ideal gas at

A. low pressure and low temperature

B. low pressure and high temperature

C. high pressure and low temperature

D. high pressure and high temperature

Answer: B

Watch Video Solution

4. The product of the pressure and volume of an ideal gas is

A. a constant

B. approximately equal to the universal gas constant

C. directly proportional to its temperature

D. inversely proportional to its temperature

Answer: C

Watch Video Solution

5. In the relation n $= \frac{PV}{RT}$,n is

A. number of molecules

B. atomic number

C. mass number

D. number of moles

Answer: D

Watch Video Solution

6. The dimensions of universal gas constant is

A. $\left[M^{1}L^{2}T^{-2}K^{-1}mol^{-1}\right]$

B. $\left[M^{2}L^{1}T^{-2}K^{-1}mol^{-1}\right]$

C. $\left[M^{1}L^{1}T^{-2}K^{-1}mol^{-1}\right]$

D. $\left[M^{2}L^{2}T^{-2}K^{-1}mol^{-1}\right]$

Answer: A

Watch Video Solution

7. In the equation $\frac{PV}{4}$=RT, V represents

A. volume of container

B. volume of one mole of a gas

C. volume of 4 mole of a gas

D. volume of $\frac{1}{4}$ mole of a gas

Answer: C

Watch Video Solution

8. In the gas equation PV = nRT, the value of universal gas constant would depend only on

A. the nature of the gas

B. the temperature of the gas

C. pressure of the gas

D. the units of measurement

Answer: D

Watch Video Solution

9. Which of the following gases behaves like are ideal gas?

A. CO_2 at normal temperature and pressure

B. O_2 at $250^\circ C$ and 5 atmospheric pressure.

C. H_2 at $-250^\circ C$ and 5 mm of Hg pressure

D. He at 25° C and 5 mm of Hg pressure

Answer: D

Watch Video Solution

10. Which of the following graphs represent the behaviour of an ideal gas ?

A.

B.

C.

D.

Answer: B

Watch Video Solution

11. Kinetic theory of gases proves .

A. Charles' law

B. Boyle's law

C. Charles's law and Boyle's law

D. Grahm's law

Answer: C

Watch Video Solution

12. According to the kinetic theory of matter, a molecule is the smallest particle of a substance and it possesses

A. all the properties of the substance

B. particular properties of the substance

C. none of the properties of the substance

D. the properties of inert gases

Answer: A

Watch Video Solution

13. According to the kinetic theory of gases, at absolute temperature

A. water freezes

B. liquid helium freezes

C. molecular motion stops

D. liquid hydrogen freezes

Answer: C

Watch Video Solution

14. Molecules of a gas behave like

A. inelastic rigid sphere

B. perfectly elastic rigid sphere

C. inelastic non-rigid sphere

D. perfectly elastic non-rigid sphere

Answer: B

Watch Video Solution

15. Collisions in an ideal gas are assumed to be

A. perfectly elastic

B. inelastic

C. imaginary

D. cannot be defined

Answer: A

Watch Video Solution

16. According to kinetic theory of gases, which one of the following statements is INCORRECT?

A. Real gas behaves as ideaal gas at high temperature and low temperature

B. Liquid state of ideal gas is impossible

C. There is an elastic collision between gas molecules an walls of the container

D. The molecules of real gas do not exert any force on one another

Answer: D

Watch Video Solution

17. Which of the following statements is NOT in accordance with kinetic theory of gases?

A. Molecules are point masses

B. Momentum is conserved in collisions

C. Molecules do not posses potential energy

D. Collisions with walls of container are inelastic

Answer: D

Watch Video Solution

18. Which of the follqwing laws is NOT derivable from kinetic theory of gases?

A. Joule's law

B. Boyle's law

C. Grahm's law

D. Charles's law

Answer: A

Watch Video Solution

19. Which of the following experiments does NOT suggest that molecules are always in state of motion?

A. Diffusion

B. Expansion of gases

C. Evaporation and vapour pressure

D. Interference

Answer: D

Watch Video Solution

20. Which of the following statements about kinetic theory of gases is wrong?

A. The molecules of a gas are in continuous

B. The molecules continously undergo inelastic collisions

C. The molecules do not interact with each other except during collisions

D. the collisions amongst the molecules are of short duration

Answer: B

Watch Video Solution

21. In kinetic theory of gases, it is assumed that molecular collisions are

A. inelastic

B. for negligible duration

C. one dimensional

D. unable to exert mutual force

Answer: B

Watch Video Solution

22. The collisions between the molecules among themselves and with walls of a container are

A. perfectly elastic in which only momentum is conserved

B. perfectly elastic in which momentum and energy both are conserved

C. perfectly elastic in which momentum energy and velocity is conserved

D. responsible for P.E. of gas

Answer: B

Watch Video Solution

23. The postulates of kinetic theory will be true if the number of molecules is

A. quantum number

B. very large

C. very small

D. Avogadro's number

Answer: B

Watch Video Solution

24. According to the kinetic theory of gases, total energy of a gas is equal to

A. potential energy

B. kinetic energy

C. both (A) and (B)

D. gravitational P.E

Answer: B

Watch Video Solution

25. According to kinetic theory of gas, the average kinetic energy of a gas molecule can be determined by knowing

A. the number of molecules in the gas only

B. the pressure of the gas only

C. the temperature of the gas only

D. none of the above

Answer: C

Watch Video Solution

26. The wrong statement according to the kinetic theory of gases is

A. there is loss of kinetic energy of molecules on striking the wall

B. the potential energy of ideal gases is zero

C. the molecules are in random motion

D. gas molecules are solid spherical point masses

Answer: A

Watch Video Solution

27. According to kinetic theory of gases, at a given temperature,

A. lighter molecules will have less average kinetic energy

B. lighter molecules will have more average kinetic energy

C. all molecules have same kinetic energy

D. lighter molecules will have only potential energy

Answer: C

Watch Video Solution

28. The distance travelled by a molecule between two successive collisions is called as

A. mean free path

B. free path

C. path length

D. range

Answer: B

Watch Video Solution

29. The mean free path of a gas varies with the density of gas according to the following relation:

A. $\lambda \propto \rho$

B. $\lambda \propto \sqrt{\rho}$

C. $\lambda \propto \frac{1}{\rho}$

D. $\lambda \propto \rho^2$

Answer: C

Watch Video Solution

30. At constant pressure mean free path of ideal gas $\lambda \propto T^x$. Hence, 'x' is :

A. $\lambda \propto T$

B. $\lambda \propto \frac{1}{T}$

C. $\lambda \propto \sqrt{T}$

D. $\lambda \propto \frac{1}{\sqrt{T}}$

Answer: A

Watch Video Solution

31. The average of the square values of the velocity of gaseous molecules is called

A. mean velocity

B. root mean square velocity

C. mean square velocity

D. most probable velocity

Answer: C

Watch Video Solution

32. The ratio of R.M.S. velocity of air molecules at S. T. P. and velocity of sound in air at S. T. Pis about (y = 1.41 for air)

A. 1.53

B. 1.46

C. 1

D. 1.48

Answer: B

Watch Video Solution

33. On colliding in in a closed container the gas molecules

A. transfer momentum to the walls

B. lose their momentum completely

C. move in opposite directions

D. perform Brownian motion

Answer: A

Watch Video Solution

34. The pressure exerted by a gas is proportionai to

A. velocity

B. mean square velocities

C. R.M.S of velocity

D. average velocity

Answer: B

Watch Video Solution

35. According to kinetic theory of gases, the pressure exerted by the gas on the walls of the container is measured as

A. momentum imparted to the walls per second per unit area

B. momentum imparted to the walls per unit area

C. change in momentum imparted to the walls per unit area

D. momentum imparted to the walls per second

Answer: A

Watch Video Solution

36. At N.T.P., the R.M.S velocity of hydrogen molecule is ($P = 1.013 \times 10^5 N / m^2$, Density of hydrogen $= 0.09 kg / m^3$)

A. 1640 m/s

B. 1738 m/s

C. 1838 m/s

D. 1938 m/s

Answer: C

Watch Video Solution

37. The molecular weighs of oxygen and hydrogen are 32 and 2 respectively. The root mean square velocities of oxygen and hydrogen at NTP are in the ratio

A. $4:1$

B. $1:16$

C. $16:1$

D. $1:4$

Answer: D

Watch Video Solution

38. The density of a gas is $6 \times 10^{-2} kg / m^3$ and the root mean square velocity of the gas molecules is 500 m/s. The pressure exerted by the gas on the walls of the vessel is

A. $5 \times 10^3 N / m^2$

B. $1.2 \times 10^{-4} N / m^2$

C. $0.83 \times 10^{-4} N / m^2$

D. $30N/m^2$

Answer: A

Watch Video Solution

39. Number of molecules in lO0 cc of a gas at I 47. N.T.P. is ___ . if mass of each molecule is 4.556×10^{-25}kg and R.M.S speed is 350m/s.

A. 5.4×10^{19}

B. 5.4×10^{21}

C. 5.4×10^{18}

D. 5.4×10^{23}

Answer: D

Watch Video Solution

Watch Video Solution

40. Accodring to Boyle's law, the product of pressure and volume is a constant. Hence,

A. PV

B. TV

C. $\frac{V}{T}$

D. $\frac{P}{T}$

Answer: A

Watch Video Solution

41. For the Boyle's law to hold good, the necessary condition is

A. perfect and of constant mass and temperature

B. perfect and of constant temperature but of variable mass

C. real and of constant mass and temperature

D. real and of constant temperature but of variable mass

Answer: A

Watch Video Solution

42. The necessary condition for validity of Boyle's law is

A. isothermal

B. isobaric

C. adiabatic

D. circle

Answer: A

Watch Video Solution

43. Under constant temperature, graph between P and 1/V is a

A. parabola

B. hyperbola

C. straight line

D. circle

Answer: C

Watch Video Solution

44. We write the relation for Boyle's law in the form, $PV = K_B$ when the temperature remains constant. In this relation, the magnitude of K_B depends upon the

A. nature of the gas used in the experiment

B. magnitude of g in the laboratory

C. quantity of the gas enclosed

D. atomospheric pressure

Answer: C

Watch Video Solution

45. Kinetic energy per unit volume of a gas is

A. $\frac{3P}{2}$

B. $\frac{2P}{3}$

C. $\frac{P}{2}$

D. $\frac{P}{3}$

Answer: A

Watch Video Solution

46. The temperature of a gas is due to

A. the potential energy of its molecules

B. the kinetic energy of its molecules

C. the attractive force between its molecules

D. the repulsive force between its molecules

Answer: B

Watch Video Solution

47. $H_2, O_2, N_2$and He are enclosed in identical containers under the similar conditions of pressure and temperature. The gases will have (A) same R.M.S. speed

A. same R.M.S speed

B. same $\frac{K.E}{kg}$

C. different $\frac{K.E}{\text{mole}}$

D. same$\frac{K.E}{vol}$

Answer: D

Watch Video Solution

48. Kinetic energy of a gram molecule of the gas is

A. $\frac{1}{2}$RT

B. $\frac{3}{2}$RT

C. RT

D. $\frac{5}{2}$RT

Answer: B

Watch Video Solution

49. The translatory internal energy of a gas per gram is

A. $\frac{3}{2}\frac{RT}{N}$

B. $\frac{3}{2}\frac{RT}{M}$

C. $\frac{3}{2}RT$

D. $\frac{3}{2}NKT$

Answer: B

Watch Video Solution

50. For a diatomic gas, the total kinetic energy per gram molecule is

A. $\frac{3RT}{2}$

B. $\frac{4}{2}(RT)$

C. $\frac{5RT}{2}$

D. $\frac{6RT}{2}$

Answer: C

Watch Video Solution

51. Total random kinetic energy of the molecules in 1 mole of a gas at a temperature of 300 K is (R = 2 cal/mole °C)

A. 900 cal

B. 450 cal

C. 2250 cal

D. 600 cal

Answer: A

Watch Video Solution

52. The energy of a gas/litre is 300 joule, then its pressure will be

A. $3 \times 10^5 N / m^2$

B. $6 \times 10^5 N / m^2$

C. $10^5 N / m^2$

D. $2 \times 10^5 N / m^2$

Answer: D

Watch Video Solution

53. Temperature of an ideal 'gas whose molecules have average kinetic energy 1 e V is

A. 3590 K

B. 7730 K

C. 4460 K

D. 5197 K

Answer: B

Watch Video Solution

54. The R.M.S. velocity of the molecules in a gas at 27 °C is 300 m/s. The R.M.S. velocity of the molecules in the same gas at 927 °C is

A. 1200 m/s

B. 600 m/s

C. 150 m/s

D. 75 m/s

Answer: B

Watch Video Solution

55. A steel tank holds 0.2 m^3 of air at a pressure of 5 atm. The volwne of air that would occupy at the same temperature but at a pressure l atm is

A. $0.2m^3$

B. $1m^3$

C. $5m^3$

D. 10^5m^3

Answer: B

Watch Video Solution

56. Two gases A and B having the same temperature T, same pressure P and same volume V are mixed. If the mixture is at the same temperature and occupies a volume V. The pressure of the mixture is

A. P/2

B. P

C. 2P

D. 4P

Answer: C

Watch Video Solution

57. For a given mass of gas, velocities of all the molecules are ____ even when bulk parameters like pressure, volume and temperature are fixed.

A. not same

B. always same

C. sometimes

D. fixed

Answer: A

Watch Video Solution

58. Maxwell distribution is true when

A. system contain single object

B. system contains two objects

C. system is empty

D. system contains large number of objects

Answer: D

Watch Video Solution

59. The energy associated with each degree of freedom of a molecule

A. $\frac{1}{2}Mc_{rms}^2$

B. k_BT

C. $\frac{k_BT}{2}$

D. $\frac{k_BT}{3}$

Answer: C

Watch Video Solution

60. In a monatomic gas, total degrees of freedom are due to

A. translational motion

B. rotational motion

C. vibrational motion

D. oscillation motion

Answer: A

Watch Video Solution

61. The number of degrees of freedom of molecules of argon gas is

A. 1

B. 2

C. 3

D. 6

Answer: C

Watch Video Solution

62. Degrees of freedom of a monatomic gas due to its rotational motion will be

A. 3

B. 5

C. 0

D. 6

Answer: C

Watch Video Solution

63. Total degrees of freedom of one molecule of a diatomic gas at normal temperature is

A. 5

B. 3

C. 7

D. 4

Answer: A

Watch Video Solution

64. The degrees of freedom of a triatomic gas is

A. 2

B. 4

C. 6

D. 8

Answer: C

Watch Video Solution

65. A cylinder rolls without slipping down an inclined plane, the number of degrees of freedom it has, is

A. 2

B. 3

C. 5

D. 1

Answer: A

Watch Video Solution

66. Degrees of freedom of hydrogen and ozone gases will be respectively

A. 3 and 5

B. 5 and 6

C. 6 and 5

D. 5 and 3

Answer: B

Watch Video Solution

67. A polyatomic gas with (n) degress of freedom has a mean energy per molecule given by.

A. $\frac{nk_BT}{N}$

B. $\frac{nk_BT}{2N}$

C. $\frac{nk_BT}{2}$

D. $\frac{3nk_BT}{2}$

Answer: C

Watch Video Solution

68. Ratio of molecular specific heats of a diatomic gas will be

A. 1.4

B. 1.33

C. 1.67

D. 2.4

Answer: A

Watch Video Solution

69. At same temperature and pressure of an ideal gas

A. the molar specific heat at constant pressure is the same for the all gases

B. the molar specific heat at constant volume is the same for all gases.

C. the ratio of the molar specific heats at constant volume and at constant pressure is the same for all gases

D. the difference between the molar specific heats at constant pressure and at constant volume is the same for all gases

Answer: D

Watch Video Solution

70. Dimensions of specific heat are

A. $\left[M^0 l^2 t^{-2} \theta^1\right]$

B. $M^0 l^2 t^{-2} \theta^{-1}]$

C. $\left[M^1 L^2 t^{-2} \theta^1\right]$

D. $\left[M^1 L^2 t^{-2} \theta^{-2}\right]$

Answer: B

Watch Video Solution

71. Specific heat is defined as the heat required to raise the temperature of 1 kg substance through 1 K. The unit of specific heat in S.I is

A. J kg K

B. J kg^{-1} K

C. J $kg^{-1}K^{-1}$

D. $J^{-1}kgK$

Answer: C

Watch Video Solution

72. The specific heat at constant pressure is greater than that for the same gas at constant volume because

A. at constant pressure, work is done in expanding the gas

B. at constant volume, work is done in expanding the gas

C. the molecular attraction increases more at constant pressure

D. the molecular vibration increases more at constant pressure

Answer: A

Watch Video Solution

73. If specific heat of a substance is infinite, it means

A. heat is given out

B. heat is taken in

C. no change in temperature whether heat is taken in or or given out

D. change in temperature is infinite

Answer: C

Watch Video Solution

74. At constant volume, for different diatomic gases, the molar specific heat

A. is same and 3 cal/$mol^{\circ}C$ approximately

B. is same and its value is 4 cal/$mol^{\circ}C$.

C. will be totally different

D. are approximately equal and its value is 5 cal/$mol^{\circ}C$

Answer: D

Watch Video Solution

75. During melting process, the heat given to a solid is used in (generally)

A. increasing the temperature

B. increasing the density of the material

C. increasing the potential energy of the molecules

D. increasing the kinetic energy of the molecules

Answer: C

Watch Video Solution

76. Molar specific heat at constant volume C_v for a monatomic gas is

A. $\frac{3}{2}$R

B. $\frac{5}{2}$R

C. 3R

D. 2R

Answer: A

Watch Video Solution

77. What is the value of $\frac{R}{C_v}$ for diatomic gas?

A. $\frac{2}{5}$

B. $\frac{3}{5}$

C. $\frac{2}{7}$

D. $\frac{5}{7}$

Answer: C

Watch Video Solution

78. For hydrogen gas $C_p - C_v = a$ and for oxygen gas $C_p - C_v = b$,C_p and C_v being molar specific heats. The relation between a and b is

A. a=16b

B. b=16a

C. a=4b

D. a=4b

Answer: D

Watch Video Solution

79. Given the , $C_p - C_v = R$ and $\gamma = \frac{C_p}{V_v}$ where C_p=molar specific heat at constant pressure C_v=molar specific heat at constant volume. Then C_v=

A. $\dfrac{\gamma R}{\gamma - 1}$

B. $\dfrac{R}{\gamma - 1}$

C. $\dfrac{\gamma - 1}{R}$

D. $\dfrac{\gamma - 1}{\gamma R}$

Answer: B

Watch Video Solution

80. If a gas has n degrees of freedom ratio of specific heats of gas is

A. $\dfrac{1+n}{2}$

B. $1 + \dfrac{1}{n}$

C. $1 + \dfrac{n}{2}$

D. $1 + \dfrac{2}{n}$

Answer: D

Watch Video Solution

81. For an ideal monoatomic gas, the universal gas constant R is n times the molar heat capacity a constant pressure C_p.Here n is

A. 0.67

B. 1.4

C. 0.4

D. 1.67

Answer: C

Watch Video Solution

82. When a gas is in thermal equilibrium, its molecules have

A. zero energy

B. the same energy

C. a certain constant energy

D. different energies which remains constant

Answer: D

Watch Video Solution

83. Which of the following statements is correct for any thermodynamic system?

A. The internal energy changes in all processes.

B. The temperature of a system can be increased without heating it.

C. The work done is never zero in thermodynamic processes.

D. The work done in an adiabatic process is always zero.

Answer: B

Watch Video Solution

84. 'If a system A is in thermal equilibrium with B and B is in thermal equilibrium with C, then A and C are in thermal equilibrium with each other." This is a statement of

A. Zeroth

B. First

C. Second

D. Third

Answer: A

Watch Video Solution

85. Temperature is a measurement of coldness or hotness of an object. This definition is based on

A. Zeroth law of thermodynamics

B. First law of thermodynamics

C. Second law of thermodynamics

D. Newton's law of cooling

Answer: A

Watch Video Solution

86. According to first law of thermodynamics,

A. energy is conserved

B. heat neither enters nor leaves the system

C. heat is constant in isothermal system

D. heat is a form of energy

Answer: A

Watch Video Solution

87. First law of thermnodynamics is given by

A. dQ=dU+PdV

B. Dq=Du $\times$ PdV

C. dQ=(dU+dV)P

D. $dQ=PdU+dV$

Answer: A

Watch Video Solution

88. If a system undergoes contraction of volume then the work done by the system will be

A. zero

B. negligible

C. negative

D. positive

Answer: C

Watch Video Solution

89. In a thermodynamic system working substance is ideal gas, its internal energy is in the form of

A. kinetic energy only

B. kinetic and potential energy

C. potential energy

D. heat energy

Answer: B

Watch Video Solution

90. In an adiabatic process, the state of a gas is changed from $P_1, V_1, T_1, \text{to} P_2, V_2, T_2$. Which of the following relation is correct

A. $T_1V_1^{\gamma-1} = T_2V_2^{\gamma-1}$

B. $P_1V_1^{\gamma-1} = P_2V_2^{\gamma-1}$

C. $T_1P_1^{\gamma} = T_2P_2$

D. $T_1V_1^{\gamma} = T_2V_2^{\gamma}$

Answer: A

Watch Video Solution

91. A cycle tyre bursts suddenly. This represents an

A. isothermal process

B. isobaric process

C. isochoric process

D. adiabatic process

Answer: D

Watch Video Solution

92. The process in which no heat enters or leaves the system is termed as

A. isochoric

B. isobaric

C. isothermal

D. adiabatic

Answer: D

Watch Video Solution

93. For an ideal gas, in an isothermal process

A. heat content remains constant

B. heat content and temperature remains constant

C. temperature remains constant

D. heat energy varies.

Answer: C

Watch Video Solution

94. In an isothermal expansion

A. internal energy of the gas increases

B. internal energy of the gas decreases

C. internal energy remains unchanged

D. average kinetic energy of gas molecule decreases

Answer: C

Watch Video Solution

95. no work is done against gas.

A. heat is released by the gas

B. the internal energy of gas will increase

C. pressure does not change

D.

Answer: B

Watch Video Solution

96. In an isothermal thermodynamical process, the value of work done by a system is

A. dependent on the path

B. equal to the amount of energy absorbed or ejected

C. equal to the area between PV curves and V-axis

D. all of the above

Answer: D

Watch Video Solution

97. second law of thermodynamics is equivalent to which of the following statements?

A. In general, no engine has a efficiency of 100%

B. Random motion cannot be completely ordered

C. Heat cannot be fully converted into work

D. all of the above

Answer: D

Watch Video Solution

98. Which of the following laws of thermodynamics leads to the interference that it is difficult to convert whole of heat into work?

A. Zeroth

B. First

C. Second

D. Third

Answer: C

Watch Video Solution

99. In a spontaneous irreversible process the total entropy of the system and surroundings

A. increase

B. decrease

C. remain same

D. uncertain

Answer: C

Watch Video Solution

100. The thermal efficiency of a heat engine will be 100% when

A. no heat is given to the sink

B. net amount of heat absorbed by working substance is 50% of heat from source.

C. heat from the source is transferred back

D. working substance does not absorb any heat

Answer: A

Watch Video Solution

101. A refrigerator is

A. a heat engine

B. an electric motor

C. reverse of heat engine

D. an electric generator

Answer: C

Watch Video Solution

102. A refrigerator acts as

A. a heat engine

B. a heat pump

C. air cooler

D. electric motor

Answer: B

Watch Video Solution

103. In the refrigerator, freezer is kept in the topmost part so that

A. Full chamber of the fridge is quickly cooled.

B. motor is not affected

C. lost heat can be taken from the surrounding

D. more heat is taken from the surrounding

Answer: A

Watch Video Solution

104. Working coefficient of refrigerator is

A. $\frac{Q_1}{Q_1 - Q_2}$

B. $\dfrac{Q_2}{Q_2 - Q_1}$

C. $\dfrac{Q_2}{Q_1 - Q_2}$

D. $\dfrac{Q_1}{Q_2 - Q_1}$

Answer: C

Watch Video Solution

105. 300 cc of a gas is compressed to 150 cc at the atmospheric pressure of 10^6 dyne/cm^2. If the change is sudden, what is final pressure ?

[Given $\gamma = 1.4$]

Watch Video Solution

106. A gas for which $\gamma = 1.5$ is suddenly compressed to $1/4$ th of the initial volume. Then the ratio of the final to initial pressure is

A. $1:16$

B. $1:8$

C. $1:4$

D. $8:1$

Answer: D

Watch Video Solution

107. A refrigerator takes 500 calorie heat at the temperature 260 K. At 300 K, the heat rejected will be

A. 322 calorie

B. 273 calorie

C. 373 calorie

D. 577 calorie

Answer: D

Watch Video Solution

108. Which of the following is not a thermodynamical function

A. Enthalpy

B. Work done

C. Gibb's energy

D. Internal energy

Answer: B

Watch Video Solution

109. We consider a thermodynamic system. If ΔU represents the increase in its internal energy and W the work done by the system, which of the following statements is true?

A. $\triangle\ U$=-W in an adiabatic process

B. $\triangle\ U = W$ in an isothermal process

C. $\triangle\ U = \ - W$ in an isothermal process

D. $\triangle\ U = W$ in an adiabatic process

Answer: A

Watch Video Solution

110. In thermodynamic processes which of the following statement is not true?

A. In an adiabatic process, the system is insulated from the surroundings

B. In an isochoric process, pressure remains constant.

C. In an isothermal process the temperature remains constant

D. In an adiabatic process, PV^{γ}=constant

Answer: B

Watch Video Solution

111. The coefficient of absorption of the thermal radiation of body is

A. dependent on temperature

B. dependent on wavelength

C. independent of wavelength

D. independent of the nature of the surface

Answer: B

Watch Video Solution

112. Athermanous bodies are those

A. which do not allow heat radiation to pass through

B. which allow heat radiation to pass through.

C. which are special type of black bodies.

D. which are insulators

Answer: A

Watch Video Solution

113. Substances which transmit heat radiations are called

A. adiathermanous substance

B. isothermal substance

C. athermanous substance

D. diathermanous substance

Answer: D

Watch Video Solution

114. The sum of the absorptance, reflectance and transmittance of a body is

A. 1

B. 2

C. 3

D. ∞

Answer: A

Watch Video Solution

115. Which of the following statements is wrong?

A. Rough surfaces are better radiators than smooth surface

B. Highly polished mirror-like surfaces are very good radiators.

C. Black surfaces are better absorbers than white ones

D. Black surfaces are better radiators than white.

Answer: B

Watch Video Solution

116. Which of the following surfaces will radiate maximum heat?

A. White (rough)

B. Bright (white)

C. Black (rough)

D. Bright(black)

Answer: C

Watch Video Solution

117. The best laboratory approximation to an ideal black body is .

A. lamp of charcoal heated to a high temperature.

B. metal coated with a black dye.

C. glass surface coated with colter

D. hollow enclosure blackened inside and having a small hole.

Answer: D

Watch Video Solution

118. which of the following is NOT the property of black body radiations?

A. They are of all wavelengths.

B. The intensity of very long wavelength radiations is small

C. Intensity of very short wavelength radiations is large.

D. Intensity of radiations of all wavelengths is same.

Answer: D

Watch Video Solution

119. Perfectly black body appears black in colour because

A. body does not reflect radiation.

B. body does not transmit radiation.

C. body neither reflects nor transmits the radiation.

D. body absorbs black colour.

Answer: C

Watch Video Solution

120. In Ferry's black body, the area of black body is

A. area of aperture

B. inner area of body

C. outer area of body

D. area of complete body along with area of opening

Answer: A

Watch Video Solution

121. Lamp black absorbs radiant heat which is near about

A. 0.9

B. 0.98

C. 1

D. 0.5

Answer: B

Watch Video Solution

122. Which of the following is the example of ideal black body?

A. Kajal

B. Black board

C. A pin hole in a box

D. Wooden ashers

Answer: C

Watch Video Solution

123. The coefficient of absorption of the thermal radiation of body is

A. 1

B. 0

C. 0.75

D. none of these

Answer: A

Watch Video Solution

124. The spectrum from a black body radiation is a

A. line spectrum

B. band spectrum

C. continuous spectrum

D. line and band spectrum both

Answer: C

Watch Video Solution

125. We do not use spectrometer of visible light to study the spectral distribution of radiation of blackbody because

A. sensitivity is decreased by it.

B. infrared lines are very close.

C. visibility of infrared rays is high.

D. glass prism and lens absorb infrared rays

Answer: D

Watch Video Solution

126. A shining 500 W bulb behaves like a black body because

A. its spectrum is a line spectrum

B. its spectrum is a band spectrum

C. its spectrum is a continuous spectrum

D. its spectrum is a visible spectrum

Answer: C

Watch Video Solution

127. The area enclosed between $E_\lambda - \lambda$ curve and λ-axis is equal to

A. σT^4

B. b

C. σT^5

D. 1/b'

Answer: A

Watch Video Solution

128. The area under the curve drawn between E_{λ} and λ for a body is proportional to

A. T

B. T^2

C. 1/T

D. T^4

Answer: D

Watch Video Solution

129. The value of wavelength of maximum energy by a blackbody is inversely proportional to the absolute temperature. This law is

A. Stefan's law

B. Wien's law

C. Kirchhoff's law

D. Newton's law

Answer: B

Watch Video Solution

130. Wien's displacement law fails for

A. low temperature

B. high temperature

C. short temperature

D. long wavelengths

Answer: D

Watch Video Solution

131. The SI unit of Wien's constant in Wien's displacement law is

A. $cm \quad K^{-1}$

B. mK

C. $cm^2 K^{-1}$

D. $cm \quad K^{-2}$

Answer: B

Watch Video Solution

132. The maximum energy in thermal radiation from a source occurs at the wavelength 4000Å. The effective temperature of the source

A. 7.325×10^3 K

B. 8×10^4 K

C. 10^4 K

D. 10^6 k

Answer: A

Watch Video Solution

133. The wavelength of maximum energy released during an atomic axplosion was $2.93 \times 10^{-10} m$. Given that Wien's constant is $2.93 \times 10^{-3} m - K$, the maximum temperature attained must be of the order of

A. 10^{-7} K

B. 10^7 K

C. 10^{-13} K

D. 5.86×10^{7} K

Answer: B

Watch Video Solution

134. The wavelength of maximum emitted energy of a body at 700 K is $4.08\mu m$. If the temperature of the body is raised to 1400 K , the wavelength of maximum emitted energy will be

A. $1.02\mu m$

B. $16.32\mu m$

C. $8.16\mu m$

D. $2.04\mu m$

Answer: D

Watch Video Solution

135. Two stars emit maximum radiation at wavelength 3600 Å and 4800 Å respectively. The ratio of their temperatures is

A. $1:2$

B. $3:4$

C. $4:3$

D. $2:1$

Answer: C

Watch Video Solution

136. A star radiates maximum radiation at wavelength λ_m at temperature T. What will be the temperture of another star which radiates maximum energy of wavelength $2\lambda_m$?

A. $\frac{T}{4}$

B. 2T

C. $\frac{T}{2}$

D. 4T

Answer: C

Watch Video Solution

137. The radiation energy density per unit wavelength at a temperature T has a maximum at a wavelengthλ_0. At temperature 2T, it will have a maximum wavelength

A. $4\lambda_0$

B. $2\lambda_0$

C. $\frac{\lambda_0}{2}$

D. $\frac{\lambda_0}{4}$

Answer: C

Watch Video Solution

138. On investigation of light from three different stars A, B and C, it was found that in the spectrum of A, the intensity of red colour is maximum, in B the intensity of blue colour is maximum and in C the intensity of yellow colour is maximum. From these observations, it can be concluded that

A. the temperature of A is maximum, B is minimum and C is intermediate.

B. the temperature of A is maximum C is minimum and B is intermediate.

C. the temperature of B is maximum A is minimum and C is intermediate.

D. the temperature of C is maximum B is minimum and A is intermediate.

Answer: C

Watch Video Solution

139. The rate of emission of electromagnetic energy by any body does not depend on

A. area of its surface

B. its mass

C. its temperature

D. its power of absorption of radiation

Answer: B

Watch Video Solution

140. Coefficient of emission of a surface does NOT depend upon

A. Wavelength of radiation

B. nature of the surface

C. temperature of the surface

D. surrounding medium

Answer: D

View Text Solution

141. The reflectance and emittance of a perfectly black body are respectively

A. zero

B. infinity

C. one

D. constant

Answer: C

Watch Video Solution

142. For a perfectly black body, its abosrpitve power is

A. 1

B. 0.5

C. 0

D. infinity

Answer: A

Watch Video Solution

143. The emissive power of a body does not depend upon__________of the body

A. area

B. time of observation

C. temperature

D. colour

Answer: D

View Text Solution

144. S.I unit of emissive power is

A. J/s

B. J/m^2

C. J/sm^2

D. W//m

Answer: C

Watch Video Solution

145. Dimensions of emissive power are

A. $\left[M^1L^0T^{-3}\right]$

B. $\left[M^1L^0T^{-2}\right]$

C. $\left[M^0L^1T^{-3}\right]$

D. $\left[M^1L^1T^{-1}K^1\right]$

Answer: A

Watch Video Solution

146. Coefficient of emission or emissivity (e) is defined as

A. ratio of emissive power of a body to that of a emissive power of perfectly black body at the same temperature.

B. product of the emissive powers of the body and perfectly black body at the same temperature.

C. ratio of emissive power of the body to that of perfectly black body

D. product of emissive powers of the body and perfectly back body

Answer: A

Watch Video Solution

147. Three bodies A,B and C have equal areas which are painted red, yellow and black respectively. If they are at same temperature then

A. emissive power of A is maximum

B. emissive power of B is maximum

C. emissive power of C is maximum.

D. emissive power of A, B and C are equal.

Answer: C

Watch Video Solution

148. At a certain temperature for given wavelength, the ratio of emissive power of a body to emmisve power of black body in same circumstance in known as

A. relative emissivity

B. emissivity

C. absorption coefficient

D. reflection coefficient

Answer: A

Watch Video Solution

149. At a given temperature the ratio between emissive power and absorptive power is same for all bodies and is equal to the emissive power of black body This statement is called .

A. $\frac{EA}{T}$

B. EAT

C. $\frac{A}{E}$

D. $\frac{E}{A}$

Answer: D

Watch Video Solution

150. At a given temperature the ratio between emissive power and absorptive power is same for all bodies and is equal to the emissive power of black body This statement is called .

A. Kirchhoff's law

B. Wien's law

C. Newton's law of cooling

D. Stefan's law

Answer: A

Watch Video Solution

151. The correct equation out of the following is

A. $E.\ E_b = a$

B. $\dfrac{E}{E_b} = a$

C. $\dfrac{E_b}{E} = a$

D. $E.\ E_b = \dfrac{1}{a}$

Answer: B

Watch Video Solution

152. If at temperature T, the emissive power and absorption power of a body for wave length are e_λ and a_λ respectively, then-

A. $e_\lambda = a_\lambda$

B. $e_\lambda > a_\lambda$

C. $e_\lambda < a_\lambda$

D. there will not be any definite relation between e_λ and a_λ

Answer: A

Watch Video Solution

153. sweet makers do not clean the bottom or cauldron because

A. emission power of black and bright surface is more

B. absorption power of black and bright surface is more

C. black and rough surface absorbs more heat

D. transmission power of black and rough surface is more

Answer: C

Watch Video Solution

154. The amount of radiation emitted by a perfectly black body is proportional to .

A. temperature

B. fourth root of temperature

C. fourth power of temperature

D. square of temperature

Answer: C

Watch Video Solution

155. The law which relates the energy radiated per second by unit area of a body and fourth power of absolute temperature of body is

A. Newton's law of cooling

B. Kirchhoff's law

C. Stefan's law

D. Wien's law

Answer: C

Watch Video Solution

156. One black body at temperature T is surrounded by another black body at temperate $T_1(T_1 < T)$. At T, the radiation emitted by inner blackbody per unit area per second is proportional to

A. difference of temperature of two blackbodies.

B. fourth power of difference of temperature of two black-bodies.

C. difference of fourth powers of temperature of two bodies.

D. sum of fourth powers of temperature of the bodies.

Answer: C

Watch Video Solution

157. Unit of Stefan's constant is

A. Joule/$m^2 K^4$

B. Joule/$m^2 s$

C. Joule/m s K^4

D. $Jo\frac{e}{=}$m^2K^4`

Answer: A

Watch Video Solution

158. In MKS system, Stefan's constant is denoted by σ. In CGS system multiplying factor of σ will be

A. 1

B. 10^3

C. 10^5

D. 10^2

Answer: B

Watch Video Solution

159. A sphere, a cube and a thin circular pate are heated to the same temperature. If they are made of same material and have equal masses, determine which of these three object cools the fastest and which one cools the slowest?

A. sphere

B. cube

C. plate

D. both 'a' and 'b'

Answer: C

Watch Video Solution

160. A body cools from $80^\circ C$ to $60^\circ C$ in 5 minutes. Then its average rate of cooling is

A. $4^\circ C / s$

B. $4^\circ C$/min

C. $16^\circ C$/min

D. $12^\circ C$/min

Answer: B

Watch Video Solution

161. Newton's law of cooling refers to

A. conduction

B. convection

C. radiation

D. melting

Answer: C

Watch Video Solution

162. Newton's law of cooling is applicable for

A. any excess of temperature over the surrounding.

B. small excess of temperature over the surrounding.

C. large excess of temperature over the surrounding

D. very large excess of temperature over the surrounding.

Answer: B

Watch Video Solution

163. Graph of rate of cooling against time is (assume Newton's law of cooling)

A. straight line

B. exponentially decreasing curve

C. curve

D. parabola

Answer: B

Watch Video Solution

164. In Newton's law of cooling, if the rates of emission of radiation by a calorimeter from 90 DC to 85 DC, 85 °C to 80 °C- and from 80 °C to 75 °C are E_1, E_2 and E_3 respectively, then

A. $E_1 = E_2 = E_3$

B. $E_1 > E_2 > E_3$

C. $E_1 < E_2 > E_3$

D. $E_1 < E_2 < E_3$

Answer: B

Watch Video Solution

165. Newton's law of cooling is applicable for

A. convection losses

B. natural convection losses

C. forced convection losses

D. conduction losses

Answer: C

Watch Video Solution

166. Greenhouse effect is

A. Stefan's law

B. Stefan-Boltzmann law

C. Wien's displacement law

D. Newton's law of cooling

Answer: C

Watch Video Solution

167. Greenhouses are provided with glass roofs and glass doors because glass is

A. athermanous

B. transparent

C. bad conductor

D. made up of silica

Answer: A

Watch Video Solution

168. Radiations which are trapped in green house are ___ radiations.

A. ultraviolet

B. visible

C. red coloured

D. infra-red

Answer: D

Watch Video Solution

169. Which of the following statements is CORRECT?

A. The pressure exerted by an enclosed gas depends on the shape of the container

B. The R.M.S. speeds of molecules of different ideal gases are the same at the same temperature.

C. The average kinetic energy of the molecules in one mole of all ideal gases at the same temperature is the same.

D. The average kinetic energy of 1 g of all ideal gases at the same temperature is the same.

Answer: C

Watch Video Solution

170. Emissive power of a perfectly black body

A. is independent of temperature

B. is inversely proportional to fourth power of its temperature

C. decrease with increase in temperature

D. depends on the wavelength of radiation

Answer: D

Watch Video Solution

171. Half part of ice block is covered with black cloth and rest half is covered with white cloth and then it is kept in sunlight. After some time clothes are removed to see the melted ice. Which of the following statements is correct

A. Ice covered with white cloth will melt more

B. Ice covered with black cloth will melt more

C. Equal ice will melt under both clothes

D. It will depend on the temperature of surroundings of ice

Answer: B

Watch Video Solution

172. At constant pressure , which of the following is true ?

A. $x \propto \sqrt{\rho}$

B. $c \propto \rho$

C. $c \propto \frac{1}{\rho}$

D. $c \propto \frac{1}{\sqrt{\rho}}$

Answer: D

Watch Video Solution

173. In terms of mechanical unit $C_p - C_v$=________, where C_P and C_V are principal specific heats.

A. R

B. $\frac{R}{J}$

C. $\frac{R}{M}$

D. $\frac{R}{MJ}$

Answer: C

Watch Video Solution

174. If the pressure of an ideal gas is decreased by 10% isothermally, then its volume will

A. decrease by 9%

B. increase by 10%

C. increase by 11.6%

D. increase by 9%

Answer: C

Watch Video Solution

175. For an opaque body coefficient of transmission is

A. 1

B. 0.5

C. 0

D. ∞

Answer: C

Watch Video Solution

Critical Thinking

1. Universal gas constant $R = 8.3 \times 10^3$ J/kmol K. The gas constant of one kg of nitrogen will be

A. 2.96×10^2 J/kg K

B. 2.96×10^3 J/kg K

C. 2.96×10^1 J/kg K

D. 2.96 J/kg K

Answer: A

Watch Video Solution

2. For ideal gas equation PV XT, X is proportional to

A. absolute temperature

B. density of gas

C. number of molecules of the gas in container

D. number of particles of gas

Answer: C

Watch Video Solution

3. Half a mole of helium at 27 °C and at a pressure of 2 atmosphere is mixed with 1.5 mole of N_2 at 77 °C and at a pressure of 5 atmosphere so that the volume of the mixture is equal to the sum of their initial volumes. If the temperature of the mixture is 69 °C, then its pressure, in atmospheres, is

A. 3.5

B. 3.8

C. 3.95

D. 4.25

Answer: B

Watch Video Solution

4. At pressure P and absolute temperature T a mass M of an ideal gas fills a closed container of volume V. An additional mass 2M of the same gas is added into the container and the volume is then reduced to $\frac{V}{3}$ and the temperature to $\frac{T}{3}$. The pressure of the gas will now be:

A. $\frac{P}{3}$

B. P

C. 3P

D. 9P

Answer: C

Watch Video Solution

5. At N.T.P., sample of equal volumes of chlorine and oxygen are taken. Now ratio of number of molecules is

A. $1:1$

B. $32:27$

C. $2:1$

D. $16:14$

Answer: A

Watch Video Solution

6. A gas kept in an insulated chamber is heated from 30 $^{\circ}C$ to 75 $^{\circ}C$. The density of gas will

A. increase slightly

B. increase largely

C. remain same

D. decrease slightly

Answer: C

Watch Video Solution

7. A jar A is filled with a gas characterised by parameters P,V and T and another jar B with a gas with parameters 2P, $\frac{V}{8}$ and 2T, where the symbols have their usual meaning. The ratio of the number of molecules of jar A to thosej of jar B is

A. $1:1$

B. $1:2$

C. $8:1$

D. `4:1

Answer: C

Watch Video Solution

8. The kinetic theory of gases breaks down at

A. high pressures and high tmeperature

B. low pressure and high temperature

C. high pressure and low temperature

D. low pressure and high temperature

Answer: C

Watch Video Solution

9. At what temperature is the R.M.S. speed of gas molecules half the value at N.T.P.?

A. 68.25 K

B. 273 K

C. 345 K

D. 0 K

Answer: A

Watch Video Solution

10. The mean free path of a gas molecule depends on the molecular diameter (σ) as

A. σ

B. σ^{-1}

C. σ^{-2}

D. σ^{2}

Answer: C

Watch Video Solution

11. The path lengths travelled by a molecule A in 6 collisions are 3, 7, 1, 2, 4, 3 units respectively. The mean free path of the molecule A is

A. $\frac{13}{6}$ unit

B. $\frac{20}{6}$ unit

C. $\frac{87}{6}$ unit

D. $\frac{6}{20}$ unit

Answer: B

Watch Video Solution

12. The root mean square velocity of a gas molecule of mass m at a given temperature is proportional to

A. m^0

B. m

C. $m^{1/2}$

D. $m^{-1/2}$

Answer: D

Watch Video Solution

13. Given: $v_1 = 3m/s, v_2 = 4m/s, v_3 = 5m/s$ What is mean square velocity ?

A. 50 m/s

B. 12 m/s

C. 4.5 m/s

D. 16.7 m/s

Answer: D

Watch Video Solution

14. What is average velocity of gas, if velocities of three molecules of gas are 3 m/s, 4 m/s and 5 m/s?

A. $\sqrt{50}$ m/s

B. 4 m/s

C. 3 m/s

D. 16 m/s

Answer: B

Watch Video Solution

15. If velocities of 3 molecules are 5 m/s, 6m/s and 7 m/s respectively, then their mean square velocity in $\frac{m^2}{s^2}$ is

A. 11

B. 36.7

C. 6

D. 2

Answer: B

Watch Video Solution

16. Two molecules have velocities equal to +5 cm/s and -5 cm/s. Their average and root mean square velocities repectively are

A. 0 cm/s and 5 cm/s

B. zero and 0 cm/s

C. 0 cm/s and $5\sqrt{2}$ cm/s

D. 5 cm/s and 0 cm/s

Answer: A

Watch Video Solution

17. Velocities of three molecules are 2,3 and 4 m/s. Ratio of mean velocity to R.M.S velocity is

A. lt1

B. 1

C. gt1

D. gt2

Answer: A

Watch Video Solution

18. Five molecules of gas have velocities 10,20,30,40 and 50 m/s. The ratio of R.M.S speed to average speed is

A. $1.105 : 1$

B. $1:1.105$

C. $11.05:1$

D. $1:11.05$

Answer: A

Watch Video Solution

19. Let A and B the two gases and given: $\frac{T_A}{M_A} = 4. \frac{T_B}{M_B}$, where T is the temperature and M is the molecular mass. If C_A and C_B are the rms speed, then the ratio $\frac{C_A}{C_B}$ will be equal to ....

A. 2

B. 4

C. 1

D. 0.5

Answer: A

Watch Video Solution

20. The ratio of the vapour densities of two gases at the same temperature is $8:9$. The ratio of the rms velocities of their molecules is

A. $8:9$

B. $9:8$

C. $\sqrt{9}:\sqrt{8}$

D. $\sqrt{8}:\sqrt{9}$

Answer: C

Watch Video Solution

21. A vessel contains hydrogen gas which exerts a pressure of 4 atm. If gas is replaced by equal mass of oxygen, the pressure exerted on the walls will be

A. 0.4 atm

B. 16 atm

C. 0.25 atm

D. 4 atm

Answer: C

Watch Video Solution

22. If masses of all molecules of a gas are halved and the speed doubled. Then the ratio of initial and final pressure is :

A. $2:1$

B. $1:2$

C. $4:1$

D. $1:4$

Answer: B

Watch Video Solution

23. The density of a certain mass of a gas at STP is d. If the pressure of the gas is doubled and the temperature is made one-third of its initial value, the new density will be

A. 3ρ

B. 4.5ρ

C. 6ρ

D. 9ρ

Answer: C

Watch Video Solution

24. By what percentage should the pressure of a given mass of a gas be increased so as to decrease its volume by 10% at a constant temperature?

A. 0.1111

B. 0.07

C. 0.08

D. 0.1

Answer: A

Watch Video Solution

25. At what temperature will the mean kinetic energy of O_2 be the same for H_2 molecules at -73 ºC ?

A. $127^\circ C$

B. $527^\circ C$

C. $-73^\circ C$

D. $-173^\circ C$

Answer: C

Watch Video Solution

26. A jar has a mixture of hydrogen and oxygen gas in the ratio of 1 : 5. The ratio of mean kinetic energies of hydrogen and oxygen molecules is

A. $1:16$

B. $1:4$

C. $1:5$

D. $1:1$

Answer: D

Watch Video Solution

27. A container has N molecules at absolute temperature T. If the number of molecules is doubled but kinetic energy in box remains the same as before, the absolute temperature of the gas is

A. T

B. $\frac{T}{2}$

C. 2T

D. zero

Answer: B

Watch Video Solution

28. The average K.E. of hydrogen molecules at 27 °C is E. The average K.E. at 327 °C is

A. K.E

B. $\sqrt{2}$ K.E

C. 2 K.E

D. 4 K.E

Answer: C

Watch Video Solution

29. The kinetic energy of translation per unit volume of the molecules of hydrogen gas at N.T.P. is (Atmospheric pressure = $10 \% 5N / m^2$)

A. $1.5 \times 10^5 J$

B. $1.5 \times 10^6 J$

C. $1.25 \times 10^5 J$

D. $1.25 \times 10^6 J$

Answer: A

Watch Video Solution

30. The temperature at which the kinetic energy of a gas molecule is doubled to its value at 27 °C is

A. $54^{\circ} C$

B. 300 K

C. $327^{\circ} C$

D. $108^{\circ} C$

Answer: C

Watch Video Solution

31. The molecular weights of hydrogen and helium are respectively 2 and 4. The temperature at which the heliwn molecules will have half the R.M.S. velocity as that of hydrogen molecules at N.T.P. is

A. $273^\circ C$

B. 365.1 K

C. 546 K

D. `137K

Answer: D

Watch Video Solution

32. When the temperatw-e of a gas is raised from 30 °C to 90 °C, the percentage increase in the R.M.S. velocity of the molecules will be

A. 0.1

B. 0.15

C. 0.2

D. 0.175

Answer: A

Watch Video Solution

33. A container has a mixture of two gases, hydrogen and oxygen at room temperature. Which one of the following statements is true, if C_H and C_O are the root mean square. velocities of hydrogen and oxygen molecules respectively?

A. $C_H > C_O$

B. $C_H < C_O$

C. $C_O = C_H$

D. Data is insufficient

Answer: A

Watch Video Solution

34. At what temperature the molecule of nitrogen will have same rms velocity as the molecule of oxygen at $127^{\circ} C$?

A. $77^{\circ} C$

B. $350^{\circ} C$

C. $273^{\circ} C$

D. $457^{\circ} C$

Answer: A

Watch Video Solution

35. Boiling water is changing into steam. Under this condition the specific heat of water is

A. zero

B. one

C. inifinite

D. less than one

Answer: C

Watch Video Solution

36. 294 joules of heat is requied to rise the temperature of 2 mole of an ideal gas at constant pressure from $30^{\circ} C$ to $35^{\circ} C$. The amount of heat required to rise the temperature of the same gas through the same range of temperature at constant volume $(R = 8.3 \text{Joules}/\text{mole} - K)$ is

A. 27.4 J/mole K

B. 28.4 J/mole K

C. 27.4 J/mole K

D. 30.4 J/mole K

Answer: C

Watch Video Solution

37. When an ideal diatomic gas is heated at constant pressure, the fraction of the heat energy supplied, which increases the internal energy of the gas, is

A. $\frac{2}{5}$

B. $\frac{3}{5}$

C. $\frac{3}{7}$

D. $\frac{5}{7}$

Answer: B

Watch Video Solution

38. The difference between the principal specific heats of a gas is 300J/kg K and the ratio of its specific heats $\left(\frac{C_p}{C_v}\right)$ is 1.4. Then the value of C_p expressed in J/kg K is

A. 1050 J/kg K

B. 250 J/kg K

C. 650 J/kg K

D. 150 J/kg K

Answer: A

Watch Video Solution

39. The molar heat capacity in a process of a diatomic gas if it does a work of $\frac{Q}{4}$ when a heat of Q is supplied to it is

A. $\frac{2}{5}$ R

B. $\frac{5}{2}$ R

C. $\frac{10}{3}R$

D. $\frac{6}{7}$R

Answer: C

Watch Video Solution

40. If R = universal gas constant, the amount of heat needed to raise the temperature of 2 mole of an ideal monoatomic gas from 273 K to 373 K when no work is done

A. 100 R

B. 450 R

C. 300 R

D. 500 R

Answer: B

Watch Video Solution

41. The specific heat of hydrogen gas at constant pressure is $C_P = 3.4 \times 10^3 \text{cal} / kg^\circ C$ and at constant volume is $C_V = 2.4 \times 10^3 \text{cal} / kg^\circ C$. If one kilogram hydrogen gas is heated from $10^\circ C$ to $20^\circ C$ at constant pressure the external work done on the gas to maintain it at cosntant pressure is

A. 10^5 calories

B. 10^4 calories

C. 10^3 calories

D. 5×10^3 calories

Answer: B

Watch Video Solution

42. Which of the following statements is correct for any thermodynamic system?

A. The internal energy changes in all processes.

B. Internal energy and entropy are state functions

C. The change in entropy can never be zero

D. The work done in an adiabatic process is always zero.

Answer: B

Watch Video Solution

43. For an isothermal expansion of a perfect gas, the value of $\frac{\Delta P}{P}$ is

A. $-\gamma^{1/2}\frac{\triangle V}{V}$

B. $-\frac{\triangle V}{V}$

C. $-\gamma\frac{\triangle V}{V}$

D. $-\gamma^2\frac{\triangle V}{V}$

Answer: B

Watch Video Solution

44. Work done per mol in an isothermal change is

A. $RT \quad \frac{\log_{10}(V_2)}{V_1}$

B. $RT \quad \frac{\log_{10}(V_1)}{V_2}$

C. $RT \quad \frac{\log_e(V_2)}{V_1}$

D. $RT \quad \frac{\log_e(V_1)}{V_2}$

Answer: C

Watch Video Solution

45. When 1g of water at $0^\circ C$ and $1 \times 10^5 \frac{N}{m^2}$ pressure is converted into ice of volume $1.091 cm^3$. The external work done will e

A. 0.0091 joule

B. 0.0182 joule

C. -0.0091 joule

D. -0.0182 joule

Answer: A

Watch Video Solution

46. In an adiabatic expansion

A. $\angle \mid U = 0$

B. $\triangle U$=negative

C. $\triangle U$=positive

D. $\triangle W$=zero

Answer: B

Watch Video Solution

47. A gas expands under constant pressure P from volume V_1 to V_2The work done by the gas is

A. $P(V_2 - V_1)$

B. $P(V_1 - V_2)$

C. $P(V_1^\gamma - V_2^\gamma)$

D. $P\frac{V_1 V_2}{V_2 - V_1}$

Answer: A

Watch Video Solution

48. Which of the following is correct in terms of increasing work done for the same initial and final state?

A. Adiabatic lt Isothermal lt Isobaric

B. Isobaric lt Adiabatic lt Isothermal

C. Adiabatic lt Isobaric lt Isothermal

D. none of these

Answer: A

Watch Video Solution

49. Which of the following processes is reversible?

A. Transfer of heat by radiation

B. Electrical heating of a nichrome wire

C. Transfer of heat by conduction

D. Isothermal compression

Answer: D

Watch Video Solution

50. When an ideal gas $(\gamma = 5/3)$ is heated under constant pressure, what percentage of given heat energy will be utilized in doing external work ?

A. 0.4

B. 0.3

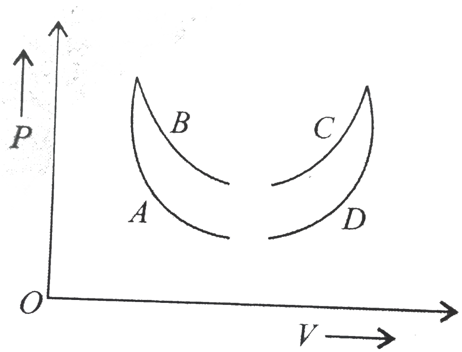
C. 0.6

D. 0.2

Answer: A

Watch Video Solution

51. Four curves A, B, C and D are drawn in figure for a given amount of gas. The curve which represents adiabatic and isothermal changes, respectively, is



A. C and D respectively

B. D and C respectively

C. A and B respectively

D. B and A respectively

Answer: C

Watch Video Solution

52. An ideal heat engine working between temperature T_1 and T_2 has an efficiency η, the new efficiency if both the source and sink temperature are doubled, will be

A. $\frac{\eta}{2}$

B. η

C. 2η

D. 3η

Answer: B

Watch Video Solution

53. An ideal heat engine exhausting heat at 77° is to have a 30% efficiency. It must take heat at

A. 127° C

B. $227^{\circ} C$

C. $327^{\circ} C$

D. $673^{\circ} C$

Answer: B

Watch Video Solution

54. If a= 0.8 and r = 0. 15, then t is equal to

A. 0.5

B. 0.05

C. 1

D. 0.2

Answer: B

Watch Video Solution

55. The coefficient of absorption and reflection of the surface of a body are 0. 75 and 0.20 respectively. If 200 calorie of radiant heat is incident on the surface of the body, then the beat absorbed is

A. 40 calories

B. 150 calories

C. 20 calories

D. 10 calories

Answer: B

Watch Video Solution

56. Out of 10J of radiant energy incident on a surface, the energy absorbed by the surface is 2 J and the energy reflected is 7 J. Then, coefficient of transmission of the body is

A. 0.2

B. 0.7

C. 0.1

D. zero

Answer: C

Watch Video Solution

57. If an athermanous body absorbs 20% of the incident radiant energy, then reflection coefficient of the body is

A. 0.2

B. zero

C. 0.8

D. 1

Answer: C

Watch Video Solution

58. If 'p' calorie of heat energy is incident on a body and absorbs 'q' calories of heat absorbed then its coefficient of absorption is .

A. p/q

B. q/p

C. (q-p)/p

D. (p-q)/p

Answer: D

Watch Video Solution

59. An ideal Black-body at room temperature is thrown into a furnace. It is observed that

A. initially it is the darkest body and becomes the brightest later.

B. it is the darkest body at all times

C. it cannot be distinguished at all times.

D. initially it is the darkest body and cannot be distinguished later.

Answer: A

Watch Video Solution

Watch Video Solution

60. Why is a conical projection in front of the hole in Ferry's black body?

A. To avoid absorption ofradiations

B. To avoid return of the radiations by reflection

C. To avoid emission of radiations.

D. For some reason other than those mentioned above

Answer: B

Watch Video Solution

61. If the temperature of any ideal black body is halved, then the wavelength of maximum emission will be

A. four times

B. double

C. half

D. one fourth

Answer: B

Watch Video Solution

62. The rate of emission of heat energy per unit area of an iron ball of radius 10 cm is $10J/m^2s$ s, then rate ·of emission of heat energy per unit area by a copper ball of radius 5 cm at same temperature will be (emissivity of both the balls is same)

A. $2J/m^2s$

B. $2.5J/m^2s$

C. $2cal/m^2s$

D. none of these

Answer: B

View Text Solution

63. Emissive power of cube is 1000 J/m^2s and it · radiates heat at the rate 60 watt at that temperature. The length of each side of cube will be

A. 1 cm

B. 100 cm

C. 10 cm

D. 0.1 cm

Answer: C

Watch Video Solution

64. A body of surface are $15 \times 10^{-3} m^2$ emits 0.3 kcal in 40 second at a temperature $70^\circ C$. The emissive power of the surface at that temperature is

A. $2.66 kcal / m^2 s$

B. $5.66 \times 10^{-3} kcal / m^2 s$

C. $0.50 kcal / m^2 s$

D. $2.77 \times 10^{-3} kcal / m^2 s$

Answer: C

Watch Video Solution

65. A hot and a cold body are kept in vacuum separated from each other. Which of the following cause decrease in temperature of the hot body

A. Radiation

B. convection

C. Conduction

D. Temperature remains unchanged

Answer: A

Watch Video Solution

66. Unit of Stefan's constant is

A. Watt/m^2K^4

B. Watt/m^3K

C. Watt/m^2K

D. Watt/m^3K^4

Answer: A

Watch Video Solution

67. If the temperature o fblack body decreases to half of the initial temperature, then the radiation emitted by the body will be what fraction of the earlier ?

A. $\frac{1}{2}$

B. $\frac{1}{4}$

C. $\frac{1}{8}$

D. $\frac{1}{16}$

Answer: D

Watch Video Solution

68. If the temperature of a hot body is increased by 50%, then the increase in the quantity of emitted heat radiation will be

A. 1.25

B. 2

C. 3

D. 4

Answer: D

Watch Video Solution

69. The temperatures of two bodies A and B are $727^{\circ}C$ and $127^{\circ}C$. The ratio of rate of emission of radiations will be

A. $\frac{727}{127}$

B. $\frac{625}{16}$

C. $\frac{1000}{400}$

D. $\frac{100}{16}$

Answer: B

Watch Video Solution

70. A spherical black body with a radius of 20 cm radiates 440 W power at 500 K. If the radius were halved and the temperature doubled, the power radiated in watt would be

A. 225

B. 450

C. 980

D. 1760

Answer: D

Watch Video Solution

71. A body having a surface area of $50 cm^2$ radiates 300J of energy per minute at a temperature of $727^\circ C$. The emissivity of the body is

(Stefan's constant $= 5.67 \times 10^{-8} W/m^2K^4$)

A. 0.09

B. 0.018

C. 0.36

D. 0.54

Answer: B

Watch Video Solution

72. At $127^\circ C$ radiated energy is $2.7 \times 10^{-3} J/s$. At what temperature radiated energy is $4.32 \times 10^{6} J/s$

A. 400 K

B. 4000 K

C. 80000 K

D. 40000 K

Answer: C

Watch Video Solution

73. The rate of cooling at 600 K, if surrounding temperature is 300 K is R. The rate of cooling at 900 K is

A. $\frac{16}{3}$R

B. 2R

C. 3R

D. $\frac{2}{3}$ R

Answer: A

Watch Video Solution

74. Two solid spheres of radii R_1 and R_2 are made of the same material and have similar surfaces. These are raised to the same temperature and then allowed to cool under identical conditions. The ratio of their initial rates of loss of heat are

A. $\frac{R_1}{R_2}$

B. $\frac{R_2}{R_1}$

C. $\frac{R_1^2}{R_2^2}$

D. $\frac{R_2^2}{R_1^2}$

Answer: C

Watch Video Solution

75. A black body radiates $6J/cm^2$s when its temperature is 127 °C. How much heat will be radiated per square centimetre per second when its temperature is 527 °C?

A. 6 J

B. 12 J

C. 96 J

D. 48 J

Answer: C

Watch Video Solution

76. The ratio of masses of two metal spheres A and B is 8 : I. If their temperatures are 2000 K and 1000 K respectively, then the ratio of the rates of their energy emission will be

A. $64:1$

B. $128:1$

C. $16:1$

D. $4:1$

Answer: A

Watch Video Solution

77. A hot liquid is kept in a big room. The logarithm of the numerical value of the temperature difference between the liquid and the room is plotted against time.The plot will be very nearly

A. a straight line

B. a circular arc

C. a parabola

D. an ellipse

Answer: A

Watch Video Solution

78. Rate of cooling of a body is 0 .2° C/min, when excess temperature is 20° C. The proportionality constant is

A. 0.01

B. 0.02

C. 0.03

D. 0.04

Answer: A

Watch Video Solution

79. A body cools at the rate of 0.75 °C/s, when it is 50 °C above the surrounding. Its rate of cooling, when it is 30 °C above the same surrounding, will be

A. $0.32^{\circ} C / s$

B. $0.125^{\circ} C / s$

C. $0.40^{\circ} C / s$

D. $0.45^{\circ} C / s$

Answer: D

Watch Video Solution

80. A body cools at the rate of 0.75 °C/s, when it is 50 °C above the surrounding. Its rate of cooling, when it is 30 °C above the same surrounding, will be

A. $0.2^{\circ} C / s$

B. $0.3^{\circ} C / s$

C. $0.15^{\circ} C / s$

D. $0.4^{\circ} C / s$

Answer: B

Watch Video Solution

81. A body takes 5 minutes for cooling from $50^{\circ} C$ to $40^{\circ} C$ Its temperature comes down to $33.33^{\circ} C$ in next 5 minutes. Temperature of surroundings is

A. $15^{\circ} C$

B. $20^{\circ} C$

C. $25^{\circ} C$

D. $10^{\circ} C$

Answer: B

Watch Video Solution

Watch Video Solution

82. Consider two hot bodies B_1 and B_2 which have temperature $100^\circ \mathrm{C}$ and $80^\circ \mathrm{C}$ respectively at t = 0. The temperature of surroundings is $40^\circ \ \mathrm{C}$. The ratio of the respective rates of cooling R_1 and R_2 of these two bodies at$t=0$ will be

A. $R_1 : R_2 = 3:2$

B. $R_1 : R_2 = 5:4$

C. $R_1 : R_2 = 2:3$

D. $R_1 : R_2 = 4:5$

Answer: A

Watch Video Solution

83. A body in laboratory takes 4 minutes to cool from 6 1 °C to 59 °C. If the laboratory temperature is 30° C, then the time taken by it to cool from 51 °C to 49 °C will be

A. 4 min

B. 5 min

C. 6 min

D. 8 min

Answer: C

Watch Video Solution

84. A pan filled with hot food cools from 50 °C to 49.9 °C in 5 s. If it cools from 40 °C to 3 9.9 °C in 10 s, then room temperature is

A. $30^\circ C$

B. $35^\circ C$

C. $25^\circ C$

D. $37^\circ C$

Answer: A

Watch Video Solution

85. A metal ball cools from $64^\circ C$ to $50^\circ C$ in 10 minutes and to $42^\circ C$ in the next 10 minutes. The ratio of the rates of fall of temperature during the two intervals is

A. $\frac{4}{7}$

B. $\frac{7}{4}$

C. 2

D. $\frac{5}{2}$

Answer: B

Watch Video Solution

86. A cup of tea cools from $80^\circ C$ to $60^\circ C$ in one minute. The ambient temperature is $30^\circ C$. In cooling from $60^\circ C$ to $50^\circ C$ it will take

A. 30 seconds

B. 60 seconds

C. 90 seconds

D. 48 seconds

Answer: D

Watch Video Solution

87. The temperature of a body falls from $50^\circ C$ to $40^\circ C$ in 10 minutes. If the temperature of the surroundings is $20^\circ C$ Then temperature of the body after another 10 minutes will be

A. $36.6^\circ C$

B. $33.3^\circ C$

C. $35^\circ C$

D. $30^\circ C$

Answer: B

Watch Video Solution

88. A body initially at $80^{\circ}\ \mathrm{C}$ cools to $64^{\circ}\ \mathrm{C}$ in 5 minutes and to $52^{\circ}\mathrm{C}$ in 10 minutes. The temperature of the body after 15 minutes will be

A. $42.7^{\circ}C$

B. $35^{\circ}C$

C. $47^{\circ}C$

D. $40^{\circ}C$

Answer: A

Watch Video Solution

89. Green house effect is to

A. transmit radiations from a source at high temperature and block radiations from a source at low temperature.

B. transmit radiations from a source at low temperature and block radiations from source at high temperature.

C. transmit radiations from both the types of sources.

D. block radiations from both the types of sources at high and low temperature.

Answer: A

Watch Video Solution

90. Two beakers A and B are filled to the brim with water at 4 °C. When A is heated and B is cooled, the water

A. level in B decrease

B. will overflow in A only

C. will overflow in B only

D. will overflow in both A and B

Answer: D

Watch Video Solution

91. Two objects have exactly the same shape. Object A has emissivity of 0.3 and object B has emissivity of 0.6. If each radiates the same power, then

A. temperature of A is twice that of B.

B. temperature of B is twice that of A.

C. temperature of A is $2^{1/4}$ times that of B.

D. temperature of A is same as that of B.

Answer: C

Watch Video Solution

92. The energy spectrum f a black body exhibits a maximum around a wavelength λ_0. The temperature of the black body is now changed such that the energy is maximum around a wavelength $3\lambda_0 / 4$. The power radiated by the black body will now increase by a factor of

A. $\frac{256}{81}$

B. $\frac{64}{27}$

C. $\frac{16}{9}$

D. $\frac{4}{3}$

Answer: A

93. If R = universal gas constant, the amount of heat needed to raise the temperature of 2 mole of an ideal monoatomic gas from 273 K to 373 K when no work is done

A. 100 R

B. 700 R

C. 300 R

D. 500 R

Answer: B

94. Half part of ice block is covered with black cloth and rest half is covered with white cloth and then it is kept in sunlight. After some time clothes are removed to see the melted ice. Which of the following statements is correct

A. Ice cowred with white cloth will melt more

B. Ice covered with black cloth will melt more

C. Equal ice will melt under both clothes.

D. It will depend on the temperature of surroundings of ice

Answer: B

Watch Video Solution

95. A sphere of density d, specific heat s and radius r is hung by a thermally insulating thread in an enclosure which is kept at a lower temperature than the sphere. The temperature of the sphere starts to drop at a rate which depends upon the temperature difference between the sphere and the enclosure. If the temperature difference is ΔT and surrounding temperature is T_0 then rate of fall in temperature will be

[Given that $\Delta T < < T_0$]

A. $c/r^3\rho$

B. $1/r^3\rho c$

C. $3/r^3\rho c$

D. $1/r\rho c$

Answer: D

Watch Video Solution

96. A cup of tea cools from 65.5° C to $62.55^\circ C$ in one minute is a room at $225.^\circ\ C.$ How long will the same cup of tea take to cool from $46.5^\circ C$ to $40.5^\circ C$ in the same room ? (Choose the nearest value in min).

A. 1 min

B. 2 min

C. 3 min

D. 4 min

Answer: D

Watch Video Solution

97. In an isothermal reversible expansion, if the volume of 96 gm of oxygen at $27^\circ C$ is increased from 70 litres to 140 litres , then the work done by the gas will be

A. 300R $\log_{10} 2$

B. $81R \log_{10} 2$

C. $900R \log_{10} 2$

D. $2.3 \times 900 \quad \log_{10} 2$

Answer: D

Watch Video Solution

98. Efficiency of a Carnot engine is 50% when temperature of outlet is $500K$. In order to increase efficiency up to 60% keeping temperature of intake the same what is temperature of outlet?

A. 200 K

B. 400 K

C. 600 K

D. 800 K

Answer: B

Watch Video Solution

99. The volume of air increases by 5% in its adiabatic expansion. The precentage decrease in its pressure will be

A. 0.05

B. 0.06

C. 0.07

D. 0.08

Answer: C

Watch Video Solution

100. A gas at 300 K has pressure $4 \times 10^{-10} N/m^2$. IF $k = 1.38 \times 10^{-23} J/K$, the number of $\text{molecule}/cm^3$ is of the order of

A. 100

B. 10^5

C. 10^8

D. 10^{11}

Answer: B

Watch Video Solution

101. Assertion: If a gas is heated isothennally, then no part of the heat supplied is used to increase the internal energy.

Reason: Change in internal energy equals work done on the system.

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion

B. Assertion is True, Reason is True Reason is not a correct explanation for

C. Assertion is True , Reason is False

D. Assertion is False but, Reason is True

Answer: C

Watch Video Solution

102. Two containers are filled, each with a different gas. Two containers are at the same temperature. Suppose that the molecules weights of the two gases are M_A and M_B. Then the average momenta (in magnitude) of the molecules are related as

A. $p_A = p_B$

B. $p_A = \left(\frac{M_B}{M_A}\right) p_b$

C. $p_A = \left(\frac{M_B}{M_A}\right)^{1/2} p_b$

D. $p_A = \left(\frac{M_A}{M_B}\right)^{1/2} p_b$

Answer: D

Watch Video Solution

103. By what percentage should the pressure of a given mass of a gas be increased so as to decrease its volume by 20% at a constant temperature?

A. 0.2

B. 0.1

C. 0.15

D. 0.25

Answer: D

Watch Video Solution

104. A Carnot engine, whose efficiency is 40%, takes in heat from a source maintained at a temperature of 500K. It is desired to have an engine of efficiency 60%. Then, the intake temperature for the same exhaust (sink) temperature must be:

A. 500K

B. 1200K

C. 750K

D. 600K

Answer: C

Watch Video Solution

Competitive Thinking

1. The equation for an ideal gas is PY = RT, where Y represents the volume of

A. 1g gas

B. any mass of the gas

C. one g mol gas

D. one litre gas

Answer: C

Watch Video Solution

2. The perfect gas equation for 4 g of hydrogen gas is

A. PV=RT

B. PV=2RT

C. PV=$\frac{1}{2}$RT

D. PV=4RT

Answer: B

Watch Video Solution

3. S.I. unit of universal gas constant is

A. $Cal/^{\circ}C$

B. J/mol

C. $J''mol^{-1}K^{-1}$

D. J/kg

Answer: C

Watch Video Solution

4. A fiven sample of an ideal gas occupise a volume V at a pressure p and sbsoulte temperature T.The mass of each molecule of the gas is m. Which of the following fives the dinsity of the gas ?

A. mkT

B. P/(kT)

C. Pm/(kT)

D. P/(kTV)

Answer: C

Watch Video Solution

5. A ideal gas has pressure 'p', volume 'V' and absolute temperature 'T'. It 'm' is the mass of each molecules and 'K' is the Boltzmann constant , the density of the gas is

A. $\frac{Pm}{KT}$

B. $\frac{KT}{Pm}$

C. $\frac{Km}{PT}$

D. $\frac{PK}{Tm}$

Answer: A

Watch Video Solution

6. 1 mole of gas occupies a volume of 100 ml at 50 mm pressure . What is the volume occupied by two moles of gas at 100 mm pressure and at same temperature

A. 50 mL

B. 100 mL

C. 200 mL

D. 500 mL

Answer: B

Watch Video Solution

7. A $0^{\circ} C$ the density of a fixed mass of a gas divided by pressure is x. At $100^{\circ} C$, the ratio will be

A. x

B. $\frac{273}{373} x$

C. $\frac{373}{273} x$

D. $\frac{100}{273} x$

Answer: B

Watch Video Solution

8. A cylinder consists of hydrogen. Another cylinder of same volume has heliwn of same mass. If pressure of hydrogen is 4 atm, then pressure of helium is

A. 4 atm

B. 8 atm

C. 2 atm

D. 1 atm

Answer: C

Watch Video Solution

9. The volume of $2.8g$ of CO at $27^{\circ}C$ and $0.821atm$ pressure is $(R = 0.0821 \text{ lit. atm } mol^{-1}K^{-1})$

A. 0.3 litre

B. 1.5 litre

C. 3 litre

D. 60 litre

Answer: C

Watch Video Solution

10. Two balloons are filled one with pure He gas and the other with air respectively. If the pressure and temperature of these balloons are same, then the number of molecules per unit volume is

A. more in the He filled balloon

B. same in both balloons

C. more in air filled balloon

D. in the ratio of 1:4

Answer: B

Watch Video Solution

11. Three containes of the same volume contain three different gases. The masses of the molecules are m_1, m_2 and m_3 and the number of molecules in their respective containers are N_1, N_2 and N_3. The gas pressure in the containers are P_1, P_2 and P_3 respectively. All the gases are now mixed and put in one of the containers. The pressure P of mixture will be

A. $P < (P_1 + P_2 + P_3)$

B. $P = \dfrac{P_1 + P_2 + P_3}{3}$

C. $P = P_1 + P_2 + P_3$

D. $P > (P_1 + P_2 + P_3)$

Answer: C

Watch Video Solution

12. Which one of the following graph is correct at constant pressure?

A.

B.

C.

D.

Answer: A

Watch Video Solution

13. The temperature of an open room of volume $30m^3$ increases from $17^\circ C \rightarrow 27^\circ C$ due to sunshine. The atmospheric pressure in the room remains $1 \times 10^5 Pa$. If n_i and n_f are the number of

molecules in the room before and after heating then n_f and n_i will be

A. 2.5×10^{25}

B. -2.5×10^{25}

C. -1.61×10^{23}

D. 1.38×10^{23}

Answer: B

Watch Video Solution

14. Kinetic theory of gases was put forward by

A. Einstein

B. Newton

C. Maxwell

D. Raman

Answer: C

Watch Video Solution

15. Gases excert pressure on the walls of the container , because the gas molecules

A. have finite volume

B. obey Boyle's law

C. Posses momentum

D. collide with one another

Answer: C

Watch Video Solution

16. In kinetic theory of gases, a molecule of mass m of an ideal gas collides with a wall of vessel with velocity v. The change in the linear momentum of the molecule is

A. 2mv

B. mv

C. -mv

D. zero

Answer: A

Watch Video Solution

17. At what temperature, will R.M.S . velocity of hydrogen be four times of its value at N. T .P.?

A. $819^\circ C$

B. $4368^\circ C$

C. $1092^\circ C$

D. $4095^\circ C$

Answer: D

Watch Video Solution

18. Pressure remaining constant, at what temperature will the r.m.s. velocity of a gas be half of its value at O °C?

A. $0^\circ C$

B. $32^\circ C$

C. $-273^\circ C$

D. $-204^\circ C$

Answer: D

Watch Video Solution

19. When temperature of an ideal gas is increased from $27^\circ C$ to $227^\circ C$, its rms speed is changed from $400 ms^{-1}$ to V_s . Then , the V_s is

A. 516 metre/s

B. 450 metre/s

C. 310 metre/s

D. 746 metre/s

Answer: A

Watch Video Solution

20. The root mean square velocity of a gas molecule of mass m at a given temperature is proportional to

A. m^0

B. m

C. $\sqrt{m}$

D. $\frac{1}{\sqrt{m}}$

Answer: D

Watch Video Solution

21. The rms speed of oxygen molecules in a gas is v. If the temperature is doubled and the oxygen molecules dissociate into oxygen atoms, the rms speed will become

A. v

B. $\sqrt{2}v$

C. 2v

D. 4v

Answer: C

Watch Video Solution

22. R.M.S. velocity of oxygen molecules at N.T.P is 0.5 km.ls. The R.M.S velocity for the hydrogen molecule at N.T.P is

A. 4 km/s

B. 2 km/s

C. 3 km/s

D. 1 km/s

Answer: B

Watch Video Solution

23. Uranium. has two isotopes of masses 235 and 238 units. If both of them are present in Uranium hexafluoride gas, find the percentage ratio of difference in rms velocities of two isotopes to the rms velocity of heavier isotope.

A. 1.64

B. 0.064

C. 0.64

D. 6.4

Answer: C

Watch Video Solution

24. The molecules of a given mass of a gas have rms velocity of $200m/sat27^\circ C$ and $1.0 \times 10^5 N/m_2$ pressure. When the temperature and pressure of the gas are respectively $127^\circ C$ and $0.05 \times 10^5 Nm^{-2}$, the rms velocity of its molecules in ms^{-1} is

A. $\dfrac{100\sqrt{2}}{3}$

B. $\dfrac{100}{3}$

C. $100\sqrt{2}$

D. $\frac{400}{\sqrt{3}}$

Answer: D

Watch Video Solution

25. Temperature of an ideal gas, initially at 27 °C, is raised by 6 °C.

The rms velocity of the gas molecules will,

A. increase by nearly 2%

B. decrease by nearly 2%

C. increase by nearly 1%

D. decrease by nearly 1%

Answer: C

Watch Video Solution

26. The rms velocity of a gas at T °C is double the value at 27 °C. The temperature T of the gas in °C is (assume that the pressure remains constant)

A. 927

B. 820

C. 1000

D. 195

Answer: A

Watch Video Solution

27. To what temperature should the hydrogen at $327^{\circ} C$ be cooled at constant pressure, so that the root mean square velocity of its molecules become half of its previous value?

A. $100^{\circ} C$

B. $-100^{\circ} C$

C. $-123^{\circ} C$

D. $123^{\circ} C$

Answer: C

Watch Video Solution

28. The mean free path of molecules of a gas (radius r) is inversely proportional to

A. r^3

B. r^2

C. r

D. $\sqrt{r}$

Answer: B

Watch Video Solution

29. The mean square velocity of the five molecules of velocities are 2 m/s, 3 m/s, 4 m/s, 5 m/s and 6 m/s respectively is

A. $20m^2 / s^2$

B. $25m^2 / s^2$

C. $36m^2 / s^2$

D. $18m^2 / s^2$

Answer: D

Watch Video Solution

30. The speed of four gases molecules are 1 km/s, 3 km/s, 5 km/s and 7 km/s respectively. The difference between the R.M.S. speed and average speed is

A. 0.683 km/s

B. 0.583 km/s

C. 0.438 km/s

D. 0.358 km/s

Answer: B

Watch Video Solution

31. In a gas 5 molecules have speed 150 m/s, 160 m/s, 170 m/s, 180 m/s, 190 m/s. Ratio of

$V_{r.m.s}$ to V_{mean} is nearly

A. 1

B. 3

C. 0.5

D. 2

Answer: A

Watch Video Solution

32. Gases excert pressure on the walls of the container , because the gas molecules

A. are loosing their kinetic energy

B. are getting stuck to the walls

C. are transferring their momentum to walls

D. are accelerated toward walls

Answer: C

Watch Video Solution

33. The pressure exerted in terms of total kinetic energy per unit volume (E) is

A. $\frac{3}{2}$E

B. E

C. $\frac{2}{3}$E

D. $\sqrt{3}$E

Answer: C

Watch Video Solution

34. Ratio of pressures exerted by two gases is 3 : 2 and their densities are in the ratio 2 : 3. The ratio of their R.M.S. velocities is

A. $3:2$

B. $1:3$

C. 1

D. $6:8$

Answer: C

Watch Video Solution

35. The absolute temperature of a gas is determined by

A. the average momentum of the molecules

B. the velocity of sound in the gas

C. the number of molecules in the gas

D. the mean square velocity of the molecules

Answer: D

Watch Video Solution

36. In the expression for boyle 's law the product pV has dimensions of

A. force

B. impulse

C. energy

D. momentum

Answer: C

Watch Video Solution

37. Assertion : The total translational kinetic energy of all the molecules of a given mass of an ideal gas is 1.5 times the product of its pressure and volume.

Reason : The molecules of gas collide with each other and the velocities of the molecules chane due to the collision.

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion

B. Assertion is True, Reason is True Reason is not a correct explanation for

C. Assertion is True , Reason is False

D. Assertion is False but, Reason is True

Answer: B

Watch Video Solution

38. Assuming the expression for the pressure exerted by the gas on the walls of the container, it can be shown that pressure is

A. $\left(\frac{1}{3}\right)^{rd}$ kinetic energy per unit volume of a gas.

B. $\left[\frac{2}{3}\right]^{rd}$ kinetic energy per unit volume of a gas

C. $\left[\frac{3}{4}\right]^{rd}$ kinetic energy per unit volume of a gas

D. $\frac{3}{2} \times$ kinetic energy per unit volume of a gas

Answer: B

Watch Video Solution

39. The temperature of a gas at pressure P and volume V is $27^{\circ} C$. Keeping its volume constant. If its temperature is raised to $927^{\circ} C$, then its pressure will be

A. 2P

B. 3P

C. 4P

D. 6P

Answer: C

Watch Video Solution

40. Root mean square velocity of gas molecules is $300 m / \sec$. The $r.m.s$ velocity of molecules of gas with twice the molecular weight and half the absolute temperature is :

A. 300 m/s

B. 600 m/s

C. 75 m/s

D. 150 m/s

Answer: D

Watch Video Solution

41. The kinetic energy of one g-mole of a gas at normal temp erature and pressure is its thennal motion? [AIEEE 2009} (R == 8.31 J/mole -K)

A. $0.56 \times 10^4 J$

B. $1.3 \times 10^2 J$

C. $2.7 \times 10^2 J$

D. $3.4 \times 10^2 J$

Answer: D

Watch Video Solution

42. A monatomic gas is kept at room temperature 300 K. Calculate the average kinetic energy of gas molecule. (Use K = 1.38 x 10^{-23} M.K.S. units)

A. 0.138 eV

B. 0.062 eV

C. 0.039 eV

D. 0.013eV

Answer: C

Watch Video Solution

43. Two vessels A and B are identical. A has 1 g hydrogen at $0^\circ C$ and B has 1 g oxygen at $0^\circ C$. Vessel A contains x molecules and B contains y molecules. The average kinetic energy per molecules in A is 'n' times the average kinetic energy per molecule in B. The value of 'n' is

A. 16

B. 8

C. 32

D. 1

Answer: D

Watch Video Solution

44. Average kinetic energy of molecules is

A. directly proportional to square root of temperature .

B. directly proportional to absolute temperature.

C. independent of absolute temperature.

D. inversely proportional to absolute temperature

Answer: B

Watch Video Solution

45. Pressure of an ideal gas is increased by keeping temperature constant.What is its effect on kinetic energy of molecules?

A. decreases

B. increases

C. remain same

D. increase or decreases depending on the nature of gas.

Answer: C

Watch Video Solution

46. The temperature at which kinetic energy of a gas is doubled of its value at N.T.P., is

A. 68.25 K

B. 273 K

C. 136.5 K

D. 546 K

Answer: D

Watch Video Solution

47. One kg of a diatomic gas is at pressure of $8 \times 10^4 N/m^2$. The density of the gas is $4kg/m^3$. What is the energy of the gas due to its thermal motion?

A. $3 \times 10^4 J$

B. $5 \times 10^4 J$

C. $6 \times 10^4 J$

D. $7 \times 10^4 J$

Answer: B

Watch Video Solution

48. A gas mixture consists of 2 moles of oxygen and 4 of Argon at temperature T. Neglecting all vibrational modes, the total internal energy of the system is

A. 4RT

B. 15RT

C. 9RT

D. 11RT

Answer: D

Watch Video Solution

49. The mean energy of a molecule of an ideal gas is

A. $\frac{1}{2}$ KT

B. 2 KT

C. KT

D. $\frac{3}{2}$ KT

Answer: D

Watch Video Solution

50. C_p nad C_v are specific heats at constant pressure and constant volume respectively. It is observed that

$C_p - C_v = a$ for hydrogen gas

$C_p - C_v = b$ for niotrogen gas

The correct relation between a and b is

A. a=14b

B. a=28b

C. a=$\frac{1}{14}b$

D. a=b

Answer: A

Watch Video Solution

51. At constant volume, the specific heat of a gas is $\frac{3R}{2}$, then the value of 'γ' will be

A. $\frac{3}{2}$

B. $\frac{5}{2}$

C. $\frac{5}{3}$

D. $\frac{5}{7}$

Answer: C

Watch Video Solution

52. The molar specific heat at constant pressure of an ideal gas is $(7/2R)$. The ratio of specific heat at constant pressure to that at constant volume is

A. $\frac{5}{7}$

B. $\frac{9}{7}$

C. $\frac{7}{5}$

D. $\frac{8}{7}$

Answer: C

Watch Video Solution

53. For a gas $\frac{R}{C_V}$ = 0.4, where R is the universal gas constant and C, is molar specific heat at constant volume. The gas is made up of molecules which are

A. rigid diatomic

B. monatomic

C. non-rigid diatomic

D. polyatomic

Answer: A

Watch Video Solution

54. For a gas if $\gamma = 1.4$, then atomically, C_p and C_v of the gas are respectively

A. Monatomic, $\frac{5}{2}R$, $\frac{3}{2}R$

B. Monatomic, $\frac{7}{2}R$, $\frac{5}{2}R$

C. Diatomic, $\frac{7}{2}R$, $\frac{5}{2}R$

D. Triatomic, $\frac{7}{2}R$, $\frac{5}{2}R$

Answer: C

Watch Video Solution

55. For a gas if ratio of specific heats at constant pressure and volume is g then value of degrees of freedom is

A. $\frac{3\gamma - 1}{2\gamma - 1}$

B. $\frac{2}{\gamma - 1}$

C. $\frac{9}{2}(\gamma - 1)$

D. $\frac{25}{2}(\gamma - 1)$

Answer: B

Watch Video Solution

56. Which of the following formulae is wrong?

A. $C_v = \frac{R}{\gamma - 1}$

B. $C_p = \frac{\gamma R}{\gamma - 1}$

C. $\frac{C_p}{C_v} = \gamma$

D. $C_p - C_v = 2R$

Answer: D

Watch Video Solution

57. The molar specific heat of an ideal gas at constant pressure and constant volume is C_p and C_v respectively. If R is the universal gas constant and the ratio of C_p to C_v is γ, then C_v.

A. $\dfrac{1-\gamma}{1+\gamma}$

B. $\dfrac{1+\gamma}{1-\gamma}$

C. $\dfrac{\gamma-1}{R}$

D. $\dfrac{R}{\gamma-1}$

Answer: D

Watch Video Solution

58. For a rigid diatomic molecule, univerisal gas constant $R = mc_p$, where $'C_p'$ is the molar specific heat at constant pressure and 'n' is a number. Hence n is equal to

A. 0.2257

B. 0.4

C. 0.2857

D. 0.3557

Answer: C

Watch Video Solution

59. An office room contains about 2000 moles of air. The change in the internal energy of this much air when it is cooled from 34 °C to 24 °C at a constant pressure of 1.0 atm is

(Use $\gamma_{\text{air}} = 1.4$ and universal gas constant=8.314 J/mol K)

A. $-1.9 \times 10^5 J$

B. $+1.9 \times 10^5 J$

C. $-4.2 \times 10^5 J$

D. $+0.7 \times 10^5 J$

Answer: C

Watch Video Solution

60. Which of the following can not determine the state of a thermodynamic system

A. Pressure and volume

B. Volume and temperature

C. Temperature and pressure

D. Any one of pressure, volume or temperature

Answer: D

Watch Video Solution

61. The amount fo heat given to a system in a cyclic thermodynamic process

A. is completely changed with work

B. is completely changed into internal energy

C. brings about reduction in temperature

D. brings about increase in temperature

Answer: A

Watch Video Solution

62. First law of thermodynamics is a special case of

A. Newton's law

B. Law of conversation of energy

C. Charle's law

D. Law of heat exchange

Answer: B

Watch Video Solution

63. For adiabatic processes $\left(\gamma = \frac{C_p}{C_v}\right)$

A. $P^{\gamma}V$=constant

B. $T^{\gamma}V$=constant

C. $TV^{\gamma-1}$=constant

D. TV^{γ}=constant

Answer: C

Watch Video Solution

64. The gas equation $PV/T =$ constant is true for a constant mass of an ideal gas undergoing

A. isothermal changes only

B. adiabatic changes only

C. both isothermal and adiabatic changes

D. neither isothermal nor adiabatic changes

Answer: C

Watch Video Solution

65. An adiabatic process occurs at constant

A. temperature

B. pressure

C. heat

D. temperature and pressure

Answer: C

Watch Video Solution

66. During an adiabatic process, the pressure of a gas is found to be proportional to the cube of its absolute temperature. The ratio C_P / C_V for the gas is

A. $\frac{4}{3}$

B. 2

C. $\frac{5}{3}$

D. $\frac{3}{2}$

Answer: D

Watch Video Solution

67. If the door of a refrigerator is kept open, then which of the following is true

A. Room is cooled

B. Room is heated

C. Room is either cooled or heated

D. Room is neither cooled nor heated

Answer: B

Watch Video Solution

68. If the amount of heat given to a system be 35 joules and the amount of work done by the system be -15 joules , then the change in the internal energy of the system is

A. -50 joule

B. 20 joule

C. 30 joule

D. 50 joule

Answer: D

Watch Video Solution

69. In an adiabatic process 90 J of work is done on the gas. The change in internal energy of the gas is

A. is -90 J

B. is +90J

C. is 0J

D. depends on initial temperature

Answer: B

Watch Video Solution

70. 1 g of water at $100^\circ C$ is completely converted into steam at $100^\circ C$. 1g of steam occupies a volume of 1650cc. (Neglect the volume of 1g of water at $100^\circ C$). At the pressure of $10^5 N/m^2$, latent heat of steam is 540 cal/g (1 Calorie=4.2 joules). The increase in the internal energy in joules is

A. 2310

B. 2103

C. 1650

D. 2150

Answer: B

Watch Video Solution

71. dU+dW=0 is valid for

A. adiabatic process

B. isothermal process

C. isobaric process

D. isochoric process

Answer: A

Watch Video Solution

72. The internal energy change in a system that has absorbed $2kcal$ of heat and done $500J$ of work is

A. 8900 J

B. 6400 J

C. 5400 J

D. 7900 J

Answer: D

Watch Video Solution

73. If Q, E and W denote respectively the heat added, change in internal energy and the work done in a closed cycle process, then

A. E=0

B. Q=0

C. W=0

D. Q=W=0

Answer: A

Watch Video Solution

74. 110 J of heat is added to a gaseous system, whose internal energy change is 40 j. then the amount of external work done is

A. 150 J

B. 70J

C. 110 J

D. 40 J

Answer: B

Watch Video Solution

75. . When heat energy of 1500 Joules , is supplied to a gas at constant pressure $2.1 \times 10^5 N/m^2$, there was an increase in its volume equal to $2.5 \times 10^{-3} m^3$.The increase in internal energy of the gas in joules is

A. 450

B. 525

C. 975

D. 2025

Answer: C

Watch Video Solution

76. 5 mole of oxygen are heated at constant volume from $10^\circ C \text{to} 20^\circ C$. What will be the change in internal energy of the gas? Gram molar specific heat of gas at constant pressure $= 8cal. \text{Mole}^{-1}.^\circ C^{-1}$ and $R = 8.36J\text{mole}^{-1}.^\circ C^{-1}$.

A. 200 calories

B. 300 calories

C. 100 calories

D. None of these

Answer: B

Watch Video Solution

77. During an isothermal expansion, a confined ideal gas does $-150J$ of work aginst its surroundings. This implies that

A. 150 J of heat has been added to the gas.

B. 150 J of heat has been removed from the gas.

C. 300 J of heat has been added to the gas.

D. No heat is transferred because the process is isothermal.

Answer: B

Watch Video Solution

78. If the amount of heat given to a system is 3 5 J and the amount of work done on the system is 15 J, then the change in internal energy of the system is

A. -30J

B. 20J

C. 30J

D. 50J

Answer: D

Watch Video Solution

79. When an ideal gas in a cylinder was compreswsed isothermally by a piston, the work done on the gas found to be 1.5×10^4 cal. During this process about

A. 3.6×10^3 calories of heat flowed out from the gas

B. 3.6×10^3 calories of heat flowed into the gas

C. 1.5×10^4 calories of heat flowed into the gas

D. 1.5×10^4 calories of heat flowed out from the gas

Answer: A

Watch Video Solution

80. A cylinder fitted with a piston contains 0.2 moles of air at temperature 27° . The piston is pushed so slowly that the air within the cylinder remains in thermal equilibrium with the surroundings. Find the approximate work done by the system if the final volume is twice the initial volume

A. 543 J

B. 345 J

C. 453 J

D. 600 J

Answer: B

Watch Video Solution

81. $1mm^3$ of a gas is compressed at 1 atmospheric pressure and temperature $27^\circ C$ to $627^\circ C$. What is the final pressure under adiabatic condition (γ for the gas $= 1.5$)

A. $2780 \times 10^5 N/m^2$

B. $80 \times 10^5 N/m^2$

C. $36 \times 10^5 N/m^2$

D. $56 \times 10^5 N/m^2$

Answer: A

Watch Video Solution

82. During the adiabatic expansion of 2 moles of a gas, the internal energy of the gas is found to decrease by 2 joules , the work done during the process on the gas will be equal to

A. 1J

B. -1 J

C. 2 J

D. -2J

Answer: D

Watch Video Solution

83. Air in a cylinder is suddenly compressed by a piston. which is then maintained at the same rosition. With the passage of time

A. the pressure decreases

B. the presseure increases

C. the pressure remains the same

D. the pressure may increase or decrease depending upon the nature of the gas

Answer: A

Watch Video Solution

84. If $\lambda = 2.5$ and volume is equal to $\frac{1}{8}$ times to the initial volume then perssure p' is equal to (initial pressure = p)

A. P'=P

B. P'=2P

C. P'=P $\times$ $(2)^{15/2}$

D. P'=7P

Answer: C

Watch Video Solution

85. Two moles of a gas is expanded to double its volwne by two different processes. One is isobaric and the other is isothermal. If W_1 and W_2 are the works done respectively, then

A. $w_2 = \frac{W_1}{\ln 2}$

B. $W_2 = W_1$

C. $W_2 = W_1 \ln 2$

D. $W_1^2 = W_2 \ln 2$

Answer: C

Watch Video Solution

86. One mole of an ideal gas at an initial temperature true of TK does $6R$ joule of work adiabatically. If the ratio of specific heats of this gas at constant pressure and at constant volume is $5/3$, the final temperature of the gas will be

A. (T+2.4)K

B. (T-2.4)/K

C. (T-4)K

D. (T-4)K

Answer: D

Watch Video Solution

87. 5.6 liter of helium gas at STP is adiabatically compressed to 0.7 liter. Taking the initial temperature to be T_1, the work done in the process is

A. $\frac{9}{8}RT_1$

B. $\frac{3}{2}RT_1$

C. $\frac{15}{8}RT_1$

D. $\frac{9}{2}RT_1$

Answer: A

Watch Video Solution

88. Two moles of an ideal monatomic gas occupies a volume V at 27 °C. The gas expands adiabatically to a volume 2V. Calculate (i) the final temperature of the gas and (ii) change in its internal energy.

A. (i) 189 K (ii)-2.7 kJ

B. (i) 195 K (ii) 2. 7 kJ

C. (i) 189 K (ii) 2. 7 kJ

D. (i) 195 K (ii)-2.7 kJ

Answer: A

Watch Video Solution

89. A gas expands $0.25m^2$ at constant perssure $10^3 N/m^2$, the work done is

A. 2.5 ergs

B. 250 J

C. 250 W

D. 250 N

Answer: B

Watch Video Solution

90. Pressure P, volume V and temperature T for a certain gas are related by $P = \frac{AT - BT^2}{V}$, where A and B are constatns .The work done by the gas as its temperature change from T_1 to T_2 while pressure remaining constatn is

A. $A(T_2 - T_1) + B(T_2^2 - T_1^2)$

B. $A\frac{T_2 - T_1}{V_2 - V_1}\frac{B(T_2^2 - T_1^2)}{V_2 - V_1}$

C. $A(T_2 - T_1) - B(T_2^2 - T_1^2)$

D. $\frac{A(T_2 - T_2^2)}{V_2 - V_1}$

Answer: C

Watch Video Solution

91. The temperature inside a refrigerator is t_2 °C and the room temperature is t_1 °C. The amount of heat delivered to the room for each joule of electrical energy consumed ideally will be

A. $\frac{t_1 + t_2}{t_1 + 273}$

B. $\dfrac{t_1}{t_1 - t_2}$

C. $\dfrac{t_1 + 273}{t_1 - t_2}$

D. $\dfrac{t_2 + 273}{t_1 - t_2}$

Answer: C

Watch Video Solution

92. The cofficient of performance of a refrigerator is 5. If the temperature inside freezer is $-20^\circ C$, the temperature of the surroundings to which it rejects heat is :

A. $21^\circ C$

B. $31^\circ C$

C. $41^\circ C$

D. $11^\circ C$

Answer: B

Watch Video Solution

93. A refrigerator works between $4^{\circ} C$ and $30^{\circ} C$. It is required to remove $600 cal \text{ or } ies$ of heat every second in order to keep the temperature of the refrigerator space constant.The power required is (Take $1 cal \text{ or } ie = 4.2 J$)

A. 236.5 W

B. 2365 W

C. 1.365 W

D. 23.65 W

Answer: A

Watch Video Solution

94. The efficiency of an ideal heat engine working between the freezing point and boiling point of water, is

A. 0.268

B. 0.2

C. 0.0625

D. 0.125

Answer: A

Watch Video Solution

95. The efficiency of a Carnot engine which operates between the two temperatures $T_1 = 500K$ and $T_2 = 300K$ is

A. 0.75

B. 0.5

C. 0.4

D. 0.25

Answer: C

Watch Video Solution

96. A scientist says that the efficiency of his heat engine which operates at source temperature $127^{\circ} C$ and sink temperature $27^{\circ} C is 26 \%$, then

A. it is impossible

B. it is possible but less probable

C. it is quite probable

D. data is incomplete

Answer: A

Watch Video Solution

97. A Carnot engine takes 3×10^6 cal of heat from a reservoir at $627^\circ C$ and gives it to a sink at $27^\circ C$. The work done by the engine is:

A. 4.2×10^6 J

B. 8.4×10^6 J

C. 16.8×10^6 J

D. zero

Answer: B

Watch Video Solution

98. When an ideal diatomic gas is heated at constant pressure, the fraction of the heat energy supplied which increases the internal energy of the gas, is :

A. $2/5$

B. $3/5$

C. $3/7$

D. $3/4$

Answer: B

Watch Video Solution

99. A diatomic gas undergoes same change of temperature by two different processes (i) at constant volume and (ii) at constant pressure. The heat supplied in the two cases will be in the ratio of

A. $1:1$

B. $3:5$

C. $5:7$

D. $7:5$

Answer: C

Watch Video Solution

100. A diatomic gas (γ = 1.4) does 300 J work when it is expanded isobarically. The heat given to the gas in this process is

A. 1050 J/kg K

B. 950 J

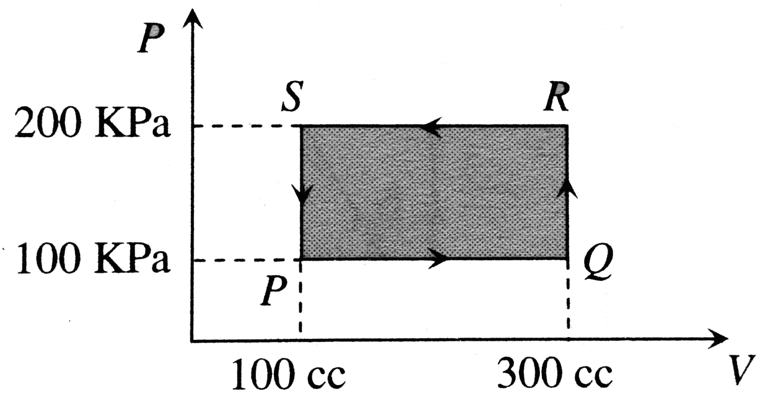
C. 600 J

D. 550 J

Answer: A

Watch Video Solution

101. A thermodynamic system is taken through the cyclic $PQRSP$ process. The net work done by the system is



A. 20 j

B. -20J

C. 400J

D. -374J

Answer: B

Watch Video Solution

102. One mole of an ideal gas goes from an initial state A to final state B via two processs : It first undergoes isothermal expansion from volume V to $3V$ and then its volume is reduced from $3V$ to V at constant pressure. The correct $P-V$ diagram representing the two process in (figure)

A.

B.

C.

D.

Answer: D

Watch Video Solution

103. An ideal gas is compressed to half its initial volume by means of several peocesses. Which of the process results in the maximum work done on the gas ?

A. Isothermal

B. Adiabatic

C. Isobaric

D. Isochoric

Answer: B

Watch Video Solution

104. A gas is compressed isothermally to half its initial volume. The same gas is compressed separately through an adiabatic process untill its volume is again reduced to half. Then

A. Compressing the gas isothermally or adiabatically will require the same amount of work.

B. Which of the case (whether compression through isothermal or through adiabatic process) requires more work will depend upon the atomicity of the gas.

C. Compressing the gas isothermally will require more work to be done.

D. Compressing the gas through adiabatic process will require more work to be done.

Answer: D

Watch Video Solution

105. Which of the following statements is true?

A. Good emitters are good reflectors.

B. Good absorbers are good emitters.

C. At $0^{\circ} C$ heat radiations are not emitted by any body.

D. Every body absorbs heat radiations at all temperatures and does not emit heat radiations

Answer: B

Watch Video Solution

106. Absorption co-efficient of an open window is...

A. zero

B. 0.5

C. 1

D. 0.2

Answer: C

Watch Video Solution

107. Absorption coefficient of totally blackbody is

A. zero

B. one

C. more than one

D. infinity

Answer: B

Watch Video Solution

108. 0.4

A. 0.02

B. 0.01

C. 0.74

D.

Answer: A

View Text Solution

109. Coefficient of transmission is 0.22 and coefficient of reflection is 0.74 for a given body. For a given body, at given temperature, the coefficient of emission is

A. 0.4

B. 0.04

C. 0.96

D. 0.22

Answer: B

Watch Video Solution

110. When 150 J of energy. is incident on surface of a body, 15 J of energy is reflected by it. If the coefficient of absorption is 0.6, then the amount of energy transmitted will be

A. 4.5 J

B. 9 J

C. 45 J

D. 90 J

Answer: C

Watch Video Solution

111. Heat energy is incident on the surface at the rate of 1000 J/min. If coefficient of absorption is 0.8 and coefficient of reflection is 0.1 then heat energy transmitted by the surface in 5 minute is

A. 100 J

B. 500 J

C. 700 J

D. 900 J

Answer: B

Watch Video Solution

112. Wien's law is

A. $\lambda_m \propto T$

B. $\lambda_m \propto T^2$

C. $\lambda_m \propto T^{-1}$

D. $\lambda_m \propto T^{-2}$

Answer: C

Watch Video Solution

113. A black body radiates heat at temperatures T_1 and $T_2(T_2 > T_1$ the frequency corresponding to maxium energy is

A. more at T_1

B. more at T_2

C. equal for $T_1 \quad T_2$

D. independent of $T_1 \quad T_2$

Answer: B

Watch Video Solution

114. On observing light from three different stars P, Q and R, it was found that intensity of violet colour is maximum in the spectrum of P, the intensity of green colour is maximum in the spectrum of R and the intensity of red colour is maximum in the spectrum of Q. if T_P, T_Q and T_R are respective absolute temperature of P, Q and R. then it can be concluded from the above observation that

A. $T_p > T_Q > T_R$

B. $T_p > T_R > T_Q$

C. $T_P < T_R < T_Q$

D. $T_P < T_Q < T_R$

Answer: B

Watch Video Solution

115. A piece of iron is heated in a flame. It first becomes dull red then becomes reddish yellow and finally turns to white hot. The correct explanation for the above observation is possible by using.

A. Stefan's law

B. Wien's displacement Law

C. Kirchhoff's law

D. Newton's law of cooling

Answer: B

Watch Video Solution

116. Behaviour of an ideal black body is similar to

A. group of classical oscillators which emit waves of same frequency.

B. group of classical oscillators which emit waves of different frequencies.

C. group of quantum oscillators which emit waves of same frequency

D. group of quantum oscillators which emit waves of different frequencies.

Answer: D

Watch Video Solution

117. The colour of a star depends upon its

A. density

B. distance from the sun

C. radius

D. surface temperature

Answer: D

Watch Video Solution

118. Wein's constant is 2892×10^{-6} MKS unit and the value of λ_m from moon is 14.46 microns. What is the surface temperature of moon

A. 200 k

B. 2000 K

C. 20 K

D. $200^\circ C$

Answer: A

Watch Video Solution

119. The intensity of radiation emitted by the sun has its maximum value at a wavelength of 510 nm and that emitted by the North star has the maximum value at 350 nm. If these stars behave like black bodies, then the ratio of the surface temperatures of the sun and the north star is

A. 1.46

B. 0.69

C. 1.21

D. 0.83

Answer: B

Watch Video Solution

120. A black body has maximum wavelength λ_m at temperature $2000K$. Its corresponding wavelength at temperature 3000 will be

A. $\frac{3}{2}\lambda_m$

B. $\frac{2}{3}\lambda_m$

C. $\frac{4}{9}\lambda_m$

D. $\frac{9}{4}\lambda_m$

Answer: B

Watch Video Solution

121. A black body emits radiations of maximum intensity at a wavelength of 5000 A, when the temperature of the body is 1227° C. If the temperature of the body is increased by 2227 °C, the maximum intensity of emitted radiation would be observed at

A. 2754.8 A

B. 3000 A

C. 3500 A

D. 4000 A

Answer: B

122. A black body is at a temperature of 5760 K. The energy of radiation emitted by the body at wavelength 250 nm is U_1, at wavelength 500 nm is U_2 and at 1000 nm is U_3, Wien's constant, $b = 2.88 \times 10^6$ nm K, which of the following is correct ?

A. $U_1 > U_2$

B. $U_2 > U_1$

C. $U_1 = 0$

D. $U_3 = 0$

Answer: B

123. Three objects coloured black, gray and white can withstand hostile conditions upto $2800^{\circ} C$. These objects are thrown into a furance where each of them attains a temperature of $2000^{\circ} C$. Which object will glow brightest?

A. The white object

B. The black object

C. All glow with equal brightness

D. Gray object

Answer: B

Watch Video Solution

124. Two perfect blacd bodies A_1 and A_2 made out of same material have diameters 2 cm and 16 cm respectively. $\lambda'_{\max}$ and

$\lambda'_{\max}$' are the wavelengths corresponding to their maximum radiation of energy at a common temperature $\lambda'_{\max}$ and $\lambda'_{\max}$' are related as

A. $\lambda'_{\max} = 8\lambda'_{\max}$'

B. $16\lambda'_{\max} = 5\lambda'_{\max}$'

C. $\lambda'_{\max} = \lambda'_{\max}$'

D. $8\lambda'_{\max} = \lambda'_{\max}$'

Answer: C

Watch Video Solution

125. A black rectangular surface of area A emits energy E per second at $27^{\circ} C$. If length and breadth are reduced to one third of initial value and temperature is raised to $327^{\circ} C$, then energy emitted per second becomes

A. $\frac{4E}{9}$

B. $\frac{7E}{9}$

C. $\frac{10E}{9}$

D. $\frac{16E}{9}$

Answer: D

Watch Video Solution

126. If the temperature of the sun (black body) is doubled, the rate of energy received on earth will be increase by a factor of

A. 2

B. 4

C. 8

D. 16

Answer: D

Watch Video Solution

127. If the temperature of the sun were to increase form T to 2T and its radius from R to 2R, then the ratio of the radiant energy received on earth to what it was previously will be

A. 4

B. 16

C. 32

D. 64

Answer: D

Watch Video Solution

128. The dimensions of stefan 's constant are

A. $\left[M^{0}L^{1}T^{3}k^{-4}\right]$

B. $\left[M^{1}L^{1}T^{-3}K^{-3}\right]$

C. $\left[M^{1}L^{1}T^{-3}K^{-4}\right]$

D. $\left[M^{1}L^{0}T^{-3}K^{-4}\right]$

Answer: D

Watch Video Solution

129. Two spherical black bodies of radii R_1 and R_2 and with surface temperature T_1 and T_2 respectively radiate the same power. R_1 / R_2 must be equal to

A. $\frac{T_1}{T_2}$

B. $\frac{T_2}{T_1}$

C. $\left(\frac{T_1}{T_2}\right)^2$

D. $\left(\frac{T_2}{T_1}\right)^2$

Answer: C

Watch Video Solution

130. A black body radiates 20 W at temperature $227^\circ C$. If temperature of the black body is changed to $727^\circ C$ then its radiating power wil be

A. 120 W

B. 240 W

C. 320 W

D. 360 W

Answer: C

Watch Video Solution

131. A body radiates energy 5 W at a temperature of $127^\circ C$. If the temperature is increased to $927^\circ C$, then it radiates energy at the rate of

A. 410 W

B. 81W

C. 405 W

D. 200 W

Answer: C

Watch Video Solution

132. Rate of loss of heat of two spheres at same temperature having radii in ratio 1 : 2 is

A. $1/2$

B. $2/1$

C. $1/4$

D. $4/1$

Answer: C

Watch Video Solution

133. Rates of emission of heat by perfectly black body maintained at temperatures 27° C and 927° Care in ratio

A. $\frac{1}{256}$

B. $\frac{1}{16}$

C. $\frac{1}{64}$

D. $\frac{1}{128}$

Answer: A

Watch Video Solution

134. A black body at $227^{\circ} C$ radiates heat at the rate of $7 cal cm^{-2} s^{-1}$. At a temperature of $727^{\circ} C$, the rate of heat radiated in the same unit will be

A. 60

B. 50

C. 112

D. 80

Answer: C

Watch Video Solution

135. The temperature of two bodies A and B are respectively $727^{\circ} C$ and $327^{\circ} C$. The ratio $H_A : H_B$ of the rates of heat radiated by them is

A. $727:327$

B. 0.21041666666667

C. $25:9$

D. $625:81$

Answer: D

Watch Video Solution

136. A black body at a temperature of $227^{\circ} C$ radiates heat energy at the rate of 5 cal/cm^2-sec. At a temperature of $727^{\circ} C$, the rate of heat radiated per unit area in cal/cm^2-sec will be

A. $10 cal / m^2 - s$

B. $20 cal / m^2 - s$

C. $40 cal / m^2 - s$

D. $80 cal / m^2 - s$

Answer: D

Watch Video Solution

137. The surface of a black body is at a tempera ture $727^{\circ} C$ and its cross section is $1 m^2$ Heat radi ated from this surface in one minute in Joules is (Stefan's constant $= 5.7 \times 10^{-8} W/m^2/k^4$)

.

A. 34.2×10^5

B. 2.5×10^5

C. 3.42×10^5

D. 2.5×10^5

Answer: A

Watch Video Solution

138. A metal ball of surface area $200 cm^2$ and temperature $527^\circ C$ is surrounded by a vessel at $27^\circ C$. If the emissivity of the metal is 0.4, then the rate of loss of heat from the ball is $(\sigma = 5.67 \times 10^{-8} J/m^2 - s - k^4)$

A. 108 Joule/s approx

B. 168 Joule/s approx

C. 182 Joule/s approx

D. 192 Joule/s approx

Answer: C

Watch Video Solution

139. A black body of emissive power 81 J/m^2 s when it is at 300 K and ordinary body of emissivity 0.8 when it is at 500 K. what is the emissive power of an ordinary body?

A. $500 J / m^2 s$

B. $800 J / m^2 s$

C. $600 J / m^2 s$

D. $400J/m^2s$

Answer: A

Watch Video Solution

140. A spherical black body with a radius of 12 cm radiates 450 watt power at 500 K. If the radius were halved and the temperature doubled, the power radiated in watt would be

A. 225

B. 450

C. 1000

D. 1800

Answer: D

Watch Video Solution

Watch Video Solution

141. Parallel rays of light of intensity $I = 912 W M^{-2}$ are incident on a spherical black body kept in surroundings of temperature 300K. Take Stefan-Boltzmann constant $\sigma = 5.7 \times 10^{-8}$ $W m^{-2} K^{-4}$ and assume that the energy exchange with the surroundings is only through radiation. The final steady state temperature of the black body is close to

A. 330 K

B. 660 K

C. 990 K

D. 1550 K

Answer: A

Watch Video Solution

Watch Video Solution

142. A sphere at temperature $600K$ is placed in an enviroment to temperature is $200K$. Its cooling rate is H. If its temperature reduced to $400K$ then cooling rate in same enviorment will become

A. $\frac{3}{16}R$

B. $\frac{8}{27}R$

C. $\frac{16}{3}R$

D. 7R

Answer: A

Watch Video Solution

143. Two bodies A and B are placed in an evacuated vessel maintained at a temperature of $27^\circ C$, the temperature of A is $327^\circ C$ and that of B is $227^\circ C$. Then the ratio of heat loss by body A and B is

A. $9 : 4$

B. $6 : 5$

C. $16:25$

D. $3 : 2$

Answer: A

Watch Video Solution

144. The sphere of radii 8 cm and 2 cm are cooling. Their temperatures are $127^\circ C$ and $527^\circ C$ respectively . Find the ratio of energy radiated by them in the same time

A. 0.5

B. 1

C. 2

D. 3

Answer: B

Watch Video Solution

145. Assertion : Perspiration from human body helps in cooling the body.

Reason : A thin layer of water on the skin enhances its emissivity.

A. Both assertion and reason are true and the reason is the correct explanation of the assertion.

B. Both assertion and reason are true but reason is not the correct explanation of the assertion.

C. Assertion is True , Reason is False

D. Assertion is False but, Reason is True

Answer: C

Watch Video Solution

146. Ac cording to Newton's law of cooling, the rate of cooling of a body is proportional to $(\Delta\theta)^n$, where $\Delta\theta$ is the difference of the temperature of the body and thae surrounding. What is the value of n out of 4,3,2,and 1?

A. one

B. two

C. three

D. four

Answer: A

Watch Video Solution

147. A bucket full of hot water cools from $75^{\circ} C$ to $70^{\circ} C$ in time T_1, from $70^{\circ} C$ to $65^{\circ} C$ in time T_2 and from $65^{\circ} C$ to $60^{\circ} C$ in time T_3, then

A. $\frac{T_1}{T_2}$

B. $\frac{T_2}{T_1}$

C. $\left(\frac{T_1}{T_2}\right)^2$

D. $\left(\frac{T_2}{T_1}\right)^2$

Answer: C

Watch Video Solution

148. A liquid cools from 70 °C to 60 °C in 5 minutes. If the temperature of the surrounding is constant at 30 °C, then the time taken by the liquid to cool from 60 °C to 50 °C is

A. 5 minutes

B. 10 minutes

C. 7 minutes

D. 8 minutes

Answer: C

Watch Video Solution

149. An object is cooled from $75^{\circ} C \rightarrow 65^{\circ} C$ in 2 min in a room at $30^{\circ} C$ .the time taken to cool another identical object from $55^{\circ} C$ to $45^{\circ} C$ in the same room , in minutes is

A. 4

B. 5

C. 6

D. 7

Answer: A

Watch Video Solution

150. A body cools from 100° C to 70° C in 8 second. If temperature of surrounding is I 5° C, then time required for body to cool from 70° C to 40° C is

A. 14s

B. 10s

C. 8s

D. 5s

Answer: A

Watch Video Solution

151. A body cools from a temperature $3T$ to $2T$ in 10 minutes. The room temperature is T. Assume that Newton's law of cooling is applicable. The temperature of the body at the end of next 10 minutes will be

A. T

B. $\frac{7}{4}T$

C. $\frac{3}{2}T$

D. $\frac{4}{3}T$

Answer: C

Watch Video Solution

152. Certain quantity of water cools from $70^\circ C$ to $60^\circ C$ in the first 5 minutes and to $54^\circ C$ in the next 5 minutes. The temperature of the surrounding is

A. $45^\circ C$

B. $20^\circ C$

C. $42^\circ C$

D. $10^\circ C$

Answer: A

Watch Video Solution

153. Rate of cooling of body is $0.5^{\circ} C$/min, when the system is $50^{\circ} C$ above the surroundings. When a system is $30^{\circ} C$ above the surroundings, the rate of cooling will be

A. $0.3^{\circ} C / \min$

B. $0.6^{\circ} C / \min$

C. $0.7^{\circ} C / \min$

D. $0.4^{\circ} C / \min$

Answer: A

Watch Video Solution

154. Two thermometers A and B are exposed in sunlight. The bulb of A is painted black, But that of B is not painted. The correct statement regarding this case is

A. Temperature of A will rise faster than B but the final temperature will be the same in both.

B. Both A and B show equal rise in beginning.

C. Temperature of A will remain more than B

D. Temperature of B will rise faster

Answer: A

Watch Video Solution

155. In a given process on an ideal gas, $dW = 0$ and $dQ < 0$. Then for the gas

A. the temperature will decrease

B. the volume will decrease

C. the pressure will remain constant

D. the temperature will increase

Answer: A

Watch Video Solution

156. A perfect gas goes from state A to another state B by absorbing 8 x 10^5 J of heat and doing 6.5 x 10^5 J of external work. It is now transferred between the same two states in another process in which it absorbs 10^5 J of heat. Then in the second process,

A. work done on the gas is 0.5×10^5 J

B. work done by gas is 0.5×10^5 J

C. work done on gas is 10^5 J

D. work done by gas is 10^5 J

Answer: A

Watch Video Solution

157. A metal bar of mass 1.5 kg is heated at atmospheric pressure. Its temperature is increased from 30 °C to 60 °C. Then the work done in the process is (Volume expansion coefficient of the metal = $5 \times 10^{-5} \hat{} (\circ)C^{-1}$,

density of the metal $= 9 \times 10^3 kgm^{-3}$

Atmospheric pressure $= 1 \times 10^5 Pa)$

A. $25 \times 10^{-3} J$

B. $2.5 \times 10^{-3} J$

C. $12.5 \times 10^{-3} J$

D. $1.25 \times 10^{-3} J$

Answer: A

Watch Video Solution

158. 100g of water is heated from $30^{\circ} C \rightarrow 50^{\circ} C$. Ignoring the slight expansion of the water, the change in its internal energy is (specific heat of water is $4184 J / kg / K$):

A. 4.2 kJ

B. 8.4 kJ

C. 84 kJ

D. 2.1 kJ

Answer: B

Watch Video Solution

159. The work of 146 kJ is performed in order to compress one kilo mole of a gas adiabatically and in this process the temperature of the gas increases by $7^\circ C$. The gas is $(R = 8.3ml^{-1}Jmol^{-1}K^{-1})$

A. triatomic

B. a mixture of monatomic and diatomic

C. monatomic

D. diatomic

Answer: D

Watch Video Solution

160. A thermally insulated vessel contains an ideal gas of molecular mass M and ratio of specific heats γ. It is moving with speed v and it's suddenly brought to rest. Assuming no heat is lost to the surroundings, Its temperature increases by:

A. $\dfrac{(\gamma-1)}{2(\gamma+1)R}Mv^2$

B. $\dfrac{(\gamma-1)}{2\gamma R}Mv^2$

C. $\dfrac{\gamma Mv^2}{2R}$

D. $\dfrac{\gamma-1}{2R}Mv^2$

Answer: D

Watch Video Solution

161. A Carnot refrigerator absorbs heat from water at O °C and gives it to a room at 27 °C. When it converts 2 kg of water at 0°C into ice. at 0°C, the work.done is (Latent heat of fusion of ice= 333 x $10^3 Jkg^{-1}$)

A. 25×10^3 J

B. 82×10^3 J

C. 65.87×10^3 J

D. 92.52×10^3 J

Answer: C

Watch Video Solution

162. A Carnot engine, having an efficiency of $\eta = \frac{1}{10}$ as heat engine, is used as a refrigerator. If the work done on the system is 10 J, the amount of energy absorbed from the reservoir at lower temperature is

A. 1 J

B. 90 J

C. 99 J

D. 100 J

Answer: B

Watch Video Solution

163. When the absolute temperature of the source of a Carnot heat engine is increased by 25 %, its efficiency increases by 80%. The new efficiency of the engine is

A. 0.12

B. 0.24

C. 0.48

D. 0.36

Answer: D

Watch Video Solution

164. An ideal Carnot engine takes heat from a source at 317 $^{\circ}C$, does some external work and delivers the remaining energy to a heat sink at 117 $^{\circ}C$. If 500 kcal of heat is taken from the source, then the heat delivered to the sink is

A. 169 kcal

B. 331 kcal

C. 117 kcal

D. 317 kcal

Answer: B

Watch Video Solution

165. A Carnot engine working between 300 Kand 400 K has 800 J of useful work. The amount of heat energy supplied to the engine from the source is

A. 2400 J

B. 3200 J

C. 1200 J

D. 3600 J

Answer: B

Watch Video Solution

Watch Video Solution

166. A Carnot engine working between 200 Kand 500 K has done work equal to 800 joules. Amount of heat energy supplied to the engine from the source is

A. $\frac{4000}{3}$ J

B. $\frac{2000}{3}$ J

C. $\frac{800}{3}$ J

D. $\frac{1600}{3}$ J

Answer: A

Watch Video Solution

167. An engine has an efficiency of $\frac{1}{6}$. When the temperature of sink is reduced by $62^{\circ} C$, its efficiency is doubled. Temperature of the source is

A. 372 K and 310 K

B. 273 K and 300 K

C. $99^{\circ} C$ and $10^{\circ} C$

D. $200^{\circ} C$ and $37^{\circ} C$

Answer: A

Watch Video Solution

168. A diatomic ideal gas is used in a Carnot engine as the working substance. If during the adiabatic expansion part of the cycle the volume of the gas increase from V to 32V, the efficiency of the engine is

A. 0.25

B. 0.5

C. 0.75

D. 0.99

Answer: C

Watch Video Solution

169. A cylinder of fixed capacity 67 .2 litres contains helium gas at STP. Th~ amount of heat needed to rise the temperature of the gas in the cylinder by 20 °C is (R = 8.31 J$mol^{-1}K^{-1}$)

A. 748 J

B. 374 J

C. 1000 J

D. 500 J

Answer: A

View Text Solution

170. A solid cube and a solid sphere of the same material have equal surface area. Both are at the same temperature $120^{\circ} C$, then

A. both the cube and the sphere cool down at the same rate.

B. both the cube and the sphere cool down at the same rate.

C. the sphere cools down faster than the cube

D. whichever is having more mass will cool down faster.

Answer: B

Watch Video Solution

171. Two metallic spheres S_1 and S_2 are made of the same material and have got identical surface finish. The mass of S_1 is thrice that of S_2. Both the spheres are heated to the same high temperature and placed in the same room having lower temperature but are thermally insulated from each other. the ratio of the initial rate of cooling of S_1 to that of S_2 is

$(a)\frac{1}{3}(b)\frac{1}{\sqrt{3}}(c)\frac{\sqrt{3}}{1}(d)\left(\frac{1}{3}\right)^{\frac{1}{3}}$

A. $\frac{1}{3}$

B. $\left(\frac{1}{3}\right)^{1/3}$

C. $\frac{1}{\sqrt{3}}$

D. $\frac{\sqrt{3}}{1}$

Answer: B

Watch Video Solution

172. Show below are the black body radiation curves at temperature T_1 and $T_2 (T_2 > T_1)$. Which of the following plots is correct?

A.

B.

C.

D.

Answer: A

View Text Solution

173. Two spheres A and B having radii 3 cm and 5 cm respectively are coated with carbon black on their outer surfaces. The wavelengths of maximum intensity of emitted radiation are 300 nm and 500 nm respectively. If the powers radiated are Q_A and Q_B respectively, then $\frac{Q_A}{Q_B}$ is

A. $\sqrt{\frac{5}{3}}$

B. $\frac{5}{3}$

C. $\left(\frac{5}{3}\right)^2$

D. $\left(\frac{5}{3}\right)^4$

Answer: C

Watch Video Solution

174. A liquid in a beaker has temperature $\theta(t)$ at time t and θ_0 is temperature of surroundings, then according to Newton's law of cooling the correct graph between $\log_e(\theta - \theta_0)$ and t is :

A.

B.

C.

D.

Answer: A

Watch Video Solution

175. A gaseous mixture consists of 16g of helium and 16 g of oxygen. The ratio $\frac{C_p}{C_v}$ of the mixture is

A. 1.4

B. 1.54

C. 1.59

D. 1.62

Answer: D

Watch Video Solution

176. A vessel of volume V contains an ideal gas at absolute temperature T and pressure P. The gas is allowed to leak till its pressure falls to P'. Assuming that the temperature remains constant during leakage, the number of moles of the gas that have leaked is

A. $\frac{V}{RT}(P + P')$

B. $\frac{V}{2RT}(P + P')$

C. $\frac{V}{RT}(P - P')$

D. $\frac{V}{2RT}(P - P')$

Answer: C

Watch Video Solution

177. A monatomic gas at a pressure P, having a volume V expands isothermally to a volume 2 V and then adiabatically to a volume 16 V. The final pressure of the gas is (take $\gamma = \frac{5}{3}$)

A. 64 P

B. 32 P

C. $\frac{P}{64}$

D. 16 P

Answer: C

Watch Video Solution

178. An ideal gas expands isothermally from volume V_1 to V_2 and is then compressed to original volume V_1 adiabatically. Initialy pressure is P_1 and final pressure is P_3. The total work done is W. Then

A. $P_3 > P_1, w > 0$

B. $P_3 < p - 1, W < 0$

C. $P_3 > P_1, W < 0$

D. $P_3 = P_1, W = 0$

Answer: C

Watch Video Solution

179. If a piece of metal is heated to temperature θ and the allowed to cool in a room which is at temperature θ_0, the graph between the temperature T of the metal and time t will be closet to

A.

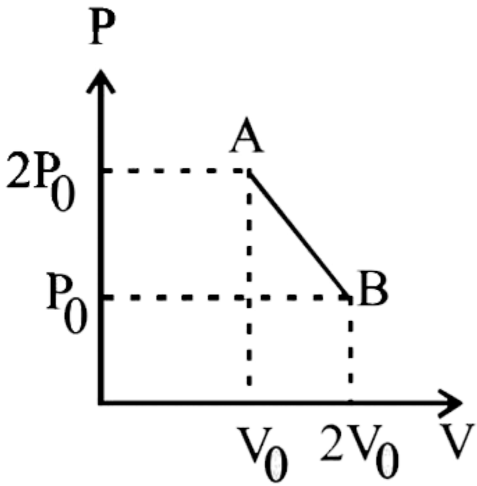
B.

C.

D.

Answer: C

180. n' moles of an ideal gas undergoes a process $A \rightarrow B$ as shown in the figure. The maximum temperature of the gas during the process will be:



A. $\dfrac{3P_0V_0}{2nR}$

B. $\dfrac{9P_0V_0}{2nR}$

C. $\dfrac{9P_0V_0}{nR}$

D. $\dfrac{9P_0V_0}{4nR}$

Answer: D

Watch Video Solution

181. The amount of heat energy required to raise the temperature of $1g$ of Helium at NTP, from T_1K to T_2K is

A. $\frac{2}{8}N_A k_B(T_2 - T_1)$

B. $\frac{3}{2}N_A k_B(T_2 - T_1)$

C. $\frac{3}{4}N_A k_B(T_2 - T_1)$

D. $\frac{3}{4}N_A k_B(T_2 - T_1)$

Answer: A

Watch Video Solution

182. At what temperature will the R.M.S. velocity for H_2 molecule- be same as that for O_2 molecule at 127° C?

A. $27^{\circ} C$

B. $-248^{\circ} C$

C. $-127^{\circ} C$

D. $35^{\circ} C$

Answer: B

Watch Video Solution

183. At what temperature , will the rms speed of oxygen molecules be sufficient for escaping from the earth ? Take $m = 2.76 \times 10^{-26} kg$, $k = 1.38 \times 10^{-23} J / K$ and $v_e = 11.2 km / s$

.

A. $2.508 \times 10^{4} K$

B. $8.360 \times 10^{4} K$

C. $5.016 \times 10^4 K$

D. $1.254 \times 10^4 K$

Answer: B

Watch Video Solution

184. Aseertion: Thermodynamics process in nature are irreversible.

Reason: Dissipactive effects cannot be eliminated.

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion

B. Assertion is True, Reason is True Reason is not a correct explanation for

C. Assertion is True , Reason is False

D. Assertion is False but, Reason is True

Answer: A

Watch Video Solution

185. Assertion : In an isolated system the entropy increases.

Reason : The processes in an isolated system are adiabatic.

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion

B. Assertion is True, Reason is True Reason is not a correct explanation for

C. Assertion is True , Reason is False

D. Assertion is False but, Reason is True

Answer: B

Watch Video Solution

186. One mole of an ideal gas requires 207J heat to raise the temperature by 10 K, when heated at constant pressure. If the same gas is heated at constant volume to raise the temperature by 10 K, then heat required is [given gas constant. R = 8.3 1/(mol - K)]

A. 96.6 J

B. 124.2 J

C. 198.8 J

D. 215.4 J

Answer: B

Watch Video Solution

187. Consider a spherical shell of radius R at temperature T. The black body radiation inside it can be considered as an ideal gas of photons with internal energy per unit volume $u = \frac{U}{V} \propto T^4$ and pressure $P = \frac{1}{3}\left(\frac{U}{V}\right)$. If the shell now undergoes an adiabatic expansion the relation between T and R is :

A. $T \propto e^{-R}$

B. $T \propto e^{-3R}$

C. $T \propto \frac{1}{R}$

D. $T \propto \frac{1}{R^3}$

Answer: C

Watch Video Solution

Evaluation Test

1. The power radiated by a black body is P, and it radiates maximum energy around the wavelength λ_0. If the temperature of the black body is now changed so that it radiates maximum energy around a wavelength $3\lambda_0 / 4$, the power radiated by it will increase by a factor of

A. $\frac{3}{4}$

B. $\frac{4}{3}$

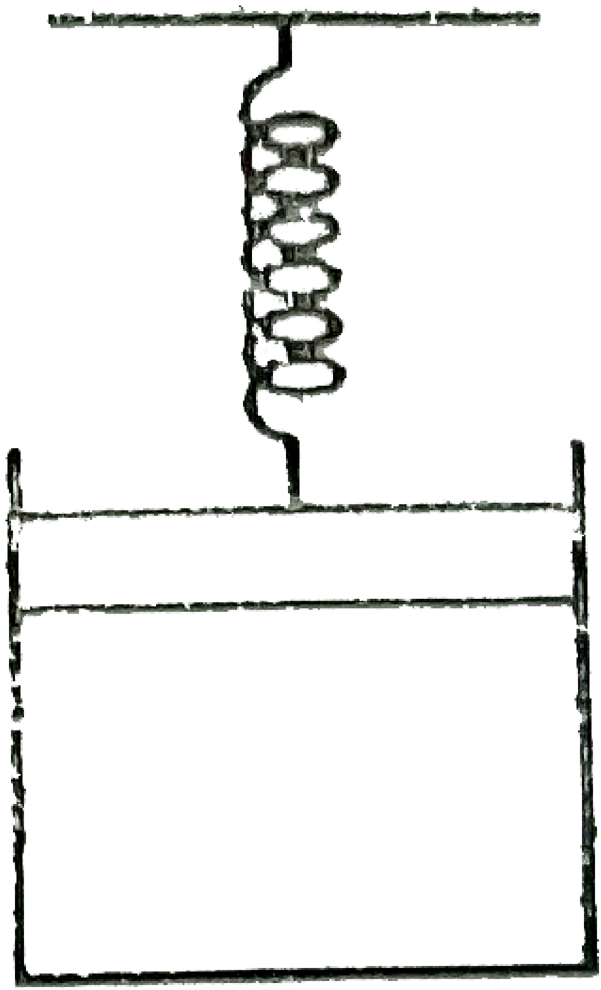
C. $\frac{256}{81}$

D. $\frac{81}{256}$

Answer: C

Watch Video Solution

2. One mole of an ideal gas is kept enclosed under a light piston (area $= 10^{-2} m^2$) connected by a compressed spring (spring constant $100 N/m$). The volume of gas is $0.83 m^3$ and its temperature is $100 K$. The gas is heated so that it compresses the spring further by $0.1 m$. The work done by the gas in the process is $N \times 10^{-1} J$. Find N. (Take $R = 8.3 J/K - \text{mole}$) and suppose there is no atmosphere).



A. 0.5 J

B. 1.0 J

C. 1.5 J

D. 3J

Answer: B

Watch Video Solution

3. A metallic pipe with nut and bolt assembly is shown in the figure. as is the coefficient of linear expansion for bolt and $\propto_p$ (when $\propto_B > \propto_p$) is for the material of pipe. The arrangement is heated then

(##TRG_PHY_MCQ_XII_C09_E04_001_Q01.png" width="80%">

A. tensile stress is developed in the bolt

B. compressive stress is developed in the bolt.

C. no stress is developed in the bolt

D. Both (A) and (B)

Answer: C

View Text Solution

4. Variation of heat of reaction with temperature is known as

A.

B.

C.

D.

Answer: B

Watch Video Solution

5. A black pattern on a porcelain bowl appears brighter than the rest of bowl, when it is strongly heated and taken to a dark room. This is an illustration of

A. Kirchhoff's radiation law

B. Stefan-Boltzmann law

C. joule's law

D. Wien's displacement law

Answer: A

Watch Video Solution

6. A boiler heats water flowing at the rate of 2.0 litres per minute from 27°C to 77°C. If the boiler operates on a gas burner, the rate of consumption of the fuel if its heat of combustion is $4.0 \times 10^4 J/g$, is

A. $31.5g \quad min^{-1}$

B. $1.05g \quad min^{-1}$

C. $10.5g \quad m \in^{-1}$

D. $62.5g \quad m \in^{-1}$

Answer: C

Watch Video Solution

7. For an ideal gas,

A. the change m internal energy in a constant pressure process from temperature T_1 to T_2 is equal to,

$nC_v(T_2 - T_1)$, where C_v is the molar specific heat at constant volume and n is the number of moles of the gas

B. the change in internal energy of the gas is equal to the work done by the gas in magnitude in an adiabatic process.

C. The internal energy shows no change in an isothermal process

D. All of options A, B and C

Answer: D

Watch Video Solution

8. A reversible engine converts one third input into work. When the temperature of the sink is reduced by 62 °C, then efficiency of the engme 1s tripled. The temperature of the source and sink are

A. 90 °C, 30 °C

B. 101 °C, 50 °C

C. 229 °C, 62 °C

D. 59 °C, 21 °C

Answer: C

View Text Solution

9. Two bodies A and B having same surface areas have emmissivities of 0.01 and 0.49 respectively. The two bodies emit total radiant power at the same rate. The wavelength A8 corresponding to maximum spectral radiancy 111 the radiation from B shifted from the wavelength corresponding to maximum spectral radiancy in the radiation from A by 1 μm. Jf temperature of A is 5200 K then,

A. the temperature of B is 26006K

B. the temperature of B is 2000 K and `lamda_B=

C.

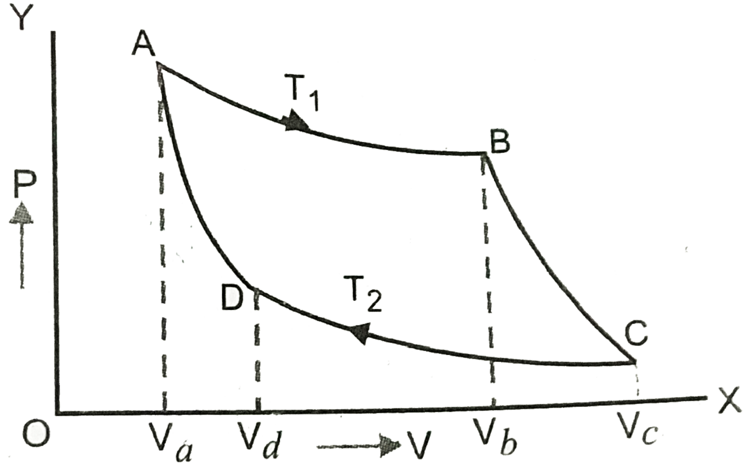
D.

Answer: B

View Text Solution

10. Two different adiabatic curves for the same gas intersect two isothermals at $T_1, \text{ and } T_2$ as shown in $P-V$ diagram, (figure).

How does the ratio (V_a / V_d) compare with the ratio (V_b / V_c) ?



A. $\dfrac{V_c}{V_b}$

B. $V_c V_b$

C. $\dfrac{V_b}{V_c}$

D. $\dfrac{V_c V_b}{V_c + V_b}$

Answer: C

Watch Video Solution

11. A given quantity of a ideal gas is at pressure P and absolute temperature T. The isothermal bulk modulus of the gas is

A. $\frac{3}{2}P$

B. P

C. $\frac{3}{2}P$

D. 2P

Answer: B

Watch Video Solution

12. A given quantity of a ideal gas is at pressure P and absolute temperature T. The isothermal bulk modulus of the gas is

A. 20K

B. 36K

C. 44K

D. 56K

Answer: D

Watch Video Solution

13. Real gases obey ideal gas laws more closely at

A. high pressures and high tmeperature

B. low pressure and high temperature

C. high pressure and low temperature

D. low pressure and low temperature

Answer: B

Watch Video Solution

14. A flask is filled with 10 g of a gas at 20 °C and then heated to 50 °C. As some quantity of gas escaped, the pressure in the flask remained the same throughout the experiment. The mass of the gas that has escaped has a mass equal to

A. 0.46g

B. 0.68g

C. 0.92g

D. 3.68g

Answer: C

Watch Video Solution

15. One mole of an ideal gas at temperature T was cooled isochorically till the gas pressure fell from P to $\frac{P}{n}$. Then, by an isobaric process, the gas was restored to the initial temperature. The net amount of heat absorbed by the gas in the process is

A. nRT

B. $\frac{RT}{n}$

C. $RT\left(1-n^{-1}\right)$

D. $RT(n-1)$

Answer: C

Watch Video Solution

16. Assertion: Equal volumes of monatomic and polyatomic gases are adiabatically compressed separately to equal compression ratio $\left(\frac{P_2}{P_1}\right)$. Then monatomic gas will have greater final volume.

Reason: Among ideal gases, molecules of a monatomic gas have the smallest number of degrees of freedom

A. Assertion is True, Reason is True, Reason is a correct explanation for Assertion

B. Assertion is True, Reason is True Reason is not a correct explanation for

C. Assertion is True , Reason is False

D. Assertion is False but, Reason is True

Answer: D

Watch Video Solution

17. A certain mass of an ideal gas undergoes a reversible isothermal compression. When compared with their initial state, its molecules will have the same

(i) root mean square velocity

(ii) mean momentum

(iii) mean kinetic energy

A. (i),(ii),(iii) correct

B. (i),(ii) correct

C. (ii),(iii) correct

D. (i) correct

Answer: A

Watch Video Solution

18. An ideal Black-body at room temperature is thrown into a furnace. It is observed that

A. initially it is the darkest body and becomes the brightest

B. it is the darkest body at all times

C. it cannot be distinguished at all times.

D. initially it is the darkest and at later times if cannot be distinguished

Answer: A

Watch Video Solution