PHYSICS

BOOKS - NIKITA PHYSICS (HINGLISH)

KINETIC THEORY OF GASES & RADIATION

MCQs (Concept of an ideal gas and gas equation)

1. In and ideal gas, the molecules posses

A. only kinetic energy

B. kinetic energy and potential energy

C. only potential energy

D. only gravitational energy

Answer: A

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2. Internal energy of an ideal gas depends upon

A. pressure alone

B. temperature alone

C. volume alone

D. both on pressure and temperature

Answer: B

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3. Water can be made to boil at $0^\circ C$. If the pressure of the surroundings is

A. 760 mm of mercury

B. 40 mm of mercury

C. 76 mm of merucyr

D. 4 mm of mercury

Answer: D

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4. Heat is not closely related to

A. momentum

B. energy

C. temperature

D. friction

Answer: A

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5. The gas equatioon PV/2=RT, V stands for

A. volume of 2 grams of a gas

B. volume of 2 moles of gas

C. volume of 1 mole of gas

D. volume of 1/2 mole of gas

Answer: B

6. In a gas equation, $PV = RT, V$ refers to the volume of

A. any amount of gas

B. one gram mole of gas

C. one gram of gas

D. one litre of a gas

Answer: B

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7. The dimensions of heat are

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

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

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

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

Answer: A

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8. For Boyle's law to be hold good, the gas should be

A. perfect with constant mass and temperature

B. perfect and at constant temperature but of variable mass

C. real and of constant mass and temperature

D. real and at constant temperature but of variable mass

Answer: A

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9. Temperature of a gas remains constant, the pressure of a given mass of a gas is inversely proportional to its volume. Then the law is

A. Charrle's

B. Galussac's

C. Boyle's

D. pressure

Answer: C

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10. The temperature determines the direction of net change of

A. gross kinetic energy

B. intermolecular kinetic enegy

C. gross potential energy

D. intermolecular potential energy

Answer: A

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11. The thermal motion means

A. motion due to heat engine

B. motion of the body that generates heat

C. disorderly motion of the body as a whole

D. random motion of the molecules

Answer: D

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12. SI unit of heat is

A. calorie

B. kilo calorie

C. joule

D. ergs

Answer: C

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13. The direction of flow of heat between two bodies is determined by

A. kinetic energy

B. total energy

C. internal energy

D. the difference in the average kinetic energy of the molecules is random motion.

Answer: D

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14. Heat is absorbed by a body. But its temperature does not raised. Which of the following statement explains the phenomena?

A. only kinetic energy of vibration increase

B. only potential energy of inter molecular force fields increases

C. the internal energy is not increases

D. increasein kinetic energy is balanced by decrease in its potential energy

Answer: B

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

A. energy

B. internal energy

C. kinetic energy

D. can not be predicted

Answer: C

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16. Average density of a gas at constant temperature

A. increases due to collision

B. decreases due to collision

C. does not change with collision

D. increases or decreases depending upon nature of a gas

Answer: C

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17. Given samples of 1 c.c. of hydrogen and 1 c.c. of oxygen, both at N.T.P. which sample has a larger number of molecules?

A. hydrogen sample has more molecules

B. oxygen samples has more molecules

C. both samples have equal number of molecules

D. hydrogen samples has more or less number of moles than oxygen samples

Answer: C

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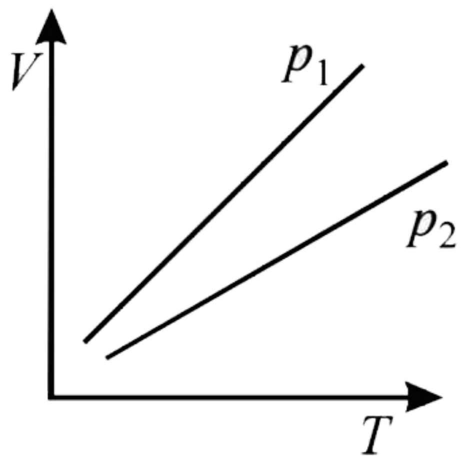
18. The volume V versus temperature T graphs for a certain amount of a perfect gas at two pressure p_1 and p_2 are as shown in Fig. It follows from the graphs that p_1 is greater than p_2.



A. P_1 may be greater or less than P_2

B. $P_1 = P_2$

C. $P_2 > P_1$

D. $P_2 > P_1$

Answer: D

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19. For a gram molecules of a gas, the value of the constant R in the equation PV=RT will be

A. 2 cal/mol K

B. 0.4 cal/mol K

C. 8 cal/mol K

D. 8.3 cal/mol K

Answer: A

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20. 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

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21. The internal energy of a gram-molecules of an ideal gas depends upon

A. pressure alone

B. volume alone

C. temperature alone

D. both pressure and temperature

Answer: C

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22. Calorie per degree kelvin is the unit of

A. temperature

B. specific heat

C. thermal capacity

D. mechanical equivalent of heat

Answer: C

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23. Heat is kinetic energy of molecule

A. kinetic energy of molecule

B. potential and kinetic energy of molecules

C. energy in transit

D. work done on the system

Answer: C

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24. The internal energy of an ideal gas depends upon

A. pressure only

B. volume only

C. both on pressure and volume

D. temperature only

Answer: C

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25. A star which appears blue will be

A. hotter than the sun

B. colder than the sun

C. having nearly the same temperature as that of the sun

D. nothing can be predicted

Answer: A

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26. The volume of gas at $27^\circ C$ and 1 atm pressure is 1 lit. if the pressur eis doubled and absolute temperature is made half, then the volume of the gas will be

A. 0.05 lit

B. 0.25 lit

C. 0.75 lit

D. 1.6 lit

Answer: B

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27. A vessel contains 2 mole of gas and the pressure is 40 cm of Hg. Under the same conditons, iif 1 gm of gas is introduced into the vessel, the pressure will be

A. 40 cm of Hg

B. 20 cm of Hg

C. 76 cm of Hg

D. 60 cm of Hg

Answer: D

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28. The pressure of gas at $100^{\circ} C$ is 2 atm. When the gas is heated at constant volume. At what temperature the pressure raises to 3 atm?

A. $286.5^{\circ} C$

B. $380.7^{\circ} C$

C. $420.2^{\circ} C$

D. $227.4^{\circ} C$

Answer: A

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29. It is required to double the pressure of helium gas, contained in a steel cylinder, by heating. If the initial temperature of helium be $27^{\circ} C$ the temperature up to which it ought to be heated is –

A. $327^{\circ} C$

B. $273^{\circ} C$

C. $108^{\circ} C$

D. $54^{\circ} C$

Answer: A

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30. An open mouthed bottle contains a gas at $60^{\circ} C$ the temperature to which the bottle should be heated so that 1/4 of the mass of the gas may leave is,

A. $171^{\circ} C$

B. $250^{\circ} C$

C. $300^{\circ} C$

D. $342^{\circ} C$

Answer: A

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31. To what temperature in $.^{\circ}C$ a gas has to be heated to produce 10% change in volume at constant pressure, if the initloa temperature of the gas is at $0^{\circ}C$?

A. 17.3

B. 27.3

C. 33.3

D. 13.15

Answer: B

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32. A cylinder contains oxygen at pressure of 28 atm and at a temperature of 300 K. the mass of oxygen the gas, the pressure is found to be 7 atm and the temperature is 200 K. what mass of the gas has been used?

A. 100 gm

B. 250 gm

C. 625 gm

D. 1000 gm

Answer: C

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33. A litre of air at $27^{\circ} C$ is heated until both the volume and pressure are doubled. What is the temperature?

A. $1200^{\circ} C$

B. $327^{\circ}C$

C. $200^{\circ}C$

D. $927^{\circ}C$

Answer: D

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34. If the volume of an ideal gas decreased by 5% at constant pressure, the increase of pressure is

A. 0.05

B. 0.0518

C. 0.0526

D. 0.0541

Answer: C

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35. The volume of a given mass of air at temperature $27^\circ C$ is 100 c.c. if its temperature is raised to $57^\circ C$ maintaining the pressure constant, thhen the increase in its volume is

A. 100 c.c.

B. 130 c.c.

C. 10 c.c.

D. 30 c.c.

Answer: C

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36. The volume of gas at $27^{\circ} C$ and 2 atmospheric pressure is 2 litres. If the pressure is doubled and absolute temperature is reduced to halff, what will be volume of the gas?

A. 2 litres

B. 1 litre

C. 0.5 litre

D. 0.25 litre

Answer: C

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37. The volume of a gas at $27^{\circ}C$ and 760 mm atmospheric pressure is 500 c.c. what will be the volume of the gas at $27^{\circ}C$ and 380 mm of mercury pressure?

A. 500 c.c.

B. 600 c.c.

C. 750 c.c.

D. 1000 c.c.

Answer: D

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38. A given amount of a gas is heated till the volume and pressure are each increased by 1%. Then the temperature increases by

A. $0.5\ \%$

B. $1\ \%$

C. 0.02

D. 0.04

Answer: C

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39. If the pressure at half the depth of a tank is equal to $\frac{2}{3}$ the pressure at the bottom of the tank, then the height of the water column in the tank is

$\left(\text{Atmospheric pressure } = 10^5 N/m^2\right)$

A. 10 m

B. 20 m

C. 30 m

D. 40 m

Answer: B

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40. 8 gm of oxygen and x gm of hydrogen posses same pressure, volume and temperature. Then x=

A. $1/2$

B. 16

C. 32

D. 2

Answer: A

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41. The pressure of a gas filled in a closed vessel increase by 0.4% when temperature is increased by $1^{\circ} C$. Find the initial temperature of the gas.

A. $23^{\circ} C$

B. $250^{\circ} C$

C. $-23^{\circ} C$

D. $300 K$

Answer: C

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42. A gas at temperature 27^0C and pressure 30 atmosphere is allowed to expand to one atmospheric pressure. If the volume becomes 10 times its initial volume, the final temerpature becomes

A. $100^\circ C$

B. $373K$

C. $373^\circ C$

D. $-173^\circ C$

Answer: D

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43. One litre of helium gas at a pressure $76 cm$. Of Hg and temperature $27^{\circ} C$ is heated till its pressure and volume are double. The final temperature attained by the gas is:

A. $900^{\circ} C$

B. $927^{\circ} C$

C. $627^{\circ} C$

D. $327^{\circ} C$

Answer: B

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44. An air bubble doubles its radius on raising from the bottom of water reservoir to the surface of water in it. If the atmosphetic pressure is equal to 10 m of water, the height of water in the reservoir will be

A. 10 m

B. 20 m

C. 70 m

D. 80 m

Answer: C

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45. A gas is heated through $2^{\circ} C$ in a closed vessel. Its pressure is increased by 0.4%. The initial temperature of the gas is

A. $250^{\circ} C$

B. $100^{\circ} C$

C. $500^{\circ} C$

D. $227^{\circ} C$

Answer: D

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46. If a given mass of a gas occupies a volume $100 cm^3$ at one atmospheric pressure and a temperature of $100^0 C$. What will be its volume at 4 atmospheric pressure, the temperature being the same?

A. 100 cm^3

B. 400 cm^3

C. 25 cm^3

D. 200 cm^3

Answer: C

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47. It is decided to verify Boyle's law over a wide range of temperature and pressure. The most suitable gas to be selected for this pupose is

A. carbon dioxide

B. helium

C. oxygen

D. hydrogen

Answer: D

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48. When a large bubble rises from the bottom of a lake to the surface its radius doubles. If atmospheric pressure is equal to that of column of water height H then the depth of lake is

A. H

B. 2H

C. 7H

D. 8H

Answer: C

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49. When a gas enclosed in a closed vessel was heated so as to increase its temperature by $5^\circ C$, its pressure was seen to have increased by 1%. The initial temperature of the gas was nearly

A. $500^\circ C$

B. $227^{\circ} C$

C. $273^{\circ} C$

D. $150^{\circ} C$

Answer: B

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50. The molecular weight of a gas is 44. the volume occupied by 2.2 g of this gas at $0^{\circ} C$ and 2 atm pressure will be

A. 0.56 lt

B. 1.2 lt

C. 2.4 lt

D. 5.6 lt

Answer: A

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51. Avagadro's number is the number of molecules present in

A. one litre of a gas at NTP

B. 22.4 moles of a gas at NTP

C. 22.4 liters of a gas at NTP

D. 44.8 liters of a gas at NTP

Answer: C

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52. A gas at the temperature 250 K is contained in a closed vessel. If the gas is heated through 1K, then the percentage increase in its pressure will be

A. 0.4%

B. 0.8%

C. 0.6%

D. 1.0%

Answer: A

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53. 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. 8.1%

B. 10.1%

C. 9.1%

D. 11.1%

Answer: D

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54. Oxygen and hydrogen in two enclosures have same mass, volume and pressure. The ratio of the temperatures of the two gases is

A. $1:4$

B. $16:1$

C. $4:1$

D. $1:1$

Answer: B

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55. Two idential cylinders contain helium at 2.5 atmosphere and Argon at 1 atmosphere respectively. If both the gases are filled in one of the cylinders then the pressure would be

A. 3.5 atmospheres

B. 1.5 atmospheres

C. 1.75 atmospheres

D. 1 atmosphere

Answer: A

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

A. 0.3 litre

B. 1.5 litre

C. 3 litre

D. 60 litre

Answer: C

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MCQs (Assumption of Kinetic Theory of Gases)

1. Kinetic theory of gases is based upon the assumptions

A. matter consists of minute particles

B. the molcules are constantly in a state of random motion

C. there exist no intermolecular force between the molecules

D. all of these

Answer: D

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2. The intermolecular force between the molecules increases

A. when the distance between the molecules increases

B. When the distance between the molecules decreases

C. when the distance remains constant

D. none of the above

Answer: B

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3. The inter molecular distances are much greater in

A. solids

B. gases

C. liquids

D. a' and 'b'

Answer: B

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4. The first evidence in favour of the molecular structure of gas come from the experimental observation of

A. brownian movement of colloidal particle

B. tracks of particles in cloud chamber

C. motion of molecules in a conduction

D. gas equation

Answer: A

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5. Molecules of a gas behave like

A. elastic and rigid spheres

B. in elastic and nonrigid spheres

C. inelastic and rigid spheres

D. perfectly elestic and nonrigid spheres

Answer: A

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6. Average kinetic energy of a gas molecule is

A. inverserly proportional to the square of its absolute temperature

B. directly proportional to square root of its absolute temperature

C. directly proportional to its absolute temperature

D. directly proportional to square of absolute temperature

Answer: C

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7. 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 pressure of the gas only

D. none of the above is enough by itself

Answer: C

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8. The volume occupied by the gas molecules v in a contains of volume V, according to kinetic theory of gases

A. $v = V$

B. $v < V$

C. $v > V$

D. $v \geq V$

Answer: B

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9. The molecules of a gas move in

A. different direction with same velocities

B. different direction with different velocities

C. same direction with same velocity

D. same direction with different velocity

Answer: B

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10. A perfect gas is one whose molecules

A. attracts one another weakly

B. repeal one another weakly

C. strongly attract or repeal one another

D. neither attract nor repel one another

Answer: D

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11. A gas which obeys all the assumptions of kinetic theory of gases at all conditions of temperatures and pressures is called

A. ideal or perfect gas

B. real gas

C. diatomic gas

D. polyatomic gas

Answer: A

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12. Which one of the following is not an assumption in the kinetic theory of gases?

A. the molecules of a gas are spherical in shape

B. the molecules of a gas are rigid

C. the molecules of a gas are perfectly inelastic

D. the gas molecules are in a state of random motion

Answer: C

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MCQs (Mean Free Path)

1. If the pressure in a closed vessel is reduced by drawing out some gas, the mean free path of the molecules

A. decreases

B. remains the same

C. increases

D. increases or decreases dependeing on the nature of the gas

Answer: C

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

A. molecular diameter

B. square of the molecular diameter

C. square root of the molecular diameter

D. fourth power of the molecular diameter

Answer: B

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3. The expression for mean free path (λ) of molecules is given by [where n is no of molecules per unit volume and d molecular diameter of the gas]

A. $\dfrac{\sqrt{2}}{\pi n d^2}$

B. $\dfrac{1}{p n d^2}$

C. $\dfrac{1}{\sqrt{2}\pi n d^2}$

D. $\dfrac{1}{\sqrt{2}\pi n d}$

Answer: C

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4. SI unit of mean free path is

A. per metre

B. metre

C. per centimetre

D. centimetre

Answer: B

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5. Mean free path of a gas molecule in a container depends upon

A. temperature of the gas molecule only

B. diameter of the gas molecule only

C. density of the gas molecule only

D. temperature diameter and density of the gas molecule

Answer: D

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6. Mean free path of a gas molecule increases with increase in

A. temperature of the gas molcule

B. diameter of the gas molecule

C. density of the gas molecule

D. temperature diameter and density of the gas molecule

Answer: A

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7. Mean free path of a gas molecule increases with decreases in

A. temperature of the gas molecule

B. diameter of the gas molecule

C. density of the gas molecule

D. diameter and density of the gas molecule

Answer: D

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8. mean free path of a gas molecule increases with decrease in

A. temperature and molecular diameter of the gas molecule

B. molecular diameter and pressure of the gas of the gas molecule

C. density and temperature of the gas molecule

D. volume of the gas

Answer: B

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MCQs (Presure exerted by the gas molecule and kinetic energy)

1. The average velocity of the molecules in a gas in equilibrium is

A. proportional to square root of temperature

B. proportional to temperature

C. proportional to square of temperature

D. equal to zero

Answer: A

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2. The mean square speed of a gas molecules in equilibrium is

A. proportional to square root of temperature

B. proportional to temperature

C. proportional to square of temperature

D. equal to zero

Answer: B

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3. The pressure exerted by the gas on the walls of a container is measured by

A. rate of change of momentum imparted to walls perr unit area of the wall

B. momentum imparted to walls per unit area

C. change of momentum imparted to wall sperr unit area

D. change of momentum pe unit volume

Answer: A

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4. The motion of a gas molecule which determines the temperature in

A. translatory

B. rotatory

C. vibratory

D. all types of motion

Answer: A

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5. A surface is hit elastically and normally by n bals per unit time, all the balls having the same mass m, and moving with the same velocity v. then the force acting on surface is

A. $m\nu^2$

B. $1/2mnv^2$

C. $2mnv$

D. $2mnv^2$

Answer: C

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6. The absolute temperature of a gas is determined by

A. average momentum of the molecules

B. velocity of sound in gas

C. number of molecule in the gas

D. mean square velocity of the gas molecules

Answer: D

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7. A gas is enclosed in a closed pot. On keeping this pot in a train moving with high speed , the temperature of the gas

A. will increase

B. will decrease

C. will change according to the nature of the gas

D. will remain the same

Answer: B

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8. 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. in elastic in which only momentum is conserved

D. in elastic in which only energy is conserved

Answer: B

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9. A molecule of a perrfect gas travels, between two successive collisions along a

A. parabolic both

B. straight-line

C. curved path

D. zigzag path

Answer: B

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10. The molecules of an ideal gas possesses

A. kinetic and potential energy

B. only kinetic energy

C. only potential energy

D. only gravitational potential energy

Answer: A

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11. According to the kinetic theory of gasses pressure exerted by perfect gas molecule on the wall of a container is equal to momentum transferred to the wall per unit area

A. by only one molecule

B. per second by only molecules

C. per second by one-third molecules

D. by one-third molecules

Answer: C

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12. The pressure exerted by the gas molecule is

A. $P = \frac{1}{3}\frac{mnc^2}{v}$

B. $P = \frac{1}{3}\frac{M}{v}c^2$

C. $P = \frac{1}{3}\rho c^2$

D. all of these

Answer: D

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13. A molecule of mass 'm' collide with a wall of container in normal direction with a velocity c. if the collision is perfectly elastic, then the change in momentum of the molcules is

A. zero

B. mc

C. $+2mc$

D. $-2mc$

Answer: D

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14. If N number of molecules in a container are enclosed then average number of molecules moving between a pair of wall is

A. $N/2$

B. $N/3$

C. $N/6$

D. $N/4$

Answer: B

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15. The pressure exerted by the molecules of a gas at any point on a wall in any direction in equilibrium state is

A. equal

B. greaer in horizontal direction

C. lesser in vertically upward direction due to opposing gravitaional force.

D. greater in vertically downward direction due to the gravitaional force.

Answer: A

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16. In an equilibrium state, pressure exerted by the gas molecules of a perfect gas on walls of a container is proportional to

A. C_{rms}

B. C_{rms}^2

C. $\sqrt{C_{rms}}$

D. $1/C_{rms}$

Answer: B

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

A. m°

B. m

C. $\sqrt{m}$

D. $1/\sqrt{m}$

Answer: D

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18. Select the correct statement

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 gm of all ideal gases at the same temperature is the same

Answer: C

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19. One mole of an ideal monoatomic gas is heated at a constant pressure of one atmosphere from0° to $100^\circ C$. Then the change in the internal energy is

A. 120 J

B. 1200 J

C. 12 J

D. 8 J

Answer: B

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20. 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. $P_A = \left(\frac{M_B}{M_A}\right)^{1/2}$

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

Answer: D

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21. The volume of a gas at pressure $21 \times 10^4 N/m^2$ and temperature $27^\circ C$ is 83L. If

R=8.3 J/mol/K, then the quantity of gas in g-mol will be

A. 15

B. 7

C. 42

D. 14

Answer: B

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

A. a vertain constant energy

B. the same energy

C. both 'a' and 'b'

D. different energies whose average remain constant

Answer: C

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23. The root mean square velocity of a gas molecule at any temperature T K of a gas molecule of molecular weight M is

A. $\sqrt{8RT / M}$

B. $\sqrt{2RT / M}$

C. $\sqrt{3RT / M}$

D. zero

Answer: C

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24. Temperature of gas is a measure of

A. kinetic energy of the gaseous molecules

B. potential energy of the gaseous molecules

C. distance between the molecules of the gas

D. kinetic energy and potential energy

Answer: A

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25. Oxygen and Helium gases are in same container. Which one has greater K.E. per molecules?

A. Oxygen

B. Both have equal K.E.

C. Helium

D. None of the above

Answer: B

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26. The mean transitional kinetic energy of a perfect gas molecule at absolute temperature T

is (k is the Boltzmann constant)

A. 1/2 KT

B. 3/2 KT

C. KT

D. 2 KT

Answer: B

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27. Mean kinetic energy of a perfect gas is proportional to

A. temperature

B. reciprocal of temperature

C. square of temperature

D. square of reciprocal of temperature

Answer: A

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28. The mean kinetic energy of one mole or gas per degree of

A. 1/2 KT

B. 3/2 RT

C. 1/2 RT

D. 3/2 KT

Answer: A

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29. On the basis of kinetic theory of gases, the mean $K.E.$ of `1 mole per degree of freedom is

A. 3/2 RT

B. 1/2 KT

C. 1/2 RT

D. 3/2 KT

Answer: C

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30. Mean kinetic energy of a perfect gas per gram at the temperature T K is

A. 1/2 KT

B. KT

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

D. $\frac{1}{2}\frac{RT}{M}$

Answer: C

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31. The mean transitional kinetic energy of a perfect gas molecule at absolute temperature T is (k is the Boltzmann constant)

A. 1/2 KT

B. 1/2 RT

C. 3/2 KT

D. 3/2 RT

Answer: D

Watch Video Solution

32. 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. $30N/m^2$

D. $0.8 \times 10^4 N/m^2$

Answer: A

Watch Video Solution

33. The temperature of an ideal gas is increased from $27^\circ C$ to $927^\circ C$. The rms speed of its molecules becomes.

A. twice

B. four times

C. half

D. $\sqrt{2}$ times

Answer: A

Watch Video Solution

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

A. $30\sqrt{2}m / s$

B. $75m / s$

C. $600m / s$

D. $150m / s$

Answer: D

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35. if the density of airr at N.T.P. is 1.25kg / m^3, then the r.m.s. velocity of air molecules at N.T.P. will be

A. 0.50 km/s

B. 0.48 km/s

C. 0.96 km/s

D. 0.64 km/s

Answer: B

Watch Video Solution

36. At what temperature the r.m.s. velocity is eual to the escape velocity of the hydrogen gas from the surface of earth ?

(

$V_e = 11.2 km / s, R = 8.314 J / \text{mole} \quad K, M_H = 2$

)

A. 1000 K

B. 10,000 K

C. 100 K

D. 10,000 K

Answer: B

Watch Video Solution

37. What will be the rms speed f argon at $40^{\circ} C$? If the rms speed of oxygen molecule at 1092 K is 920 /s. (molecular weight of oxygen is 32 and that of argon is 40).

A. 460 m/s

B. 404.5 m/s

C. 44 m/s

D. 4405.0 m/s

Answer: A

Watch Video Solution

38. If the R.M.S. velocity of oxygen molecules at NTP is 460 m/s, then the R.M.S. velocity at $127^{\circ} C$ will be

A. 556.6 m/s

B. 55.66 m/s

C. 380 m/s

D. 382 m/s

Answer: A

Watch Video Solution

39. Four molecules of ags have speeds 1,2,3 and 4 km/s.The volue of the root mean square speed of the gas molecules is

A. $\sqrt{\frac{30}{2}}km/s$

B. $2.7386km/s$

C. $\sqrt{\frac{15}{4}}km/s$

D. $\frac{1}{2}\sqrt{10}km/s$

Answer: B

Watch Video Solution

40. If the density of the gas at NTP is 0.178 km/m^3, then the R.M.S. velocity of the molecules of a gas at N.T.P. will be $(P_0 = 10^5 N/m^2)$

A. 1306 m/s

B. 13.06 km/s

C. 130.6 km/s

D. 1340 m/s

Answer: A

Watch Video Solution

41. If the velocities of three molecules are 2 m/s, 3 m/s, 4m/s respectively. Then the mean velocity will be

A. 4.5 m/s

B. 3 m/s

C. 2 m/s

D. 5 m/s

Answer: B

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42. In the above problem the root mean square velocity is

A. 4 m/s

B. 3.01 m/s

C. 3 m/s

D. 5 m/s

Answer: B

View Text Solution

43. 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. 4.242(m//s)^(2)`

B. $(4m/s)^2$

C. $18(m/s)^2$

D. $16(m/s)^2$

Answer: C

Watch Video Solution

44. If at same temperature and pressure, the densities for two diatomic gases are respectively d_1 and d_2 , then the ratio of velocities of sound in these gases will be

A. $\sqrt{\frac{\rho_2}{\rho_1}}$

B. $\sqrt{\frac{\rho_1}{\rho_2}}$

C. $\rho_1\rho_2$

D. $\sqrt{\rho_1\rho_2}$

Answer: A

Watch Video Solution

45. Root mean square velocity of a particle is v at pressure P. If pressure is increased two times, then the r.m.s. velocity becomes

A. 0.5 v

B. v

C. 2 v

D. 4 v

Answer: B

Watch Video Solution

46. The temperature at which rms velocities of nitrogen gas molecules will be doulbed that at $0^\circ C$ is

A. 273 K

B. 546 K

C. 136 K

D. 1092 K

Answer: D

Watch Video Solution

47. Equal volumes of hydrogen and oxygen gasses of atomic weights 1 and 16 respectively are found to exert equal pressure on the walls of two separate containers the ratio of rms speed of hydrogen and oxygen gas is

A. $1:4$

B. $4:1$

C. $1:32$

D. $32:1$

Answer: B

48. If the density of hydrogen gas at N.T.P. is $8.93 \times 10^{-5} gm / cm^3$ then the rms speed of the molecules of the hydrogen gas at NTP will be

A. 1840 cm/s

B. 184 m/s

C. 1840 m/s

D. 18.4 m/s

Answer: C

49. What will be the r.m.s. speed of a gas at $800^\circ K$?

A. four times the values at 200 K

B. half the value at 200 K

C. twice the value at 200 K

D. same as at 200 K

Answer: C

Watch Video Solution

50. Two vessels have equal volums. One of them contains hydrogen at one atmosphere and the other helium at two atmosphere. If both the samples are at the same temperature, the rms velocity of the hydrogen molecules is

A. equal to that of helium

B. twice that of helium

C. half that of helium

D. $\sqrt{2}$ times that of helium

Answer: D

Watch Video Solution

51. The root mean square velocity of the molecules in a sample of helium is $5/7th$ that of the molecules in a sample of hydrogen. If the temperature of hydrogen sample is $0^{\circ}C$, then the temperature of the helium sample is about

A. 278.46 K

B. $5.46^{\circ}C$

C. 273 K

D. a' and 'b'

Answer: D

Watch Video Solution

52. The temperature at which the r.m.s. velocity of oxygen molecules equal that of nitrogen molecules at $100^\circ C$ is nearly.

A. 42.63 K

B. 426.3 K

C. 4263 K

D. 4.263 K

Answer: B

Watch Video Solution

53. When the temperature of a gas in a metal is incrased from $27^\circ C$ to $87^\circ C$ the initial pressure of 2 atmospheres changes to

A. 1.0 atm

B. 1.6 atm

C. 2.4 atm

D. 3 atm

Answer: C

Watch Video Solution

54. If the density of oxygen is 1.44 kg/m^3 at pressure of $10^5 N/m^2$, then the root-mean-square velocity of oxygen molecules in m/s will be

A. 469

B. 456

C. 120

D. 270

Answer: B

Watch Video Solution

55. If velocities of 3 molecules are 5 m/s, -6m/s and 7 m/s respectively, then their mean squar evelocity in m^2/s^2

A. $11m^2/s^2$

B. $36.7m^2/s^2$

C. $6m^2/s^2$

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

Answer: B

Watch Video Solution

56. At what temperature of oxygen molecules have the same rms velocity as helium molecules at N.T.P.? (Molecular wt. of oxygen is 32 and that of helium is 4).

A. $1900^\circ C$

B. $1911^\circ C$

C. $1950^\circ C$

D. $1970^{\circ} C$

Answer: B

Watch Video Solution

57. At a given temperature, ratio of root mean square velocities of two different gases of molecular weights M_1 and M_2 respectively is

A. $\sqrt{\frac{M_1}{M_2}}$

B. $\sqrt{\frac{M_2}{M_1}}$

C. $\frac{M_1}{M_2}$

D. $\frac{M_2}{M_1}$

Answer: B

Watch Video Solution

58. The r.m.s. speed of the molecules of an enclosed gas in C_{rms}. If pressure is made four times keeping the temperature constant, the r.m.s. speed will be

A. $2C_{rms}$

B. $4C_{rms}$

C. C_{rms}

D. $\frac{C_{rms}}{2}$

Answer: C

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59. A container has a mixture of two gases, hydrogen and oxygen at rom temperature. Which keeping the temperature. Which one of the followingg 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. $c_O = 4c_H$

D. $c_O = 16c_H$

Answer: A

Watch Video Solution

60. The r.m.s. velocity of the molecules in a gas at $27^\circ C$ is 300 m/s. then the r.m.s. velocities o the molecules in the same gas at $927^\circ C$ is

A. 1200 m/s

B. 600 m/s

C. 150 m/s

D. 75 m/s

Answer: B

Watch Video Solution

61. A sample of hydrogen at temperature T, volume V and pressure P have speed v and in a sample of oxygen at temperature T, volume 2 V and pressure 3 P. the root mean square velocity of the oxygen molecule is

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

B. $\sqrt{6}v$

C. $\sqrt{3}v$

D. $\sqrt{2}v$

Answer: A

Watch Video Solution

62. The root mean square velocity of the gas molecule is 300 m/s. what will be the root mean square speed of the molecules if the atomic weight is doubled and absolute temperature is halved?

A. 300 m/s

B. 150 m/s

C. 600 m/s

D. 75 m/s

Answer: B

63. If the temperature at which the r.m.s. velocity of oxygen molecules equals to that of nitrogen molecules at $0^\circ C$ will be $(M_N = 28, M_0 = 32)$

A. $312^\circ C$

B. $292.5^\circ C$

C. $19.5^\circ C$

D. $39^\circ C$

Answer: D

64. At what temperature will the r.m.s. velocity of a gas be half its value at $0^\circ C$?

A. $-68.25^\circ C$

B. $-204.75^\circ C$

C. $-34.25^\circ C$

D. $-238.75^\circ C$

Answer: B

Watch Video Solution

65. The average translational energy and the rms speed of molecules in a sample of oxygen gas at $300K$ are $6.21 \times 10^{-21} J$ and $484 m / s$, respectively. The corresponding values at $600K$ are nearly (assuming ideal gas behaviour)

A. $12.42 \times 10^{-21} J, 968 m / s$

B. $8.78 \times 10^{-21} J, 684 m / s$

C. $6.21 \times 10^{-21} J, 968 m / s$

D. $12.42 \times 10^{-21} J, 684 m / s$

Answer: D

Watch Video Solution

66. At what temperature is the $K.E.$ Of a gas molecules half that of its value at $27^{\circ}C$

A. $13.5^{\circ}C$

B. 150 K

C. $150^{\circ}C$

D. $-123K$

Answer: B

Watch Video Solution

67. 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. $1:5$

C. $1:4$

D. $1:1$

Answer: D

Watch Video Solution

68. The ratio of the K.E. of Chlorine and Oxygen moles at the same temperature is

A. $16 : 35.5$

B. $(35.5)^2 : (16)^2$

C. $35.5 : 16$

D. $1 : 1$

Answer: D

Watch Video Solution

69. What temperature does the average translational K.E. of a molecule in a gas becomes equal to K.E. of an electron accelerated from through potential difference of 5 volt? $(K = 1.38 \times 10^{-23})$

A. $38.65 \times 10^3 K$

B. $0.3865 \times 10^3 K$

C. $3.865 \times 10^3 K$

D. $38.65K$

Answer: A

Watch Video Solution

70. The temperature at which mean kinetic energy of an ideal gas molecule will be doubled that at $27^{\circ} C$ is

A. $54^{\circ} C$

B. $13.5^{\circ} C$

C. $600^{\circ} K$

D. $150^{\circ} K$

Answer: C

Watch Video Solution

71. At what temperature will the average KE per molecule of a gas be exactly half its value at NTP?

A. 150 K

B. 136.5 K

C. 273 K

D. 546 K

Answer: B

Watch Video Solution

72. The kinetic energy per kg of nitrogen molecules at 175^(@)C` is (Molecular weight of nitroegn 28 and R=3820 J/k mole K)

A. $19.968 \times 10^6 J$

B. $1.783 \times 10^5 J$

C. 9.1×10^4

D. $1.678 \times 10^5 J$

Answer: C

Watch Video Solution

73. If the temperature of a gas is increased from $0^\circ C$ to $273^\circ C$, then the ratio of average kinetic energy of the gas molecules is

A. $1:4$

B. $4:1$

C. $1:1$

D. $2:1$

Answer: D

Watch Video Solution

74. A jar has a mixture of hydrogen and oxygen in the ratio 4:5. then the ratio of mean kinetic energy of hydrogen and oxygen molecule is

A. $1:16$

B. $5:4$

C. $4:5$

D. $1:1$

Answer: D

Watch Video Solution

75. If the temperature of a gas is increased from 0° to $273^\circ C$, then the ratio of change in the average kinetic energy of the gas molecule to the original is

A. $1:4$

B. $4:1$

C. $1:1$

D. $2:1$

Answer: C

Watch Video Solution

76. Mean kinetic energy per gram mole of an ideal gas at $0^{\circ} C$ is nearly $(R = 8.320 J / gm \text{ mol} \times K)$

A. 3.4 J

B. 3.4 J

C. 340 J

D. 3400J

Answer: D

Watch Video Solution

77. If one gm mole of nitrogen gas occupies 2×10^4 c.c. at a pressure of 10^6 dyne/cm^2, then the average kineticf energy of nitrogen gas molecule in ergs will be (Avagadro's number $N = 6 \times 10^{23}$)

A. 5×10^{-14}

B. 10×10^{12}

C. 10^6

D. 2×10^6

Answer: A

Watch Video Solution

78. If the mean kinetic energy of the molecules of a gas is $\left(\frac{1}{3}\right)^{rd}$ of its value at $27^\circ C$, then the temperature of the gas will be

A. $100^\circ C$

B. $-173^\circ C$

C. $900^\circ C$

D. $627^\circ C$

Answer: B

Watch Video Solution

79. Two gases at absolute temperatures 300 K and 350 K respectively. Ratio of average kinetic energy of their molecules is

A. $7:6$

B. $6:7$

C. $36:49$

D. $49:36$

Answer: B

Watch Video Solution

80. If the average kinetic energy of gas molecule at $27^{\circ} C$ is $6.21 \times 10^{-21} J$, then the average kinetic energy at $227^{\circ} C$ will be

A. $52.2 \times 10^{-21} J$

B. $5.22 \times 10^{-21} J$

C. $10.35 \times 10^{-21} J$

D. $11.35 \times 10^{-21} J$

Answer: C

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81. The average kinetic energy of the molecules of hydrogen is E. if the mass of oxygen molecules is 16 times that of hydrogen molecules, the average K.E. of an oxygen molecule at the same temperature is

A. 4E

B. E/4

C. E/16

D. E

Answer: D

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82. When two gases having volumes 1 litres and 2 liters are at the same temperature, then the ratio of the average kinetic energy of the molecules in the two gases

A. $1:1$

B. $1:2$

C. $2:1$

D. $3:2$

Answer: A

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83. Total random kinetic energy of the molecules in 1 mole of a gas at a temperature of 300 K is (R = 2 cal/mole ^{o}C)

A. 900 cal

B. 450 cal

C. 2250 cal

D. 600 cal

Answer: A

84. Temperature of gas is a measure of

A. average K.E. of the molecules of the gas

B. average P.E. of the molecules of the gas

C. average distance between the molecules of the gas

D. size of the molecules of the gas

Answer: A

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85. What is the K.E. of translational motion of molecules in 15 gram of ammonia gas at $37^\circ C$? (Molecular weight of ammonia is 17.03 and R=8.31 J/mol K)

A. 3404 J

B. 340.3 J

C. 401.5 J

D. 4090 J

Answer: A

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86. A lead bullet strikes a target with velocity of 480 m/s. if the bullet falls dead, then the rise in temperature of bullet is, (Assuming that heat produced is equally shared between the bullet and target).

$\left(J = 4.2 \times 10^3 J / kcal, C = 0.03 kcal / kgK\right)$

A. $557^\circ C$

B. $457^\circ C$

C. $857^\circ C$

D. $754^\circ C$

Answer: B

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87. Water falls from a height $500m$, what is the rise in temperature of water at bottom if whole energy remains in the water ? $(J = 4.2)$

A. $0.96^\circ C$

B. $1.02^\circ C$

C. $1.16^\circ C$

D. $0.23^\circ C$

Answer: C

Watch Video Solution

88. An ice block at $0^\circ C$ falls from rest at certain height. If 0.1% of ice mels on reching the ground, then the height from which it is realsed $(g = 10m/s^2, L = 80cal/gm, J = 4.2J/cal)$

A. 33.6 m

B. 336 m

C. 3360 m

D. 33.6 Km

Answer: A

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89. A bullet of mass 4.2 gm is moving at certain velocity. If all its kinetic energy liberated is 20 cal, then the initial velocity of the bullet is

A. 100 m/s

B. 200 m/s

C. 10 m/s

D. 20 m/s

Answer: B

Watch Video Solution

90. The density of oxygen at N.T.P. is $16 \times 0.089 kg / m^3$ then the R.M.S. velocity of oxygen molecules at N.T.P. would be

A. $4.6 \times 10^2 m / s$

B. $46 \times 10^2 m / s$

C. $0.46 \times 10^2 m / s$

D. $3.6 \times 10^2 m / s$

Answer: A

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91. Gas at a pressure P_0 in contained as a vessel. If the masses of all the molecules are halved and their speeds are doubles. The resulting pressure P will be equal to

A. $4P_0$

B. P_0

C. $2P_0$

D. $P_0/2$

Answer: C

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MCQs (Degrees of freedom and law of equipartition of energy & Application of specific hest capacities of gases)

1. Which of the following substance have the highest value of molar specific heat?

A. Aluminium

B. Hydrogen

C. Copper

D. Water

Answer: B

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2. Specific heat capacity is given by

A. $(dQ / d\theta)$

B. $(1/m)dQ/d\theta$

C. $(1/m)d\theta/dQ$

D. $m(dQ/d\theta)$

Answer: B

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3. The specific heat capacity is

A. constant for each material

B. depends on the conditions under which it is measured

C. same for a material at all conditions

D. the statement 'a', 'b' and 'c' are correct

Answer: B

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4. For each of the equation four choices have been provided .select the correct alternative

SI unit of specific heat capacity is _____.

A. kcal/kg K

B. J/ mole K

C. J/kg K

D. kcal/kmol K

Answer: C

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5. The SI unit of molar specific heat is

A. kcal/kg K

B. J/mol K

C. J/kg K

D. kcal/kmol K

Answer: B

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6. The CGS unit of specific heat is

A. cal/$kg^\circ C$

B. cal/$gm.^\circ\ C$

C. kcal/gm. $^{\circ}C$

D. erg/gm. $^{\circ}C$

Answer: B

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7. The solid and liquid have only one specific heat because of there is

A. no considerable increase in pressure and volume

B. considerable increase in volume andd pressure

C. considerable increase in volume only

D. considerable increase in pressure only

Answer: A

Watch Video Solution

8. The solid and liquid have only one specific heat because of there is

A. one specific heat

B. three specific heats

C. two specific heats

D. infinite specific heats

Answer: A

Watch Video Solution

9. The gases have

A. one specific heat

B. three specific heats

C. two specific heats

D. infinite specific heats

Answer: C

Watch Video Solution

10. Molar specific heat is

A. quantity of heat required to raise temperature of one kg through $1^\circ K$

B. quantity of heat required to raise temperature of 1 mole through 1 K

C. quantity of heat required to raise temperature of 1 gram through 1 K

D. none of the above

Answer: B

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11. The relation between molar specific heat and principal specific heats is

A. Molar specific heat=molecular weight $\times$ principal specific heat

B. Principal specific heat=molecular weight $\times$ molar specific heat

C. molar specific heat=principal specific heat

D. molar specific heat and principal specific heat product is constant

Answer: A

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12. Generally C_P is

A. greater than C_V

B. equal to C_V

C. less than C_V

D. greater than or equal to

Answer: A

Watch Video Solution

13. Heat supplied to a gas at constant volume is utilised to

A. increase the internal energy of the gas

B. to do external work done against external pressure

C. ether 'a' or 'b'

D. both 'a' and 'b'

Answer: A

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14. The MKS units of principal specific heat is,

A. kcal/kg K

B. kg K/kcal

C. J/kg K

D. J/gm.$^\circ C$

Answer: A

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15. Which of the following substances has the lowest value of specific heat

A. glass

B. copper

C. lead

D. mercury

Answer: C

Watch Video Solution

16. The dimensions of specific resistance are

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

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

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

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

Answer: A

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17. The mechanical equivalent of heat J is

A. a physical quantity

B. a dimensional quantity

C. a conversion factor

D. all of the above

Answer: C

Watch Video Solution

18. The amount of heat required to raise the temperature of 1 kg of water $1^{\circ}K$ at constant pressure is

A. c_p

B. C_P

C. c_v

D. C_V

Answer: A

Watch Video Solution

19. Which of the following has the highest specific heat?

A. copper

B. water

C. hydrogen

D. silver

Answer: C

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20. A monoatomic gas molecule has translatory motion along

A. a single axes only

B. two axes only

C. three axes only

D. three axes and rotatory motion zero

Answer: C

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21. The specific heat during an adiabatic change is

A. zero

B. infinity

C. 1

D. less than 1

Answer: A

Watch Video Solution

22. A gas that has 3 degrees of freedom is

A. monoatomic

B. diatomic

C. triatomic

D. polyatomic

Answer: A

Watch Video Solution

23. Whicih of the following in solids, liquids and gases has largest specific heat?

A. copper

B. water

C. hydrogen

D. mercury

Answer: C

Watch Video Solution

24. The specific heat of ice at $0^\circ C$ is

A. zero

B. infinity

C. in between zero to infinity

D. negative values

Answer: B

Watch Video Solution

25. Water is used as a collent because

A. lower density

B. easily availability

C. high specific heat

D. low specific heat

Answer: C

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26. If temperature scale is changed from $'^{\circ}C$ to $'^{\circ}F$, the numerical value of specific heat

A. increase

B. decrease

C. remains same

D. can not say

Answer: B

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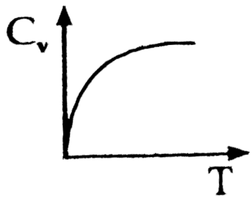
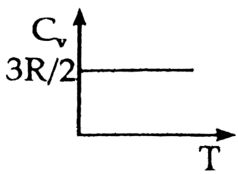
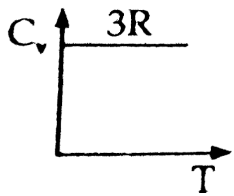
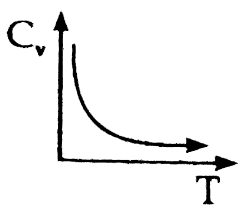
27. Graph for specific heat at constant volume for a monoatomic gas

A. 

B. 

C. 

D. 

Answer: B

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28. The molar specific heat at constant volume, for a non linear triatomic gas is

A. 3R

B. 4R

C. 2R

D. R

Answer: A

Watch Video Solution

29. The specific heat of water at boiling point is

A. zero

B. one

C. infinity

D. less than one

Answer: C

Watch Video Solution

30. The value of heat required to raise the temperature of unit mass of gas through 1 K is

A. less when pressure is constant

B. equal when pressure is constant or volume is constant

C. greter when pressure is constant

D. greater when volume is constant

Answer: C

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31. 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 givne out

D. first heat is taken then is given out

Answer: C

Watch Video Solution

32. The values of the specific heat of the gas during adiabatic change is

A. infinite

B. finite

C. zero

D. any values from zero to infinity

Answer: C

Watch Video Solution

33. Specific heat at constant pressure C_P of a gas

A. more than the specific heat at constant volume (C_V)

B. less then the specific heat at constant volume (C_V)

C. equal to the specific heat at constant volume (C_V)

D. may be more or less than specific heat at constant volume (C_V)

Answer: A

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34. If M is the molecular weight of gas then the principal specific heat of a gas is given by

A. $M \times$ Molar specific heat

B. $(1/M) \times$ molar specific heat

C. M^2 molar specific heat

D. $(1/M^2)$ molar specific heat

Answer: B

Watch Video Solution

35. An ideal gas has volumeV_0 at . $27^\circ C$ It is heated at constant pressure so that its volume becomes . $2V_0$. The final temperature is

A. $327K$

B. $327^\circ C$

C. $54^\circ C$

D. $150^\circ C$

Answer: B

Watch Video Solution

36. One mole of an ideal monoatomic gas requires 207 J 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 the same 10 K, the heat required is [Given the gas constant R = 8.3 J/ mol. K]

A. 96.6 J

B. 124 J

C. 198.8 J

D. 215.4 J

Answer: B

Watch Video Solution

37. The principal specific heat of hydrogen gas at constant pressure and at constant volume are 3400 cal/kg $.^{K}$ and 2400 cal/kg $.^{\circ} K$ respectively. Then the value of J will be (R=8300 J/kmol K, mol wt of $H_2 = 2$)

A. 4.18

B. 4.17

C. 4.16

D. 4.15

Answer: D

Watch Video Solution

38. If 2 kg of steam at $100^\circ C$ condenses into water at $40^\circ C$, then the enegy evolved in calories will be $(L = 540 cal / gm, C = 1 cal / gm .^\circ C)$

A. 600 k cal

B. 40 k cal

C. 1200 k cal

D. 120 k cal

Answer: C

Watch Video Solution

39. The ratio of the densities of the two liquid is 2:3 and the ratio of their specific heats is 3:2. what will be the ratio of their thermal heat capacities, when same volume of both liquids are taken?

A. $2:3$

B. $3:2$

C. $9:4$

D. $1:1$

Answer: D

Watch Video Solution

40. If one mole of argon is to be heated at constant volume so that its temperature rises by 2K. How much heat in calories will be required? (R=2 cal/mol K)

A. 4.24 cal

B. 6 cal

C. 6.94 cal

D. 7.94 cal

Answer: B

Watch Video Solution

41. Onemole of an ideal gas requires 135 J of heat to raise its temperature by 15 K when heated at constant pressure. If the same gas is heated at constant volume to raise the temperature by the same, then the heat required will be (R=8.3 J/mol K)

A. 198.7 J

B. 105 J

C. 215.3 J

D. 10.5 J

Answer: D

Watch Video Solution

42. If one mole of a monatomic gas $\left(\gamma=\frac{5}{3}\right)$ is mixed with one mole of a diatomic gas $\left(\gamma=\frac{7}{5}\right)$, the value of gamma for mixture is

A. 1.5

B. 1.54

C. 1.4

D. 1.45

Answer: A

Watch Video Solution

43. How much heat energy in joules must be supplied to 14gms of nitrogen at room temperature to rise its temperature by $40^{\circ} C$ at constant pressure? (Mol. Wt. of $N_2 = 28gm$, R=constant)

A. 50 R

B. 60 R

C. 70 R

D. 80 R

Answer: C

Watch Video Solution

44. If the specific heat of helium at constant volume is 12.6 J/mol K, then the specific heat of hydrogen at constant volume in J/mol K will be

A. 12.6

B. 16.8

C. 18.9

D. 21

Answer: D

Watch Video Solution

45. 743 J of heat energy is needed to raise the temperature of 5 moles of an ideal gas by 2 K at constant pressure. How much heat energy is needed to raise the temperature of the same mass of the gas by 2 K at constant volume? (R=8.3 J/mol K)

A. 826 J

B. 743 J

C. 660 J

D. 74.3 J

Answer: C

Watch Video Solution

46. 70 calories of heat required to raise the temperature of 2 moles of an ideal gas at constant pressure from $30^\circ C \to 35^\circ C$. The amount of heat required (in calories) to raise the temperature of the same gas through the same range $(30^\circ C \to 35^\circ C)$ at constant volume is:

A. 50 cal

B. 70 cal

C. 60 cal

D. 65 cal

Answer: A

Watch Video Solution

47. 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. 10^3 cal

B. 10^4 cal

C. 5×10^3 cal

D. 10^5 cal

Answer: B

Watch Video Solution

48. If for a gas, $\frac{R}{C_V} = 0.67$, the gas is

A. diatomic

B. moatomic

C. triatomic

D. polyatomic

Answer: B

Watch Video Solution

49. If 294 joules of heat energy is required to raise the temperature of 2 moles of an ideal gas from $30^\circ C$ to $35^\circ C$ at constant pressure, then the specific heat at constant pressure will be (R=8.4J/mol .$^\circ K$)

A. 27.4 J/mol K

B. 28.4 J/mol K

C. 29.4 J/mol K

D. 30.4 J/mol K

Answer: C

Watch Video Solution

50. One mole of mono atomic gas is mixed with 2 moles of diatomic gas. What is the value of molecular specific heat of the gas at constant prssure in cal/mol K? (R=2 cal/mol K)

A. 1.5

B. 6.32

C. 3.5

D. 4.16

Answer: B

Watch Video Solution

51. If the specific heat of lead is 0.03 cal/gm, then the thermal capacity of 500 gm of lead will be

A. $5cal/.^{\circ}C$

B. $10cal/.^{\circ}C$

C. $15cal/.^{\circ}C$

D. $20cal/.^{\circ}C$

Answer: C

Watch Video Solution

52. Ratio of thermal capacities of two copper spheres of radii 5 cm and 10 cm is

A. $1:4$

B. $1:1$

C. $1:8$

D. $8:1$

Answer: C

Watch Video Solution

53. The molar specific heat of a gas at constant volume is 24 J/mol K. then change in its internal energy if one mole of such gas is heated at constant from $10^{\circ}C$ to $30^{\circ}C$ is

A. 240 J

B. 480 J

C. 360 J

D. 720 J

Answer: B

Watch Video Solution

54. 5' moles of oxygen is heated at constant volume from $10^{\circ} C$ to $20^{\circ} C$. What will be the change in the internal energy of the gas in calories? (For the gas $C_P = 7cal \,/\, gm \quad mol \,/\, .^{\circ} \, C \& R = 2cal \,/\, mol \quad .^{\circ} \, C$)

A. 50

B. 100

C. 150

D. 250

Answer: D

Watch Video Solution

55. If the difference between the principal specific heats of nitrogen is 300 J/kg K and ratio of specific heat is 1.4 then c_v will be

A. 1050 J/kg K

B. 250 J/kg K

C. 750 J/kg K

D. 150 J/kg K

Answer: C

Watch Video Solution

56. One mole of an ideal monoatomic gas is heated at a constant pressure of 1 atmosphere from 0°C to $100^{\circ 0}$C. Work done by the gas is

A. $8.31 \times 10^3 J$

B. $8.31 \times 10^{-3} J$

C. $8.31 \times 10^{-2} J$

D. $8.31 \times 10^2 J$

Answer: D

Watch Video Solution

57. The change in internal energy when 5 mole of hydrogen is heated to $20^\circ C$ from $10^\circ C$, specific heat of hydrogen at constant pressure is 8 cal/mol.$^\circ$ C is

A. 200 cal

B. 350 cal

C. 300 cal

D. 475 cal

Answer: C

Watch Video Solution

58. The difference between the principal specific heats of nitrogen is 300 J/kg K and ratio of the two specific heats is 1.4. then C_P is

A. 1050 J/kg K

B. 750 J/kg K

C. 650 J/kg K

D. 150 J/kg K

Answer: A

Watch Video Solution

59. For a gas, $C_P - C_V = 5000 J/kg \quad K$, if the ratio of principal specific heat is 1.5, then C_P in J/kg K will be

A. 12000

B. 15000

C. 14000

D. 16000

Answer: B

Watch Video Solution

60. If c_p and c_v are the principal specific heats of an ideal gas in cal/gm $.^\circ C$, ρ is the density, P is the pressure and T is the temperature of the gas, then Mayer's relation is

A. $\rho(c_p - c_v) = \dfrac{P}{JT}$

B. $c_p - c_v = \dfrac{dP}{JT}$

C. $c_p - c_v = \frac{JP}{\rho T}$

D. $c_p - c_v = \frac{JT}{\rho P}$

Answer: A

Watch Video Solution

61. For hydrogen gas $C_P - C_V = \alpha$ and for Oxygen gas $C_P - C_V = b$, where C_P and C_V are molar specific heats. Then the relation between 'a' and 'b' is

A. b=16 a

B. a=b

C. a' and 'b' are not related

D. a=16 b

Answer: D

Watch Video Solution

62. The molar specific heat of oxygen at constant pressure $C_P = 7.03 cal / mol.^{\circ} C$ and $R = 8.31 J / mol.^{\circ} C$. The amount of heat taken by 5 mol of oxygen when heated at constant volume from $10^{\circ} C$ to $20^{\circ} C$ will be approximately.

A. 25 cal

B. 50 cal

C. 250.5 cal

D. 500 cal

Answer: C

Watch Video Solution

63. if R is the molar gas constant and $\gamma = C_P / C_V$, then C_V is equal to

A. R / γ

B. γR

C. $\dfrac{2R}{\gamma - 1}$

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

Answer: D

Watch Video Solution

64. If R is the molar gas constant and $\gamma = C_P / C_V$, then C_p is equal to

A. R / γ

B. γR

C. $\dfrac{2R}{\gamma - 1}$

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

Answer: D

Watch Video Solution

65. If the amount of heat given to a system is 50 J and work done on the system is 15 J, then change in internal energy of the system will be

A. 35 J

B. 50 J

C. 65 J

D. 15 J

Answer: C

Watch Video Solution

66. For a gas the differce between the two specific heat is $4150J/kgK$. What is the specific heat at constant volume of gas if the ratio of sepcific heat is 1.4

A. 8475

B. 5186

C. 1660

D. 10375

Answer: D

Watch Video Solution

67. The temperature of argon, kept in a vessel, is raised by $1^\circ C$ at a constant volume. The total heat supplied to the gas is a combination of translational and rotational energies. Their respective shares are

A. 60%,40%

B. 100%,0%

C. 0%,100%

D. 40%,60%

Answer: B

Watch Video Solution

68. The temperature of argon, kept in a vessel, is raised by $1^\circ C$ at a constant volume. The total heat supplied to the gas is a combination of translational and rotational energies. Their respective shares are

A. 60%,40%

B. 100%,0%

C. 0%,100%

D. 40%,60%

Answer: A

Watch Video Solution

69. The temperature of ozone in a vessel, is raised by $1^{\circ} C$ at constant volume. Part of total heat supplied to the gas may be taken as translational and rotational energies. Their respective shares are

A. 50%,50%

B. 100%,0%

C. 0%,100%

D. 40%,60%

Answer: A

Watch Video Solution

70. Molar specific heat of a monatomic gas at constant pressure is

A. 5/2 R

B. 3/2 RT

C. 7/2 R

D. R

Answer: A

Watch Video Solution

71. One mole of an ideal gas requires 207 J of heat to raise the temperature. If the same gas is heated at constant volume to raise the temperature by the same range, the heat required will be [R=8.3 J/mole K]

A. 215.3 J

B. 198.7 J

C. 207 J

D. 19.87 J

Answer: B

Watch Video Solution

72. If the difference the two specific heats of triatomic gas is 500 J/ kg K. then the principal specific heat of a gas constant volume c_v in J/kg K. $(\gamma = 4/3)$

A. 2000

B. 1250

C. 1000

D. 1500

Answer: D

Watch Video Solution

73. If the difference between the two specific heats of triatomic gas is 500 J/kg K. then the principal specific heat of a gas constant pressure c_p in J/kg K. $(\gamma = 4/3)$

A. 1250

B. 1500

C. 1000

D. 2000

Answer: D

Watch Video Solution

74. Molar specific heat of oxygen at constant pressure is 7.2 cal/mol $.^{\circ}C$ and R=8.3 J/mol K. at constant volume, 5 moles of oxygen is heated from $10^{\circ}C$ to $20^{\circ}C$ then the quantity of heat required will be

A. 25 cal

B. 50 cal

C. 260 cal

D. 500 cal

Answer: C

Watch Video Solution

75. The temperature of $5mol$ of gas which was held at constant volume was change from $100^\circ C$ to $120^\circ C$. The change in internal energy was found to ve $80J$. The total heat capacity of the gas at constant volume will be equal to

A. 8J/K

B. 4.0 J/K

C. 0.8 J/K

D. 0.4 J/K

Answer: B

Watch Video Solution

76. 5 moles of gas were heated from $100^{\circ}C$ to $120^{\circ}C$ at constant volume. The internal energy was changed by 200 J. what is the specific heat capacity of the gas?

A. 5 J/ mol K

B. 4 J/mol K

C. 2 J/mol K

D. 10 J/mol K

Answer: D

Watch Video Solution

77. The specific heat of a gas constant volume is 20 J/mol K. when two moles of such gas is heated through $10^{\circ} C$ at constant pressure, what is the increase in thernal energy and work done? (R=8 J/mol K)

A. 200J, 160 J

B. 400 J, 260 J

C. 400 J, 160 J

D. 200 J, 460 J

Answer: C

Watch Video Solution

78. The ratio of specific heats of a gas is 1.4. if the value of C_V is 20.8 J/mol K, then the C_P is

A. 3.93 cal/mol K

B. 4.93 cal/mol K

C. 5.93 cal/mol K

D. 6.93 cal/mol K

Answer: D

Watch Video Solution

79. The relation between principal specific heats of gases at constant pressure annd at volume is

A. $c_p - C_V = R/JM$

B. $c_p + c_v = R/JM$

C. $c_p - c_v = JM/R$

D. $c_p + c_v = JM/R$

Answer: A

Watch Video Solution

80. For nitrogen $C_p - C_V = x$ and for argon $C_P - C_V$=Y.The relation between x and y is given by

A. a=16 b

B. a=4 b

C. 16 b=a

D. a=b

Answer: D

Watch Video Solution

81. The Mayer's relation is

A. $c_p - c_v = r$

B. $C_P - C_V = R$

C. $C_P + C_V = R / JM$

D. a' and 'b'

Answer: D

Watch Video Solution

82. It temperature of 5 moles of a gas is raised through $100^\circ C$ at constant pressure, then external work done by the gas will be (R=8.32 J/mol K)

A. 832 J

B. 4160 J

C. 41.6 J

D. 15280 J

Answer: B

Watch Video Solution

83. When gas in a vessel expands, it internal energy decreases. The process involved is

A. irreversible

B. reversible

C. adiabatic

D. isothermal

Answer: C

Watch Video Solution

84. Two spheres of the same metal have radii in the_ratio 1 : 2 Their heat capacities are in what ratio

A. $1:2$

B. $1:4$

C. $1:6$

D. $1:8$

Answer: D

Watch Video Solution

85. The thermal capacity of 10 gram of a substance is 8 calories. Then the specific heat is

A. 0.8

B. 1.25

C. 0.4

D. 0.1

Answer: A

Watch Video Solution

86. The number of degres of freedom of diatomic gas are

A. 3

B. 5

C. 6

D. 2

Answer: B

Watch Video Solution

87. The difference between the specific heat is 600 J/kg K. the ratio of their specific heats is 1.6. the value of c_p is . . ..J/kg K.

A. 600

B. 1600

C. 1000

D. 40

Answer: B

Watch Video Solution

MCQs (Thermodynamics)

1. Measurement of temperature based on

A. Zeroth law of Thermodynamics

B. First law of thermodynamics

C. second law of thermodynamics

D. all of above

Answer: A

Watch Video Solution

2. Mercury is used as thermometer liquid. Which among the following properties of mercury is used in this?

A. it has low specific heat

B. it does not wet the glass tube

C. it is opaque and bright

D. all the above

Answer: C

Watch Video Solution

3. The temperature of the sun is measured with

A. Resistance thermometer

B. Vapour pressure thermometer

C. Radiation pyrometer

D. Gas themometer

Answer: C

Watch Video Solution

4. When heat is given to a gas in an isothermal change, the result will be

A. in raising temperature

B. in doing external work

C. both 'a' and 'b'

D. increasing the internal energy

Answer: B

Watch Video Solution

5. Heat added to a systemm is equal to

A. a change in internal kinetic energy

B. a change in internal potential energy

C. the work done by it

D. all the above

Answer: D

Watch Video Solution

6. An adiabatic process occurs at constant

A. heat content of the system

B. temperature of the system

C. pressure of the system

D. pressure and temperature of the system

Answer: A

Watch Video Solution

7. When a gas is suddenly compressed, its temperature rises. Why?

A. velocity of the bullet

B. material of the bullet

C. mass of the bullet

D. all of these

Answer: C

Watch Video Solution

8. Which of the following parameters does not characterize the thermodynamic state of matter?

A. pressure

B. volume

C. work

D. temperature

Answer: C

Watch Video Solution

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

A. temperature will decreases

B. volume will increase

C. temperature wil increases

D. pressure remains constant

Answer: A

Watch Video Solution

10. "Heat cannot by itself flow from a body at lower temperature to a body at higher temperature" is a statement or consequence of

A. 1st law of thermodynamics

B. 2nd law of thermodynamics

C. zeroth law off thermodynamics

D. 4th law of thermodynamics

Answer: B

Watch Video Solution

11. "It is impossible to convert total heat into work" thiis is the statement of -_____ law of thermodynamics.

A. zeroth law

B. first law

C. second law

D. third law

Answer: C

Watch Video Solution

12. Two bodies A and B are said to be in thermal equilibrium with each other if they have same

A. amount of heat

B. specific heat

C. temperature

D. thermal capacity

Answer: C

Watch Video Solution

13. TEMPERATURE AND ZEROTH LAW OF THERMODYNAMICS

A. zeroth

B. first

C. second

D. third

Answer: A

Watch Video Solution

14. Work done on or by a gas, in general depends upon the

A. final state

B. initial and final state

C. path

D. path, initial and final states

Answer: D

Watch Video Solution

15. During the change of state the heat is

A. absorbed

B. liberated

C. absorbed or liberated

D. neither absorbed nor liberated

Answer: C

Watch Video Solution

16. Which of the changes is not isothermal change?

A. Melting of ice

B. boiling of water

C. slow conversion of iodine into vapour

D. sudden conversion of iodine into vapour

Answer: D

Watch Video Solution

17. When the door of a refrigerator is kept open then the room temperature starts

A. cools the room to that of the inside of the regrigerator

B. room warms up slightly

C. neither the room cools nor warms

D. cools the room to a certain temperature

Answer: B

Watch Video Solution

18. The internal energy of a perfect monoatomic gas is

A. rotatory motion

B. translatory motion

C. vibratory motion

D. all the above

Answer: A

Watch Video Solution

19. The internal energy of diatomic gas is due to

A. rotatory motion

B. translatory motion

C. vibratory motion

D. both 'a' and 'b'

Answer: D

Watch Video Solution

20. The internal energy of triatomic gas is due to

A. vibratory motion

B. rotatory motion

C. translatory motion

D. both 'b' and 'c'

Answer: D

Watch Video Solution

21. For an adiabatic process, the correct statement is

A. dU=-dW

B. dQ=0

C. dU=dW

D. both 'a' and 'b'

Answer: D

Watch Video Solution

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

A. volume increases

B. pressure decreases

C. temperature decreases

D. temperature increases

Answer: C

Watch Video Solution

23. If thhe coffe in a thormos flask is shaked vigorously. Then,

A. Temperature increases

B. Temperature decreases

C. No change in temperature

D. Can not say

Answer: A

Watch Video Solution

24. If the door of a refrigerator is kept open in a dosed room then room :

A. falls

B. rises

C. remains same

D. depends on area of the room

Answer: B

Watch Video Solution

25. A gas receives an amount of heat equal to 110 J and performs 40 J of work. The change in the internal energy of the gas is

A. 70 J

B. 150 J

C. 110 J

D. 40 J

Answer: A

Watch Video Solution

26. In a thermodynamic process, pressure of a fixed mass of a gas is changed in such a manner that the gas release $20J$ of heat and $8J$ of work is done on the gas. If initial internal energy of the gas was $30J$, what will be the final internal energy?

A. 58 J

B. 18 J

C. 42 J

D. 2 J

Answer: B

Watch Video Solution

27. Find the change in internal energy of the system when a system absorbs 2 kilocalorie of heat and at the same time does 500 joule of work

A. 6400J

B. 8200J

C. 5600J

D. 7900J

Answer: D

Watch Video Solution

28. If the amount of heat given to a system is 40 J and the amount of work done on the system is 15 J then the change in internal energy is

A. 50 J

B. $-50J$

C. $30J$

D. $55J$

Answer: D

Watch Video Solution

29. The change in internal energy of a gas kept in a rigid cylinder on supplying 120 J of heat is

A. 0 J

B. 60 J

C. 100 J

D. 120 J

Answer: D

Watch Video Solution

30. When heat energy of 1500 J is supplied to a gas it is compressed from 10 m^3 to 5 m^3 at a pressure of 100 Pa. the change in internal energy is

A. 2000 J

B. 1000 J

C. 500 J

D. 2500 J

Answer: A

Watch Video Solution

31. A gas at constant pressure of $4.5 \times 10^5 Pa$ to a gas it is compressed from 10 m^3 to $3.0 m^3$ on givinig a heat of 800 kJ. The change in internal energy is

A. $5.25 \times 10^5 J$

B. $6.75 \times 10^5 J$

C. $1.25 \times 10^5 J$

D. $3.25 \times 10^5 J$

Answer: C

Watch Video Solution

32. A system absorbs 100 cal of heat and does an external work of 150 J. if J=4.2 J/cal the change in internal energy is

A. 420 J

B. 270 J

C. 250 J

D. 150 J

Answer: B

Watch Video Solution

33. At a constant pressure of 20 Pa a gas is compressed from 10 m^3 to 5 m^3. Later 100 J of heat is added to the system. The change in internal energy is

A. 200 J

B. 400 J, 260 J

C. 300 J

D. 100 J

Answer: A

Watch Video Solution

34. Five moles of hydrogen $(\gamma = 7/5)$, initially at STP, is compressed adiabatically so that its temperature becomes $400^\circ C$. The increase in the internal energy of the gas in kilojules is $(R = 8.30 J / mol - K)$

A. 20.5

B. 41.5

C. 21.5

D. 65.5

Answer: B

Watch Video Solution

35. The temperature of 2 moles of a gas is changed from $20^{\circ}C$ to $30^{\circ}C$ when heated at constant volume. If the molar heat capacity at constant volume is 8 J $mol^{-1}K^{-1}$, the change in internal energy is

A. 80 J

B. 20 J

C. 160 J

D. 16 J

Answer: C

Watch Video Solution

Watch Video Solution

36. A gas expands from 75 litres to 125 litres constant pressure of 4 atmosphere. Work done by the gas during this change is $(10atm = 10^5 Nm^{-2})$

A. 50 kJ

B. 40 kJ

C. 30 kJ

D. 20 kJ

Answer: D

Watch Video Solution

37. At a constant pressure of $10^4 Nm^{-2}$, a gas expands by $0.25m^3$ work done by the gas is

A. 2500 J

B. 250 J/kg K

C. 25 J

D. 2.5 J

Answer: A

Watch Video Solution

38. A gas occupies 2 litre at S.T.P. It is provided 300 joule heat so that its becomes 2.5 litre at 1 atm. Calculate change in its internal energy.

A. 50 J

B. 100 J

C. 250 J

D. 200 J

Answer: C

Watch Video Solution

39. At a constant pressure of 20 Pa a gas is compressed from 10 m^3 to 5 m^3. Later 100 J of heat is added to the system. The change in internal energy is

A. 100 J

B. 200 J

C. 300 J

D. 400 J

Answer: B

Watch Video Solution

40. Heat is supplied to a monoatomic gas which expands at constant pressure. The % of heat that goes into work done by the gas is

A. 20

B. 40

C. 60

D. 80

Answer: B

View Text Solution

41. Heat is supplied to a diatomic gas which expands at constant pressure. The % of change in internal energy to heat supplied is

A. 71.4

B. 60.8

C. 40.9

D. 18.6

Answer: A

View Text Solution

42. An ideal heat engine works between the temperature $327^{\circ}C$ (source) and $27^{\circ}C$ (sink). What is its efficiency?

A. 1

B. 0.75

C. 0.5

D. 0.25

Answer: C

View Text Solution

43. An ideal heat engine works between source at $127^{\circ} C$ and sink $27^{\circ} C$. If 800 J heat is taken from reservoir, the amount of heat rejected to sink is

A. 300 J

B. 400 J

C. 500 J

D. 600 J

Answer: D

View Text Solution

44. A carnot engine working between $300K$ and $600K$ has work output of $800J$ per cycle. What is amount of heat energy supplied to the engine from source per cycle?

A. 1400 J

B. 1600 J

C. 1500 J

D. 1700 J

Answer: B

Watch Video Solution

45. A Carnot's engine whose sink is at temperature of 300K has an efficiency of $40\ \%$ By how much should the temperature of the source be increased so as to increase the efficiency to 60%?

A. 750K

B. 200 K

C. 300K

D. 275K

Answer: A

Watch Video Solution

Watch Video Solution

46. An ideal heat engine working between $27^{\circ}C$ and $127^{\circ}C$ takes 400 cal of heat in one cycle. The work done is

A. 75 cal

B. 50 cal

C. 100 cal

D. 200 cal

Answer: C

View Text Solution

47. A Carnot reversible engine converts $1/6$ of heat input into work . When the temperature of the sink is reduced by 62 K, the efficiency of carnot's cycle becomes $1/3$. The temperature of the source and sink will be

A. 362 K

B. 372 K

C. 392 K

D. 412 K

Answer: B

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48. What is the efficiency of a heat engine whose temperature of source and sink are 800 K and 600 K respectively?

A. 1

B. 0.75

C. 0.5

D. 0.25

Answer: D

View Text Solution

49. The efficiency of a Carnot engine operating between temperatures of $100^{\circ}C$ and $-23^{\circ}C$ will be

A. $\dfrac{100-23}{100}$

B. $\dfrac{100-23}{373}$

C. $\dfrac{100+23}{373}$

D. $\dfrac{100+23}{100}$

Answer: C

Watch Video Solution

50. Two heat engines A and B have their sources at $327^{\circ}C$ and $227^{\circ}C$ and sinks at $127^{\circ}C$ and $27^{\circ}C$ the ratio of their efficiencies is

A. $6/5$

B. $5/6$

C. $2/5$

D. $5/2$

Answer: B

View Text Solution

51. The temperature of sink of Carnot engine is $27^{\circ} C$. Efficiency of engine is 25%. Then temeperature of source is

A. $27^{\circ} C$

B. $127^{\circ} C$

C. $327^{\circ} C$

D. $227^{\circ} C$

Answer: B

Watch Video Solution

52. A heat engine works on a carnot cycle with a heat sink of $27^\circ C$. The efficiency is 10%. The temperature of source is

A. 270K

B. 30K

C. $60^\circ C$

D. $30^\circ C$

Answer: C

View Text Solution

53. A carnot engine takes 300 cal. of heat at 500 k and rejects 150 cal of heat to the sink. The temperature (in k) of sink is ________.

A. 1000 K

B. 750 K

C. 250 K

D. 125 K

Answer: C

Watch Video Solution

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

A. $127^\circ C$

B. $227^\circ C$

C. $327^\circ C$

D. $673^\circ C$

Answer: B

Watch Video Solution

55. A heat engine takes in 300 K 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. $4.2 \times 10^6 J$

B. $16.8 \times 10^6 J$

C. $8.4 \times 10^6 J$

D. $2.1 \times 10^6 J$

Answer: C

View Text Solution

56. The efficiency of the reversible heat engine is η_r and that of irreversible heat engine is η_l. Which of the following relations is correct?

A. $\eta_1 > \eta_2$

B. $\eta_1 < \eta_2$

C. $\eta_1 = \eta_2$

D. $\eta_1 \leq \eta_2$

Answer: A

Watch Video Solution

MCQs (Absorption, reflection and transmission of heat radiation)

1. The heat can be transferred from a point of higher temperature to the point of lower temperature in the form of

A. conduction

B. convection

C. radiation

D. all of the above

Answer: D

View Text Solution

2. In conduction mode, heat an be transferred from a point ofhigher temperature of the point of lower temperature

A. with the actual migration of the particles of medium

B. without actual migration of the particles of medium

C. in the form of elecromagnetic radiation

D. in the form of corpuscles

Answer: B

View Text Solution

3. Convection of heat takes place in

A. solids

B. liquids

C. gases

D. b' and 'c'

Answer: D

View Text Solution

4. In radiation mode, heat energy can be transfferred

A. in presence of material medium

B. without any material medium

C. in presence of any material medium or without any material medium

D. none of these

Answer: C

View Text Solution

5. It is hotter at some distance over the fire than in front of it because

A. heat is radiated upwards only

B. convection heat takes downwards only

C. air conducts heat upwards only

D. convection takes more heat upwards

Answer: D

View Text Solution

6. The transmission of heat by conduction is

A. a reversible process

B. an irreversible process

C. an adiabatic process

D. contain large number of free electrons

Answer: B

View Text Solution

View Text Solution

7. Metals are good conductors of heat because .

A. are ductile

B. have a few free electrons

C. have no free electron

D. contain large number of free electrons

Answer: D

Watch Video Solution

8. In a room containing air, heat can go from one place to another

A. conduction

B. convection

C. radiation

D. both 'b' and 'c'

Answer: D

Watch Video Solution

9. Heat energy reaches on the earth from the sun in the form of

A. conduction

B. convection

C. radiation

D. scattering

Answer: C

View Text Solution

10. Water placed in a pot is heated because of

A. conduction

B. convection

C. radiation

D. absorption

Answer: B

View Text Solution

11. The false statement in the following is

A. radiations are electromagnetic waves

B. radiations can pass through vacuum

C. radiations travel with the velocity of light

D. none of the above

Answer: D

View Text Solution

12. In winter, the temperature inside the wall of a room as compared to the temperature of air is the room is

A. lower

B. higher

C. same

D. may be lower or higher depending on atmospheric pressure

Answer: B

View Text Solution

13. In a thermos flask, attempt is made to reduce losses of heat by

A. conduction only

B. conduction and convection

C. convection only

D. conduction, convection and radiation

Answer: D

View Text Solution

14. The velocity of heat radiation in vacuum is .

A. equal to that of light

B. equal to that of sound

C. greater than that light

D. less than that sound

Answer: A

Watch Video Solution

15. Thermal radiations are electromagnetic radiation belonging to

A. visible region

B. ultra violet region

C. infra red region

D. X-ray region

Answer: C

View Text Solution

16. The fire screen produces the sensation of cooling because it does not allow

A. infra red rays

B. electromagnetic waves

C. ultra violet rays

D. visible light

Answer: A

View Text Solution

17. The fastest mode of transfer of heat is

A. conduction

B. convection

C. radiation

D. all the above

Answer: C

View Text Solution

18. Heat radiations cannot exhibit the following phenomenon. That is

A. interference

B. diffraction

C. polarisation

D. beats

Answer: D

View Text Solution

19. SOLAR COOKER

A. bolometer

B. green house

C. pyrometer

D. hygrometer

Answer: B

Watch Video Solution

20. The thermal radiations are similar to .

A. cathode-rays

B. X-rays

C. γ-rays

D. β-rays

Answer: B

Watch Video Solution

21. Thermos flask prevents heat loss by

A. convention

B. conduction

C. radiation

D. both 'a' and 'b'

Answer: D

View Text Solution

22. On which of the following factors does the intensityof heat radiations from a body depend

A. temperature of the body

B. thermal capacity

C. amount of heat content

D. can not be predicted

Answer: A

View Text Solution

23. Cloudy nights are warmer than the nights with clean sky. Explain.

A. clouds absorbs heat in the day and supply it in the night

B. clouds reflect black heat radiations to the earth

C. heat of the earth's atmosphere increases in the presence of clouds

D. the question is irrelevant

Answer: B

Watch Video Solution

24. Two persons ordered tea in a restaurant and waited for a friend to arrive. The first person mixed hot tea and cold milk in the cup and wated for the fried and the second mixed hot tea and hot milk in the cup after the arrival of the friend. Milk in the cup after the arrival of the friend. If the temperature of the two cups of tea are T_1 and T_2 respectively, then.

A. $T_1 < T_2$

B. $T_1 = T_2$

C. $T_1 > T_2$

D. $T_1 \geq T_2$

Answer: C

View Text Solution

25. Heat radiation have wavelengths in the region of

A. visible light

B. ultraviolet

C. radiowave

D. infrared

Answer: D

View Text Solution

26. The substance which are transparent to thermal radiations are

A. athermanous

B. diathermanous

C. water vapour

D. black body

Answer: B

View Text Solution

27. Two bodies one hot an the other cold are kept in vacuum. What will happen to the temperature of the hot body after some time?

A. remain the same

B. decrease due to radiation

C. increase due to radiation

D. increase due to convection

Answer: B

View Text Solution

28. On which one of the factors do the nature of the tehrmal radiation depends inside an encolsure?

A. Nature of walls

B. temperature

C. size of the enclosure

D. colour of the walls

Answer: B

View Text Solution

29. A black body at high temperature emits thermal radiations of

A. small wavelength

B. large wavelength

C. fixed wavelength

D. all wavelengths

Answer: D

Watch Video Solution

30. Under steady state, the temperature of a body

A. decrease with time

B. does not change with time and is same at all the point of the body

C. increase with time

D. does not change with time but can be different at different point of the body

Answer: D

Watch Video Solution

31. The slowest mode of transfer of heat is

A. conduction

B. convection

C. radiation

D. all the above

Answer: A

View Text Solution

32. The colour of a star indicates its

A. weight

B. size

C. temperature

D. distance

Answer: C

Watch Video Solution

33. If the temperature of the sun increases by 100%, the maximum energy radiated by the sun would correspond to

A. radio wave region

B. ultra violet region

C. infrared region

D. visible region

Answer: B

View Text Solution

34. The sea breeze and land breeze arise due to

A. convection

B. conduction

C. both convection and conduction

D. radiations

Answer: A

View Text Solution

35. A medium is not required for transfer of thermal energy from one body to another body is

A. conduction

B. convection

C. radiation

D. all of these

Answer: C

View Text Solution

36. If thermal radiation passes through free space then the temperature of the free space

A. increases due to collision

B. decreases due to collision

C. does not change

D. either increases or decreases

Answer: C

View Text Solution

37. Thermal radiations may exhibit the following phenomenon

A. interference only

B. diffraction only

C. polarisation only

D. interference, polarisation and diffraction

Answer: D

View Text Solution

38. The door of a running refrigerator inside a room is left open. The correct statement out of the following ones is

A. cooled

B. warmed

C. no effect

D. first heated then cooled

Answer: B

Watch Video Solution

39. Mode of transmission of heat, in which heat is carried by the moving particles, is

A. radiation

B. conduction

C. convection

D. wave motion

Answer: C

Watch Video Solution

40. Morning sun is not as hot as the mid-day sun because

A. sun is cooler in the morning

B. sun rays have to travel longer in the morning that at mid-day

C. earth is father away in the morning

D. of some reason other than those given above

Answer: B

View Text Solution

41. If a liquid is heated in weightlessness, the heat is transmitted through

A. conduction

B. convection

C. radiation

D. neither, because the liquid cannot ber heated in weighlessness

Answer: A

View Text Solution

42. In which of the following process, convection does not take place primarily

A. sea and land breeze

B. boiling of water

C. warming of glass of bulb due to filament

D. heating air around a furnace

Answer: C

Watch Video Solution

43. A thermos flask is polished well

A. to make attractive

B. for shining

C. to absorb all radiations from outside

D. to reflect all radiations from outside

Answer: D

Watch Video Solution

44. Heat travels through vaccum by

A. conduction

B. convection

C. radiation

D. both 'a' and 'b'

Answer: C

Watch Video Solution

45. We consider the radiation emitted by the human body. Which of the following statements is true

A. The radiation is emitted only during the day

B. the radiation is emitted during the summers and absorbed during the winters

C. the radiation emitted lies in the ultraviolet region and hence is not visible

D. the radiation emitted is in the infrared region

Answer: D

Watch Video Solution

46. The earth radiates in the infra-red region of the spectrum. The spectrum is correctly given by

A. Wien's law

B. Rayleigh jeans law

C. Planck's law of radiation

D. Stefan's law of radiation

Answer: C

Watch Video Solution

47. Infrared radiation is detected by

A. spectrometer

B. pyrometer

C. nanometer

D. photometer

Answer: B

Watch Video Solution

48. 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

49. The coefficient of absorption is the ratio of

A. radiant energy incident to the radiatnt energy abosrbed

B. the radiant energy absorbed to the radiant energy incident

C. both 'a' and 'b'

D. energy incident to energy emitted

Answer: B

View Text Solution

50. Athermanous bodies are those

A. a medium which does not allow heat radiation

B. a medium which transmits heat radiation

C. both 'a' and 'b'

D. which reflect heat radiation

Answer: A

Watch Video Solution

51. The transmission of heat by molecular collision is called

A. conduction

B. convection

C. radiation

D. scattering

Answer: A

View Text Solution

52. When thermal radiations incident on athermanous medium, the temperature of the medium

A. increases

B. decreases

C. does not change

D. nothing can be predicted

Answer: A

View Text Solution

53. The coefficient of absorption of the thermal radiation of black body is

A. dependent on wavelength of incident radiation

B. dependent on temperature

C. independent to the nature of the surface

D. independent of wavelengths

Answer: A

Watch Video Solution

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

A. 1

B. 2

C. 3

D. ∞

Answer: A

Watch Video Solution

55. The substance which are transparent to thermal radiation are

A. athermanous

B. diathermanous

C. thermo electric

D. radioactive

Answer: B

View Text Solution

56. Absorptive power of a body depend upon

A. surface area

B. time of observation

C. temperature

D. neither surface area nor temperature

Answer: D

View Text Solution

57. The coefficient of transmission is the ratio of

A. radiant energy incident to the radiant energy transmitted through the body

B. the radiant energy transmitted through the body to the radiant energy incident on it

C. the ratio of radiant energy transmitted to the radiant energy absorbed by the body

D. none of these

Answer: B

View Text Solution

58. The coefficient of reflection is the ratio of

A. radiant energy reflected from the body to the radiant energy incident on it

B. radiant energy incident on the body to the radiant energy transmitted through the body

C. both 'a' and 'b'

D. none of these

Answer: A

View Text Solution

59. A good absorber is a

A. poor reflector and transmitter

B. good reflector

C. perfect reflector and transmitter

D. bad absorber

Answer: A

View Text Solution

60. The diathermanous is

A. a medium which does not allow heat radiation

B. a medium which transmits heat radiation

C. both 'a' and 'b'

D. which reflect heat radiation

Answer: B

View Text Solution

61. The coefficients off absorption and reflection of the surface of a thin plate are 0.74 and 0.22 respectively. If 150 J of radiant energy are incident on the plate, then the quantity of heatt transmitted is

A. 6.0 J

B. 3.3 J

C. 33 J

D. 60 J

Answer: A

View Test Solution

View Text Solution

62. 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

63. 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

Watch Video Solution

64. The coefficients of absorption and reflection of the surface of a body are 0.70 and 0.25 respectively. If 200 calories of radiant heat is incident on the surface of the body, the quantity of heat transmitted will be

A. 140 cal

B. 50 cal

C. 10 cal

D. 60 cal

Answer: C

View Text Solution

65. The coefficieents of absorption and transmission of the are 0.50 and 0.25 respectively. If 200 alories of radiant heat is incident on the surface of the body, the quantity of heat reflected will be

A. 140 cal

B. 150 cal

C. 50 cal

D. 200 cal

Answer: C

View Text Solution

MCQs (Perfectly black body, emmissive power and emmissivity)

1. A black hole, absorbs

A. all radiation

B. all radiations except X-rays

C. all radiations except visible radiations

D. X-rays only

Answer: C

View Text Solution

2. In Ferris perfectly black body, the black body is

A. aperture

B. outer sphere

C. inner sphere

D. conical projection

Answer: A

View Text Solution

3. The best 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

View Text Solution

4. Which of the following will radiate heat to a large extent?

A. Rough surface

B. Black and rough surface

C. Polished surface

D. Black-polished surface

Answer: B

View Text Solution

5. The phenomenon of black body radiation was explained satisfactorily by

A. kinetic theory

B. quantum theory

C. classical ehtory

D. theory of relativity

Answer: B

Watch Video Solution

6. An electric heater kept in vacuum is heated continuously by passing electric current. Its temperature

A. go on rising with time

B. stop rising after some time as it will lose heat to surroundings by conduction

C. will rise for some time and there after will start falling

D. will become constant after some time due to loss of heat by radiation

Answer: D

Watch Video Solution

7. A polished metal plate with a rough black spot on it is heated to about $1400K$ and quickly taken into dark room Then .

A. The spot will appear brighter that the plate

B. the spot will appear darker than the plate

C. the spot and the plate will appear equally bright

D. the spot and the plate will not be visible in the dark room

Answer: A

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8. A man with a dark skin, in comparison with a man with a white skin, will experience

A. less heat and less cold

B. more heat and less cold

C. more heat and more cold

D. less heat and more cold

Answer: C

Watch Video Solution

9. If the temperature of a perfectly black-body increases two times then the rate of radiation of the body also increases by

A. eight times

B. two times

C. sixteen times

D. four times

Answer: C

View Text Solution

10. A ferfectly black body is one which absorbs radiation of

A. all wavelengths

B. large wavelengths

C. small wavelengths

D. infrared wavelengths

Answer: A

View Text Solution

11. Reflectance of a perfectly black body is

A. zero

B. 0.9

C. 0.2

D. infinity

Answer: A

View Text Solution

12. Good absorbers of heat are

A. bad-emitters

B. ppor emitters

C. good emitters

D. a' and 'b'

Answer: C

Watch Video Solution

13. The maximum energy emitted per unit time per unit area by a body for a particular wavelength depend directly on

A. temperature

B. cube root of temperature

C. square of temperature

D. fourth power of temperature

Answer: A

View Text Solution

14. Coffee cools faster in saucer than in cup because of

A. the emissive power of saucer is less than cup

B. its surface area in the saucer is more than cup

C. its emissivity in saucer is higher than cup

D. saucer absorb more energy

Answer: B

View Text Solution

15. The ratio of spectral emissive power of a body λ and temperature T is equal to a physical quantity at the wavelength and temperature. Then the physical quantity is

A. emissive power of the body

B. absorptive powe of the body

C. reflective power of the body

D. transmission coefficient of the body

Answer: B

View Text Solution

16. The spectrum from a black body radiation is a

A. line spectrum

B. band spectrum

C. continuous spectrum

D. line and band spectrum

Answer: C

Watch Video Solution

17. A perfectly black body in one whose emissivity is

A. zero

B. unity

C. maximum

D. minimum

Answer: B

View Text Solution

18. The emissive power of a surface depends upon

A. area

B. temperature

C. time of observation

D. none

Answer: B

View Text Solution

19. A perfectly white body

A. which reflects all the wavelength incident on it

B. absorbing power is zero

C. white chalk is an approximations of a perfectly white body as per as visible radiations are concerned

D. all of the above

Answer: D

View Text Solution

20. The amount of heat energy radiated per second by a surface depends upon .

A. the nature of the surface

B. the area of the surface

C. the temperature of the surface

D. all the above three factors

Answer: D

Watch Video Solution

21. S.I unit of emissive power is

A. J/s

B. J/m^2

C. $J/s \quad m^2$

D. Watt/m

Answer: C

Watch Video Solution

22. Below a list of four types of surfaces

A. Rough white

B. White polished mirror

C. Black polished mirror

D. Rough-black

Answer: D

View Text Solution

23. The silver polishing the walls of a thermos bottle minimizes the transfer of heat by

A. conduction

B. radiation

C. convection

D. absorption

Answer: B

View Text Solution

24. The bulbs of two identical thermometers are coated one with lamp black an the other with silver thin film coated. When exposed in sun light for shorter time then the reading of the thermometer with lamp black coating will be

A. more than that with silver coating

B. less than that with silver coating

C. same of that with silver coating

D. nothing can be predicted

Answer: A

View Text Solution

25. By which of the following methods could a cup of hot tea loss heat when placed on metallic table in a class room .

A. conduction

B. convection

C. radiation and evaporation

D. all

Answer: D

Watch Video Solution

26. A black body at high temperature emits thermal radiations of

A. large wavelength

B. small wavelength

C. one fixed wavelength

D. all wavelengths

Answer: D

Watch Video Solution

27. A sphere, a cube and a thin circular plate, all having the same mass and made of the same material are heated to the same temperature and them allowed to cool. Which of them cools fastest ?

A. sphere

B. cube root of temperature

C. plate

D. both 'a' and 'b'

Answer: C

Watch Video Solution

28. A body, which emits radiations of all possible wavelengths, is known as

A. good conductor

B. partial radiator

C. absorber of photons

D. perfectly black-body

Answer: D

Watch Video Solution

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

A. kajal

B. black board

C. a pin hole in a box

D. none of these

Answer: D

Watch Video Solution

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

A. intiially it is the darkest body and att later times 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 body and at later times it cannot be distinguished

Answer: A

Watch Video Solution

31. Which of the following statement is correct?

A. A good absorber is a bad emitter

B. every body absorbs and emits radiations at every temperature

C. the energy of radiations emitted from a black body is same for all wavelengths

D. the law showing the relation of temperatures with the wavelength of maximum emission from an ideal black body is wien's law

Answer: D

Watch Video Solution

32. Which of the following law states that "good absorbers of heat are good emitters"

A. Stefan's law

B. Kirchoff's law

C. Plank's law

D. Wien's law

Answer: B

Watch Video Solution

33. Emissive power of a perfectly black body

A. absorption power

B. transmative power

C. reflective power

D. none of the above

Answer: D

Watch Video Solution

34. Three cubes of sides 1,2,3 cm are at constant temperature of $100^{\circ}C$. Then the amount of heat lost per second by them are in the ratio

A. $1:8:27$

B. $27:8:1$

C. $1:4:9$

D. $9:4:1$

Answer: C

Watch Video Solution

35. The emissive power of a sphere of area $0.07m^2$ is 0.5 k cal/m^2s. The amount of heat radiated by the spherial surface in 20 second is

A. 7 kcal

B. 0.7 kcal

C. 0.07 kcal

D. 20 kcal

Answer: B

Watch Video Solution

36. A sphere of radius 50 cm is maintained at a constant temperature, radiates energy at the rate of 0.5 kcal/s. then the emissive power of sphere is $(J = 4.2 \times 10^3 J / kcal)$

A. $11.11 \times 10^{-4} J / m^2 s$

B. $6 \times 10^2 J / m^2 s$

C. $11.11 \times 10^{-2} J / m^2 s$

D. $11.11 J / m^2 s$

Answer: D

Watch Video Solution

37. A metal cube with each side 3 cm long emits 0.27 kcal in 100s. Then its emissive power is

A. 1 kcal/sm^2

B. 1.5 kcal/sm^2

C. 0.5 kcal/sm^2

D. 3.5kcal/sm^2

Answer: C

Watch Video Solution

38. The filament of an evacuated light bulb has a length 10 cm, diameter 0.2 mm and emissivity 0.2. then the power it radiates at $1727^\circ C$ is [$\sigma = 5.67 \times 10^{-8}$ SI units]

A. 11.4 W

B. 1140 W

C. 114 W

D. $1.4 \times 10^5 W$

Answer: A

Watch Video Solution

MCQs (Spectrum of Black Body Radiations in Terms Wavelength)

1. When the temperature of black body rises, then the wavelength corresponding to the maximum intensity (λ_m)

A. decreases

B. increases

C. it may increase or decrease depending upon the nature of the black body

D. it may increase or decrease depending upon the scale of temperature

Answer: A

Watch Video Solution

2. If the temperature of a black body is increased then the wavelength corresponding to the maximum emission will

A. shift towards smaller wavelength

B. shift towards longer wavelength

C. not shift

D. shift in proportion to increase in temperature

Answer: A

Watch Video Solution

3. The cause of Fraunhoffer lines is

A. reflection of radiation by chromosphere

B. absorption of radiation by chromosphere

C. emission of radiation by chromosomes

D. transmission of radiation by chromosomes

Answer: B

Watch Video Solution

4. Wien's distribution law fails at

A. high temperature

B. low temperature

C. short wavelength

D. long wavelength

Answer: A

Watch Video Solution

5. Which of the following can be used to estimate the temperature of a star ?

A. Radiation spectrum

B. speed of the star

C. shape of the star

D. Distance from the earth

Answer: B

Watch Video Solution

6. If the wavelength corresponding to maximum energy radiated from the moon is 14 micron, and wien's constant is $2.8 \times 10^{-3} mK$, then temperature of moon is

A. 100 K

B. 200 K

C. 2000 K

D. 400 K

Answer: B

Watch Video Solution

7. A spherical body of 5 cm radius is maintained at a temperature of $327^\circ C$. The wavelength at which maximum energy radiated will be nearly $(b = 2.898 \times 10^{-3} m \quad K)$

A. 482 Å

B. 4.82 Å

C. 482 μ m

D. 4.82 μ m

Answer: D

Watch Video Solution

8. Two stars A and B radiates maximum energy at 3600 Å and 4200 Å, respectively. Then the ratio of their temperature is

A. $6:7$

B. $7:6$

C. $\sqrt{6}:\sqrt{7}$

D. $\sqrt{7}:\sqrt{6}$

Answer: B

Watch Video Solution

9. The maximum radiant energyy emitted at 1000 K is for a wavelength of 2.9 Å, the maximum radiant energy emitted at 2000 K will be for a wavelength of

A. 29000 Å

B. 14500 Å

C. 1.45 Å

D. 7250 Å

Answer: C

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10. The surface temperature of the sun is about 6000 K. the sun's radiation has maximum energy at a wavelength of 0.5 μ m. a certain light bulb filament emits radiations with a maximum at 2 μ m. if both the surface of the sun and the filament have the same emissive characteristics, then the temperature of the filament will be

A. 1500 K

B. 2000 K

C. 2500 K

D. 3000 K

Answer: A

View Text Solution

11. If wavelengths of maximum intensity of radiations emitted by the sun and the moon are $0.5 \times 10^{-6} m$ and $10^{-4} m$ respectively, the ratio of their temperatures is

A. 1/100

B. 1/200

C. 100

D. 200

Answer: D

Watch Video Solution

12. 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

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13. A black body at 200 K is found to exit maximum energy at a wavelength of $14 \mu m$. When its temperature is raised to 1000 K , the wavelength at which maximum energy is emitted is

A. $14\mu m$

B. $70\mu F$

C. $2.8\mu m$

D. $7\mu m$

Answer: C

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14. 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

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15. A black body emits radiations of maximum intensity at a wavelength of Å 5000 , when the temperature of the body is $1227^{\circ}C$. If the temperature of the body is increased by $1000^{\circ}C$, the maximum intensity of emitted radiation would be observed at

A. 2754.8A

B. 3000 Å

C. 3500 Å

D. 4000 Å

Answer: B

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16. Black body at a temperature of $1640K$ has the wavelength corresponding to maximum emission equal to $1.75 \mu m$ Assuming the moon to be a perfectly black body the temperature of the moon if the wavelength corresponding to maximum emission is $14.35 \mu m$ is .

A. 100 K

B. 150 K

C. 200 K

D. 250 K

Answer: C

Watch Video Solution

17. Solar radiation emitted by sun resembles that emitted by a body at a temperature of $6000K$ Maximum intensity is emitted at a wavelength of about $4800A^{\circ}$ If the sun was cooled down from $6000K$ to $3000K$ then the peak intensity would occure at a wavelenght of .

A. 4800 Å

B. 9600 Å

C. 7200 Å

D. 6400 Å

Answer: B

Watch Video Solution

18. What will be the ratio of temperatures of sun and moon if the wavelengths of their maximum emission radiations rates are $140 A^{\circ}$ and $4200 A^{\circ}$ respectively .

A. $1:30$

B. $30:1$

C. $42 : 14$

D. $14 : 42$

Answer: B

Watch Video Solution

19. The absolute temperatures of two black bodies are 2000 K and 3000 K respectively. The ratio of wavelengths corresponding to maximum emission of radiation by them will be

A. $2 : 3$

B. $3:2$

C. $9:4$

D. $4:9$

Answer: B

Watch Video Solution

20. A particular star (assuming it as a black body) has a surface temperature of about $5 \times 10^4 K$ The wave length in nano-meters at which its radiation becomes maximum is $(b = 0.0029mk)$.

A. 48

B. 58

C. 60

D. 70

Answer: B

Watch Video Solution

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

A. 7000 K

B. 80000 K

C. $10^4 K$

D. $10^6 K$

Answer: A

Watch Video Solution

22. 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

MCQs (Kirchhoffs law of heat radiation)

1. The essence of Kirchhoff's law is that a good absorber must be a

A. bod radiator

B. bad conductor

C. good conductor

D. good radiator

Answer: D

Watch Video Solution

2. The black body have

A. good absorption of heat capacity

B. better absorption of heat capacity

C. best absorption of heat capacity

D. no absorption of heat capacity

Answer: C

Watch Video Solution

3. A piece of charcoal and a piece of shining steel of the same surface area are kept for a long time in an open lawn in bright sun.

A. the steel will absorb more heat than the charcoal

B. the temperature of the steel will be lower than that of the charcoal

C. if both are picked up by bare hands, the steel will be felt hotter than the charcoal

D. if both are picked up by bare hands, the charcoal will be felt hotter than steel

Answer: C

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4. On inverstigation of light from three different stars A,B and C it was found that in the spectrum of A, the intensity of blue colour is maximum and in C the intensity of yellow colour is maximum in A. the intensity of yellow colour is maximum in A. from the observation 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, B is minimum and C is intermediate

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

Answer: C

View Text Solution

5. Three identical spheres of different materials iron gold and silver are at the same temperature The one that radiates more energy is .

A. gold

B. silver

C. iron

D. all radiates equally

Answer: D

Watch Video Solution

6. Which of the following is a good emitter

A. black and polished

B. white and rough

C. white and polished

D. black and rough

Answer: D

Watch Video Solution

7. Gren house effect is

A. black radiations from both the types of sources at high and low temperature

B. transmit radiations from both the types of source

C. transmit radiations from a source at low source at high temperature

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

Answer: D

View Text Solution

8. A spherical earthen vessel with a hole is heated in a furnace till it becomes red hot. When it is taken out, the hole will appear

A. as bright as the rest of the vessel

B. brigher than other parts of the vessel

C. darker than other parts of the vessel

D. any of the above depending upon the quanlity of the clay used

Answer: C

View Text Solution

9. Who explained the Fraunhoffer line in the spectrum of solar radiations?

A. Wein

B. Stefan

C. Kirchhoff

D. Fraunhoffer

Answer: C

Watch Video Solution

10. A good absorber of heat is a good radiator of heat, this statement is

A. Stefan

B. Kirchhoff

C. Newton

D. Maxwell Boltzmann

Answer: B

Watch Video Solution

11. Relation between emissivity e and absorptive power a is (for black body)

A. $e = a$

B. $e = 1/a$

C. $e = a^2$

D. $a = e^2$

Answer: A

Watch Video Solution

12. 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

View Text Solution

13. 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 surrounding of ice.

Answer: B

Watch Video Solution

14. If between wavelength λ and$\lambda + d\lambda$, e_{λ} and a_{λ} be the emissive and absorptive powers of a body and E_{λ} be the emissive power of a perfectly black body, then according to Kirchoff's law, which is true

A. $e_{\lambda} = 0_{\lambda} = E_{\lambda}$

B. $e_{\lambda} E_{\lambda} = a_{\lambda}$

C. $e_{\lambda} = a_{\lambda} E_{\lambda}$

D. $e_{\lambda}a_{\lambda}E_{\lambda} =$ constant

Answer: C

Watch Video Solution

15. When p calories of heat is given to a body, it absorbs q calories, then the absorbtion power of body will be :-

A. p/q

B. q/p

C. p^2 / q^2

D. q^2 / p^2

Answer: B

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16. Distribution of energy in the spectrum of a black body can be correctly represented by .

A. Wien's law

B. Stefan's law

C. Planck's law

D. Kirchhoff's law

Answer: C

Watch Video Solution

17. 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. of transmission coefficient

D. coefficient of reflection

Answer: B

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18. The Kirchhoff's law leads to the conclusion that the good radiators of thermal radiations are

A. good absorbers

B. bad absorbers

C. good conductors

D. bad conductors

Answer: A

Watch Video Solution

19. If E is emissive power and 'a' is the coefficient of absorption of a bbody at any temperature, E_b is the emissive power of a perfectly black body at that temperature, then according to Kirchhoff's law

A. $E = E_b / a$

B. $E / a = E_b$

C. $E. E_b = a$

D. $E.\ E_b = 1/a$

Answer: B

View Text Solution

MCQs (Stefans Law of Black Body Radiation)

1. The radiation emitted by a perfectly black body is proportional to

A. absolute temperature

B. fourth root of absolute temperature

C. fourth power of absolute temperature

D. square of absolute temperature

Answer: C

Watch Video Solution

2. Radiation emitted by a surface is directly proportional to

A. third power of its temperature

B. equal to its temperature

C. twice power of its temperature

D. fourth power of its temperature

Answer: D

Watch Video Solution

3. The unit of Stefan's constant σ is

A. N/m^2

B. Jm^2

C. W/m^2K^4

D. $J/m^2s\quad\mathrm{K}$

Answer: C

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4. The amount of heat enerrgy radiated per unit time per unit area by a body depends upon

A. area of the body

B. temperature and nature of the body

C. nature of the body only

D. all of these

Answer: B

Watch Video Solution

5. The rate at which a black body emits radiation at a temperature T is proportional to

A. T^4

B. T^5

C. T^2

D. T^3

Answer: A

Watch Video Solution

6. The relation between rate of loss of heat from the body and its absolute temperature is known as

A. Newton's law of cooling

B. Stefan's law of radiation

C. Kirchhoff's law of heat radiation

D. Prevost's law of heat exchanges

Answer: B

Watch Video Solution

7. The unit of Stefan's constant σ is

A. watt/m^2 / K

B. watt/m/K^4

C. watt/m^2 / K^4

D. watt/m^2 / K^2

Answer: C

8. The amount of heat energy radiated per second by a surface depends upon .

A. the nature of surface only

B. The area of the surface only

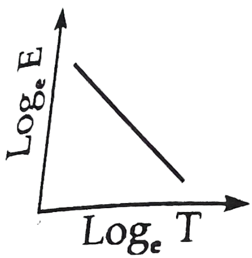
C. The difference of temperature between the surface and the surrounding only

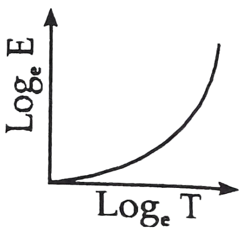
D. The nature of surface, area of the surface and the temperature of body

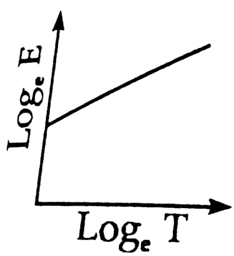
Answer: D

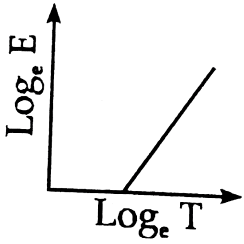
Watch Video Solution

9. If the rate of emission of radiation by a body at temperature TK is E then graph between log E and log T will be .

A. 

B. 

C. 

D. 

Answer: C

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10. Two sphere of the same material and radii 4 m and 1m respectively are at temperature 1000 K and 2000 K respectively. The ratio of energies radiated by them per second is

A. $1:2$

B. $2:1$

C. $1:1$

D. $1:4$

Answer: C

Watch Video Solution

11. The luminousity of a star is 10000 times that of the sun. if the surface temperature of the sun is 6000 K, then the surface temperature of the star is

A. 8446 K

B. 84860 K

C. 848600 K

D. 60,000 K

Answer: D

Watch Video Solution

12. A spherical black body of 5 cm radius is maintained at a temperature of $327^{\circ} C$. Then the power radiated will be $\left(\sigma = 5.7 \times 10^{-8} \text{SI unit}\right)$

A. 58 W

B. 231 W

C. 75 W

D. 482 W

Answer: B

Watch Video Solution

13. A black body at high temperature T K radiates energy at the rate of $E W / m^2$. When the temperature falls to $(T/2)K$, the radiated energy will be

A. E/16

B. E/4

C. E/2

D. 16 E

Answer: A

Watch Video Solution

14. A black body is at temperature of $500K$. It emits energy at rate which is proportional to

A. $25 \times 10^4 J/s$

B. $25 \times 10^8 J/sm^2$

C. $5 \times 10^2 J/s$

D. $3543 J/sm^2$

Answer: D

Watch Video Solution

15. A black body at temperature $227^\circ C$ radiates heat at the rate of 5 cal/cm^2, at a temperature of $27^\circ C$, the rate of heat radiated per unit area per unit time in cal/cm^2s, is

A. 4

B. 1.5

C. 0.64

D. 0.25

Answer: C

Watch Video Solution

16. 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

17. The temperature of a black body becomes half of its original temperature, the amount of radiation emitted by the body will reduce to

A. $1/16$

B. $1/18$

C. $1/12$

D. $1/8$

Answer: A

Watch Video Solution

18. A body at $300^\circ C$ radiates 10^5 watt/m^2. If the sun radiates 10^9 watt/m^2, then its temperature will be (if both bodies are considered as black)

A. 5730 K

B. $5457^\circ C$

C. $3000^\circ C$

D. both 'a' and 'b'

Answer: D

Watch Video Solution

19. 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. $3 : 2$

B. $245 : 1$

C. $2 : 1$

D. $3 : 1$

Answer: A

Watch Video Solution

20. 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 watts

B. 168 watt

C. 182 watt

D. 192 watt

Answer: C

Watch Video Solution

21. A solid sphere cools at the rate of $2.8^{\circ} C$ per minute, when its temperature is $127^{\circ} C$. Find the rate at which another solid copper sphere of twice the radius looses its temperature at $127^{\circ} C$, in both the cases, the room temperature is maintained at $27^{\circ} C$ is

A. $9.72^{\circ} C / \text{min}$

B. $11.2^{\circ} C/\text{min}$

C. $3.6^{\circ} C/\text{min}$

D. $1.4^{\circ} C$/min

Answer: B

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22. Ratio of rate of radiation of heat of body at $227^{\circ} C$ to that of the same body at $27^{\circ} C$ is

A. $3.25 : 9$

B. $27 : 125$

C. $5 : 3$

D. $625 : 81$

Answer: D

Watch Video Solution

23. The ratio of the rate of radiation of heat by a perfectly black body at a temperature $527^\circ C$ and $127^\circ C$ is

A. $16:1$

B. $4:1$

C. $2:1$

D. cannot be found as the temperature of the surroundings is not known

Answer: A

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24. A body radiates heat at the rate of 50 J/s at 300 K. when the same body is at 600 K then its rate of radiation of heat will be

A. 100 J/s

B. 200 J/s

C. 400 J/s

D. 800 J/s

Answer: D

Watch Video Solution

25. The rate of emission of heat energy of an iron ball of radius 5 cm is 10 J/s, then rate of emission of heat energy by a copperr ball of radius 1 cm at same temperature will be (If emissivity of both the balls is same)

A. 2 J/s

B. 0.4 J/s

C. 2 cal/s

D. 250 J

Answer: B

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26. A cube, which may be regarded as a perfectly black body, radiates heat at the rate of 2770.2

watt when its temperature is $27^{\circ} C$. The volume of the cube is $\left(\sigma = 5.7 \times 10^{8} J / m^{2} \text{ s } K^{4}\right)$

A. $10^{-2} m^{3}$

B. $100 m^{3}$

C. $1 m^{3}$

D. $10^{3} m^{3}$

Answer: C

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27. The amount of thermal radiations emitted from one square metre area of a black body in one second when at a temperature of 100 K is

A. 5.67 J

B. 56.7 J

C. 567 J

D. 5670 J

Answer: A

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28. A black body radiates 3 J/cm^2 s when its temperature is $127^\circ C$. How much heat will be radiated/cm^2 s when its temperature is $527^\circ C$?

A. 6

B. 12

C. 3.84

D. 48

Answer: D

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29. The rate of loss of heat by radiation frombody at $400^\circ C$ is R. then radiation from it when the temperature of the ball is $627^\circ C$. Then the rate of loss of heat per unit area will be

A. 2R

B. 4R

C. 3/16 R

D. 16/3 R

Answer: D

View Text Solution

30. A ball is coated with lamp black. Its temperature is $327^{\circ}C$ and is placed in the atmosphere at $27^{\circ}C$, it's rate of loss of heat per unit area is R. if the temperature of the ball is $627^{\circ}C$. Then the rate of loss of heat per unit area will be

A. 2R

B. 4R

C. 3/16 R

D. 16/3 R

Answer: D

View Text Solution

31. 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. 40

B. 80

C. 160

D. 240

Answer: B

Watch Video Solution

32. The temperature of a body is increased by 50%. The amount of radiation emitted by it would be nearly

A. 22.5%

B. 250%

C. 400%

D. $50\ \%$

Answer: C

Watch Video Solution

33. 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. R_1 / R_2

B. R_2 / R_1

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

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

Answer: C

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34. Two spheres P and Q of the same colour and having radii 4 cm and 2 cm are kept at $127^\circ C$ and $527^\circ C$ respectively. The ratio of the energies radiated by P and Q

A. $4:1$

B. $1:16$

C. $1:1$

D. $2:1$

Answer: C

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35. A black body at a temperature of $127^{\circ}C$ radiates heat at the rate of 5 cal/cm^2s at a temperature of $927^\circ C$, its rate of emission in units of cal/cm^2 s will be nearly

A. 405

B. 35

C. 245

D. 350

Answer: A

View Text Solution

36. The ratio of loss of heat from a metal sphere at $327^{\circ} C$ to that of the same sphere at $527^{\circ} C$. When placed in the surrounding of temperature $127^{\circ} C$ is

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

B. $\frac{13}{48}$

C. $\frac{22}{48}$

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

Answer: B

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37. The radiant energy from the Sun incident normally at the surface of earth is $20 kcal / m^2$ min What would have been the radiant energy incident normally on the earth if the sun had a temperature twice of the present one ? .

A. 160 kcal/m^2 min

B. 40 kcal/m^2 min

C. 320 kcal/m^2 min

D. 80 kcal/m^2 min

Answer: C

Watch Video Solution

38. A body radiates heat at the rate of 50 J/s at 300 K. when the same body is at 600 K then its rate of radiation of heat will be

A. 100 J/s

B. 200 J/s

C. 400 J/s

D. 800 J/s

Answer: D

Watch Video Solution

39. If the temperature of a hot body is raised would increased by

A. 0.16

B. 0.125

C. 0.04

D. 0.09

Answer: A

View Text Solution

40. A 60 w bulb has a filament temperature of 2000 K. what will be the wattage of another bulbs of same filament area and material at a temperature of 4000 K?

A. 8 w

B. 32 w

C. 64 w

D. 960 w

Answer: D

Watch Video Solution

41. The surface of a house hold radiator has an emissivity of 0.5 and an area of 1.5 m^2. The rate at which the radiation is emitted by then the radiator when its temperature is $47^\circ C$ will be nearly ($\sigma = 5.7 \times 10^{-8}$ Si units)

A. 598 watt

B. 299 watt

C. 448 watt

D. 346 watt

Answer: C

Watch Video Solution

42. A body emits Q cal/cm^2 of radiation at temperature $227^{\circ} C$. If the temperature of the body is raised to $727^{\circ} C$, then the amount of radiant enegy emitted will be

A. 2Q

B. 4Q

C. 16Q

D. 32Q

Answer: C

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43. The thermal capacities of two bodies A and B are in the ratio 1:4. if the rate of heat loss are equal for these two bodies then the rate of fall of the temperature will be in the ratio

A. $1:1$

B. $1:4$

C. $4:1$

D. $(4)^{1/4}:1$

Answer: C

Watch Video Solution

44. A black body is at a temperature of $527^\circ C$, to radiate twice as much energy per second its temperature must be increased to

A. $921^\circ C$

B. 960 K

C. 678 K

D. 400 K

Answer: B

Watch Video Solution

45. If the temperature of a black body incresese from $7^\circ C$ to $287^\circ C$ then the rate of energy radiation increases by

A. 0.16

B. 0.41

C. 16

D. 11.77

Answer: C

Watch Video Solution

46. Two solid sphere of copper have radii 10 cm and 8 cm respectively. Their temperature are $227^\circ C$ and $127^\circ C$ respectively they are allowed to cool by radiation in a room of temperature $27^\circ C$ then the initial rates of heat los are in the ratio

A. $\frac{85}{14}$

B. $\frac{34}{7}$

C. $\frac{7}{34}$

D. $\frac{14}{85}$

Answer: B

View Text Solution

47. In the above problem the ratio of the initial rate of fall of the temperatures is nearly

A. 2.49

B. 3.11

C. 1.99

D. 24.9

Answer: A

View Text Solution

48. If the temperature of a body is reduced to half of in initial temperature, then radiation power decresed by

A. 0.84

B. 0.94

C. 0.06

D. 0.16

Answer: B

View Text Solution

49. A spherical black body with a radius of 12 cm radiates 450 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) 900 (d)1800

A. 3600

B. 450

C. 900

D. 1800

Answer: D

Watch Video Solution

50. A small hole is made in a metallic hollow enclosure whose walls are maintained at a temperature of 10^3K. then the amount of radiant energy emitted per metre square per second from the hole is

A. 56.7 J

B. 56.7 KJ

C. $10^3 J$

D. data is in sufficient

Answer: B

View Text Solution

View Text Solution

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

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

A. 0.09

B. 0.018

C. 0.36

D. 0.54

Answer: B

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52. 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 measured in K

B. temperature of B is twice that of A in $.^{\circ} k$

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

D. temperature of B is 2 times that of A in $. ^\circ C$

Answer: C

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MCQs (Newtons Law of Cooling)

1. Equal volumes of two liquids A and B are heated to the same temperature and left in the atmosphere in identical vessels.

A. both will cool at the same rate

B. B will cool faster

C. A will cool faster

D. A and B will cool faster

Answer: A

View Text Solution

2. A sphere, a cube and a thin circular plate, all having the same mass and made of the same material are heated to the same temperature and them allowed to cool. Which of them cools fastest ?

A. cube

B. sphere

C. plate

D. can not be predicted

Answer: C

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3. The temperature-time graphs obtained in Newton's cooling experiment is

A. a straight line with positive slope

B. a straight line with negative slope

C. a curve with positive slope

D. a curve with negative

Answer: D

View Text Solution

4. A sphere, a cube, a cone and a thin disc all made up of the same material and all have the same mass. If they are heated to the same temperature θ and allowed to cool in identical surrounding then the initial rate of cooling is maximum for

A. sphere

B. cube

C. disc

D. cone

Answer: C

View Text Solution

5. A solid cylinder, a solid cube and a solid sphere are made of the same material and have the same mass. They are heated to the same temperature and kept in a room. The one that will cool at the minimum rate is

A. cylinder

B. sphere

C. cube

D. all will cool at the same rate

Answer: B

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6. A solid cube and a sphere are made of the same material and both have the same surface area. If both are at the temperature of 300 K then initial

A. rate of heat loss for both is same

B. rate of heat loss for sphere is more

C. rate of heat loss for cube is more

D. data is in sufficient

Answer: A

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7. Two spheres of same material have radius 1 m and 4 m and temperature 4000 K and 2000 K respectively. The energy radiated per second by the first sphere is

A. more than that by the second

B. less than that by the second

C. equal to that by the second

D. nothing can be predicted

Answer: C

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8. There is a circularr hole in a square copper plate. If the plate is heated then the radius of the circular hole will

A. increase

B. decrease

C. remains same

D. increase or decrease dependeing on size of the square plate

Answer: A

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9. Newton's law of cooling is used in laboratory for the determination of the

A. steam

B. solids

C. gases

D. liquids

Answer: D

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10. Newton's law of cooling holds good provided the temperature difference between the body and the surroundings is .

A. large wavelength

B. small

C. the same

D. very small

Answer: B

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11. Newton's law of cooling leads us to the following expression.

A. $(\theta - \theta_0) = Kt + C$

B. $\log(\theta - \theta_0) = -Kt + C$

C. $\log\theta = -Kt + C$

D. $\theta = K\theta_0 + C$

Answer: B

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12. Newton's law of cooling is valid for

A. law temperature

B. high temperature

C. small temperature difference

D. large temperature difference

Answer: C

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13. When a body of mass M loses heat, the rate of fall of temperature is proportional to

A. $M^{1/2}$

B. $M^{-1/2}$

C. M

D. M^{-1}

Answer: D

View Text Solution

14. A solid sphere of copper of radius R and hollow sphere of copper of inner radius r and outer radius R are heated to the same temperature and allowed to cool in the same environment. The rate of cooling is

A. more for hollow sphere

B. more for solid sphere

C. same for both the sphere

D. can not say

Answer: A

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15. A mechanism of equalization of temperature of a body by thermal radiations, with that of its surroundings was proposed by

A. Newton

B. Stefan

C. Kirchhoff

D. Prevost

Answer: D

View Text Solution

16. The Newton's law of cooling is based on

A. Planck's law

B. Prevost's law

C. Kirchhoff's law

D. Stefan's law of radiation

Answer: D

View Text Solution

17. Newton's law of cooling is also applicable to

A. forced convection losses

B. convection losses

C. natural convection losses

D. none of these

Answer: A

View Text Solution

18. A solid sphere, cube and a cylinder of same material and density, are heated to the same temperature. If height of cylinder radius of cylinder and sphere and side length of the cube all are equal to R, then the body that cool faster is

A. sphere

B. cube

C. cylinder

D. all cool equal

Answer: B

19. A solid sphere and a hollow sphere of the same material and of equal radii are heated to the same temperature

A. both will emit equal amount fo radiation per unit time in the beginning

B. both will absorb equal amount of radiation from the surrounding in the beginning

C. the initial rate of cooling will not be same for the two sphere

D. the two spheres will have equal temperature at any instant

Answer: D

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20. Newton's law of cooling can be obtained from

A. Rayleigh's law

B. Stefan's law

C. Wien's law

D. Planck's law

Answer: B

Watch Video Solution

21. In simple radiation correction, correction in the temperature is due to loss of heat by

A. covection

B. radiation

C. conduction

D. conduction and convection

Answer: B

Watch Video Solution

22. A metal sphere cools from $72^\circ C$ to $60^\circ C$ in 10 minutes. If the surroundings temperature is $36^\circ C$, then the time taken by it to cool from $60^\circ C$ to $52^\circ C$ is

A. 8 minutes

B. 4 minutes

C. 12 minutes

D. 10 minutes

Answer: D

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23. A body cools in 7 minutes from $60^\circ C$ to $40^\circ C$. What will be its temperature after the next 7 minutes? The temperature of the surroundings is $10^\circ C$.

A. $32^\circ C$

B. $28^\circ C$

C. $20^\circ C$

D. $25^\circ C$

Answer: B

Watch Video Solution

24. Newton's law of cooling, holds good only if the temperature difference between the body and the surroundings is

A. less than $20^\circ C$

B. more than $10^\circ C$

C. less than $100^\circ C$

D. more than $100^\circ C$

Answer: A

Watch Video Solution

25. A body takes, 4 minutes to cool from $100^\circ C$ to $70^\circ C$, if the room temperature is $25^\circ C$, then the time taken to cool from $70^\circ C$ to $40^\circ C$ will be

A. 10 minute

B. 3 minute

C. 6 minute

D. 8 minute

Answer: D

Watch Video Solution

26. A body in a room cools from $85^\circ C$ to $80^\circ C$ in 5 minutes. Then the time taken to cool from $80^\circ C$ to $75^\circ C$ is

A. 5 minutes

B. more than 5 minutes

C. less than 5 minutes

D. 10 minutes

Answer: B

Watch Video Solution

27. A hot water kept in a beaker placed in a room cools from $60^\circ C$ to $50^\circ C$ in 8 min. then the time taken by it to cool from $50^\circ C$ to $40^\circ C$ is

A. 8 min

B. more than 8 min

C. less than 8 min

D. depends on quantity of water in a beaker

Answer: B

Watch Video Solution

28. A vessel full of hot water is kept in a room and it cools from $80^\circ C$ to $75^\circ C$ in T_1 minutes, from $75^\circ C$ to $70^\circ C$ in T_2 minutes and from $70^\circ C$ to $65^\circ C$ in T_3 minutes Then .

A. $t_1 = t_2 = t_3$

B. $t_1 < t_2 = t_3$

C. $t_1 < t_2 < t_3$

D. $t_1 > t_2 > t_3$

Answer: C

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29. A body cools from $50^\circ C$ to $49.9^\circ C$ in 5 s. the temperature of the surroundings is $30^\circ C$. How long will the body, take to cool from $40^\circ C$ to $39.9^\circ C$?

A. 2.5 seconds

B. 5 seconds

C. 7.5 seconds

D. 10 seconds

Answer: D

Watch Video Solution

30. A body cools from $50^\circ C$ to $46^\circ C$ in 5 min and to $40^\circ C$ in the next 10 min. then the temperature of the surrounding is

A. $30^{\circ} C$

B. $36^{\circ} C$

C. $28^{\circ} C$

D. $32^{\circ} C$

Answer: C

Watch Video Solution

31. A body cools from $60^{\circ} C$ to $50^{\circ} C$ in 10 minutes . If the room temperature is $25^{\circ} C$ and assuming Newton's law of cooling to hold good, the temperature of the body at the end of the next 10 minutes will be

A. $42.85^{\circ} C$

B. $24^{\circ} C$

C. $56.85^{\circ} C$

D. $46.5^{\circ} C$

Answer: A

Watch Video Solution

32. A body cools at the rate of $0.6^\circ C / s$ when it is $40^\circ C$ above the surrounding. Then the rate of cooling when it is at $20^\circ C$ above the same surrounding is

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

33. A body cools from $60^\circ C$ to $52^\circ C$ in five minutes. What will be further fall in temperature in the next five minutes? If the temperature of the surrounding is $28^\circ C$

A. $4^\circ C$

B. $6^\circ C$

C. $8^\circ C$

D. $2^\circ C$

Answer: B

View Text Solution

34. A body cools at the rate of $3^\circ C/\text{min}$ when its temperature is $50^\circ C$. If the temperature of surroundings is $25^\circ C$ then the rate of cooling of the body at $40^\circ C$ is

A. $2^\circ C$/min

B. $2.4^\circ C$/min

C. $2.8^\circ C$/min

D. $1.8^\circ C$/min

Answer: D

Watch Video Solution

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35. A body cools at the rate of $0.75^{\circ} C / s$ when it is $50^{\circ} C$ above the surrounding. Its rate of cooling when it is $30^{\circ} C$ above the same surrounding is

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

B. $0.36^{\circ} C / s$

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

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

Answer: D

Watch Video Solution

36. A sphere and a cube of equal volumes both are made of iron and have similar surface. If both are cool in identical surrounding, at a lower temperature, then the ratio of the initial rates of loss of heat is

A. $\left(\frac{\pi}{6}\right)^{1/3}:1$

B. $\left(\frac{3}{4\pi}\right)^{-1/3}:1$

C. $\left(\frac{3}{4\pi}\right)^{2/3}:1$

D. $1:1$

Answer: A

Watch Video Solution

37. In the above question, the ratio of the initial rate of fall of temperature is

A. $\left(\frac{\pi}{6}\right)^{1/3} : 1$

B. $1 : 1$

C. $\left(\frac{4\pi}{3}\right)^{1/3} : 1$

D. $\left(\frac{3}{4\pi}\right)^{2/3} : 1$

Answer: A

View Text Solution

38. A body cools from $60^\circ C$ to $52^\circ C$ in 5 minutes what will be the further fall in its temperature in the next five minutes? If the temperature of the surrounding is $28^\circ C$

A. $46^\circ C$

B. $40^\circ C$

C. $36^\circ C$

D. $48^\circ C$

Answer: A

Watch Video Solution

39. A body cools at the ratio of $1.2^\circ C/\text{min}$ when its temperature is more than that of the surrounding by $40^\circ C$. The rate of cooling of the body when its temperature is more than that of surrounding by $25^\circ C$ will be

A. $0.75^\circ C/\text{min}$

B. $0.25^\circ C/\text{min}$

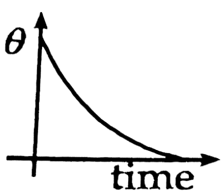
C. $1.25^\circ C/\text{min}$

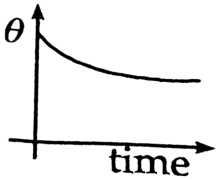
D. $1^\circ C$/min

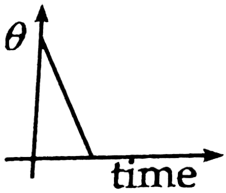
Answer: A

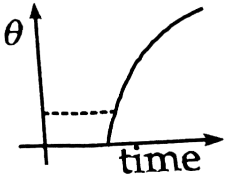
View Text Solution

40. If the temperature of the body θ and time of cooling 't' and room temperature of the surrounding θ_0. The cooling curve is

A. 

B. 

C. 

D. 

Answer: B

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MCQs (Question Given in MHT-CET)

1. The difference between the principal specific heats of nitrogen is 300 J/kg K and ratio of the two specific heats is 1.4. then C_P is

A. 1050 J/kg K

B. 650 J/kg K

C. 750 J/kg K

D. 150 J/kg K

Answer: A

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2. The mean kinetic energy of one gram-mole of a perfect gas at abolute temperature T is

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

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

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

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

Answer: D

View Text Solution

3. The volume of $2.8g$ of carbon monoxide at $27^{\circ}C$ and $0.821atm$ pressure $\left(R = 0.821 \text{atm} K^{-1} \text{mol}^{-1}\right)$

A. 0.3 litre

B. 1.5 litre

C. 3 litre

D. 60 litre

Answer: C

Watch Video Solution

4. A body cools from $50^\circ C$ to $46^\circ C$ in 5 minutes and to $40^\circ C$ in the next 10 minutes. The surrounding temperature is :

A. $30^\circ C$

B. $28^\circ C$

C. $36^\circ C$

D. $32^\circ C$

Answer: A

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5. 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 B will rise faster

B. temperature of A will remain more than B

C. both of A and B show equal rise from the beginning

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

Answer: D

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6. If at same temperature and pressure, the densities for two diatomic gases are respectively d_1 and d_2 , then the ratio of velocities of sound in these gases will be

A. $\sqrt{\frac{d_2}{d_1}}$

B. $\sqrt{\frac{d_1}{d_2}}$

C. $d_1 d_2$

D. $\sqrt{d_1 d_2}$

Answer: A

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7. One mole of an ideal monoatomic gas requires 207 J 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 the same 10 K, the heat required is [Given the gas constant R = 8.3 J/ mol. K]

A. 96.6 J

B. 124 J

C. 198.8 J

D. 215.4 J

Answer: B

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8. The volume of a gas at $20^\circ C$ is 100 cm 3 at normal pressure. If it is heated to $100^\circ C$, its volume becomes 125 cm 3 at the same pressure, then volume coefficient of the gas at normal pressure is

A. $0.0033/.^\circ C$

B. $0.0030/.^\circ C$

C. $0.0025/.^\circ C$

D. $0.0021/.^\circ C$

Answer: A

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9. Radiation emitted by a surface is direclty proportional to

A. third power of its temperature

B. equal to its temperature

C. twice power of its temperature

D. fourth power of its temperature

Answer: D

Watch Video Solution

10. A sphere, a cube and a thin circular plate all made of the same material and having the same mass are initially heated to a temperature of $300^\circ C$. Which one of these cools faster ?

A. Sphere

B. Cube

C. Plate

D. None of these

Answer: C

Watch Video Solution

11. An ideal gas is that which

A. be solidified

B. Liquefied

C. not be liquefied

D. not be solidified

Answer: C

Watch Video Solution

12. 5 gm of air is heated from 273 K to 275 K. the change in internal energy of air will be [$C_V = 172 cal / kg \text{ K and J} = 4.2 J / cal$]

A. 7.22 J

B. 5.22 J

C. 8.16 J

D. 3.5 J

Answer: A

View Text Solution

13. Calculate the RMS velocity of molecules of a gas of which the ratio of two specific heats is 1.42 and velocity of sound in the gas is 500 m/s.

A. 727 m/s

B. 527 m/s

C. 927 m/s

D. 750 m/s

Answer: A

View Text Solution

14. A body at higher temperature T K radiates heat at a rate which is proportional to

A. T

B. T^2

C. T^{-4}

D. T^4

Answer: D

View Text Solution

15. 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. $5.86 \times 10^{7} K$

B. $10^{-13} K$

C. $10^{-7} K$

D. $10^{7} K$

Answer: D

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16. The root mean square speed of hydrogen molecule at 300 K is 1930m/s. Then the root mean square speed of oxygen molecules at 900K will be...........

A. $1930\sqrt{3}m/s$

B. 836 m/s

C. 643 m/s

D. $\frac{1930}{\sqrt{3}}m/s$

Answer: B

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17. What is the true for 3 moles of a gas?

A. $3(C_p - C_V) = R$

B. $\frac{(C_p - C_V)}{3} = R$

C. $C_p - C_V = R$

D. $C_p - 3C_V = R$

Answer: C

View Text Solution

18. $PV/3=RT$, V represents volume of

A. any amount of gas

B. 2 moles of gas

C. 3 moles of gas

D. 4 moles of gas

Answer: C

View Text Solution

19. 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. 0.04

Answer: A

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20. KE per unit volume is:

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

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

C. $E = \frac{1}{2}mv^2$

D. $E = \frac{5}{2}P$

Answer: A

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21. If 3 kg of mass is converted into energy. Energy released is

A. $9 \times 10^8 J$

B. $9 \times 10^{16} J$

C. $27 \times 10^8 J$

D. $27 \times 10^{16} J$

Answer: D

View Text Solution

22. Energy supplied to convert unit mass of substnace from solid to liquid state at its melting point is called

A. latent heat of fusion

B. evaporation

C. solidification

D. latent heat of fission

Answer: A

View Text Solution

23. A unit mass of solid converted to liquid at its melting point. Heat is required for this process is

A. specific heat

B. latent heat of vaporisation

C. latent heat of fusion

D. external latent heat

Answer: C

View Text Solution

24. If 2 kcal, of heat is supplied to a system cause to change the internal energy of a gas is 5030 J, and external work done is 3350 J, then what is mechanical equivalent of heat?

A. 41.90 J/kcal

B. 4190 J/cal

C. 4.19 J/kcal

D. 4.19 J/cal

Answer: D

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25. Emissivity of perectly black body is

A. 1

B. 2

C. 5

D. 0

Answer: A

View Text Solution

26. if a=0.72, r=0.24, then value of t is

A. 0.02

B. 0.04

C. 0.4

D. 0.2

Answer: B

View Text Solution

27. Mass of a gas is 300 gm and its specific heat at constant volume is 750 J/kg K. if gas is heated through $75^\circ C$ at constant pressure of 10^5 N/m^2, it expands by volume $0.08 \times 10^6 cm^3$. Find C_p / C_V.

A. 1.4

B. 1.374

C. 1.474

D. 1.5

Answer: C

Watch Video Solution

28. A gas expands adiabatically at constant pressure such that its temperature $T \propto \frac{1}{\sqrt{V}}$, the value of C_P / C_V of gas is

A. 1.3

B. 1.5

C. 1.67

D. 2

Answer: B

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29. Which of the following is the unit of specific heat

A. J kg/. $^\circ C$

B. J/kg. $^\circ C$

C. kg. $^\circ C$/J

D. J kg/. $^\circ C^2$

Answer: B

Watch Video Solution

30. Average kinetic energy of molecules is

A. directly proportional to square root of temperature

B. diretctly proportional to absolute temperature

C. independent of absolute temperature

D. inversely proportional to absolute temperature

Answer: B

Watch Video Solution

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

A. 68.25 K

B. 273 K

C. 345 K

D. 0 K

Answer: A

Watch Video Solution

32. KE per unit volume is E. The pressure exerted by the gas is given by

A. 3/2 E

B. E

C. 2/3 E

D. $\sqrt{3}E$

Answer: C

Watch Video Solution

33. Two spherres made of same material have radii in the ratio 2:1. if both the spheres are at same temperature, then what is the ratio of heat radiation energy emitted per second by them?

A. $1:4$

B. $4:1$

C. $3:4$

D. $4:3$

Answer: B

View Text Solution

34. The coefficient of absorption of perfectly black body is

A. 1

B. 0

C. 0.75

D. none of these

Answer: A

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35. 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

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36. 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: B

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

A. $cpro\sqrt{\rho}$

B. $c \propto r$

C. $c \propto 1/\rho$

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

Answer: D

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38. In terms of mechanical unit , $C_p - C_v$ =..

Where , C_p and C_v are principal specific heats .

A. R

B. R/J

C. R/M

D. R / MJ

Answer: D

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39. The ratio of energy of emitted radiation of a black body at $27^\circ C$ and $927^\circ C$ is

A. $1:4$

B. $1:16$

C. $1:8$

D. $1:256$

Answer: D

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40. 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

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41. A body cools from $100^{\circ} C$ to $70^{\circ} C$ in 8 minutes. If the room temperature is $15^{\circ} C$ and assuming newton's law of cooling holds good, then time required for the body to cool from $70^{\circ} C$ to $40^{\circ} C$ is

A. 14 min

B. 10 min

C. 8 min

D. 5 min

Answer: A

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42. Internal latent heat of ice is

A. greater than latent heat

B. less than latent heat

C. equal to latent heat

D. equal to half that of latent heat

Answer: A

Watch Video Solution

43. Given that $C_p - C_V = R$ and $\gamma = C_p / C_V$, where C_p=Molar specific heat at constant pressure, C_V=molar specific heat at constant volume. Then C_V=

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

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

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

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

Answer: B

Watch Video Solution

44. The speed of molecules are given by 2 m/s, 3m/s, 4 m/s, 5 m/s, and 6 m/s. the mean square speed is

A. 20 m^2 / s^2

B. 25 m^2 / s^2

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

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

Answer: D

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45. The unit of Stefan's constant σ is

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

B. watt/$m^3 K$

C. watt/m^2K

D. watt/m^3K^4

Answer: A

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46. 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. $E.\ E_b = \frac{1}{a}$

Answer: B

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47. 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

48. For an ideal gas, Cv/Cp is

A. < 1

B. > 1

C. $= 1$

D. ≥ 1

Answer: A

Watch Video Solution

Watch Video Solution

49. Internal latent heat is defined as

A. amount of heat needed to do work against external pressure

B. amount of heat needed to do to work against intermolecular force

C. amount of heat needed to increase the K.E. of the molecules

D. heat needed to change the state of a substance

Answer: B

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50. Pressure at the triple point of water is

A. $4N/m^2$

B. 760 mm of Hg

C. 5440 Pa

D. 0.544 mm of Hg

Answer: C

Watch Video Solution

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51. A body radiates heat at the rate of 5 cal/ $m^2 - s$ when its temperature is $227^\circ C$. The heat radiated by the body when its temperature is $727^\circ C$ is

A. 10 calm^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

52. According to Prevost's theory of heat exchange, the heat exchange shops at

A. $0^{\circ}C$

B. $-5^{\circ}C$

C. $-273^{\circ}C$

D. $-273K$

Answer: C

Watch Video Solution

53. The mean kinetic energy per unit volume of gas (E) is related to average pressure P, exerted by the gas is

A. 3/2 E

B. 2/3 E

C. 1/3 E

D. E

Answer: B

Watch Video Solution

54. Two gases have densities in the ratio 2:3 and pressure exerted are in the ratio 3:2. then the ratio of their RMS velocity is

A. $2:3$

B. $3:2$

C. $1:3$

D. $6:8$

Answer: B

Watch Video Solution

55. At what temperature will the R.M.S. velocity of a gas be double its value at N.T.P.?

A. $273^\circ C$

B. $546^\circ C$

C. $819^\circ C$

D. $1092^\circ C$

Answer: C

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56. The S. I units of the constant in Wein's displacement law are

A. m K

B. Cal/m^2

C. J/m^2

D. K/m

Answer: A

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57. 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. 600 J/m^2 s

C. 800 J/m^2 s

D. 400 J/m^2 s

Answer: A

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58. Athermanous bodies are those

A. $r=1$

B. $a=1$

C. $t=0$

D. $t=1$

Answer: B

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59. Average straight distance covered between two successive collision of molecules is called....................

A. free path

B. constant path

C. mean free path

D. free path perr unit time

Answer: C

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60. A body cools at the rate of $0.5^\circ C/s$ when it is $50^\circ C$ above the surrounding temperature. The rat of cooling at excess temperature of $30^\circ C$ over the surrounding temperature is

A. $3^\circ C/s$

B. $0.3^\circ C/s$

C. $0.2^\circ C/s$

D. $0.1^\circ C/s$

Answer: B

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61. If a gas expands under isothermal conduction, then what happen to rms velocity will be?

A. increases

B. decreases

C. remains constant

D. can not be predicted

Answer: C

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62. 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. 2103 J

B. 2310 J

C. 210 J

D. 375 J

Answer: A

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63. What will be the r.m.s. speed of a gas at $800^{\circ} K$?

A. four times the values at 200 K

B. half the value at 200 K

C. twice the value at 200 K

D. same as at 200 K

Answer: C

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64. What temperature does the average translational K.E. of a molecule is a gas becomes equal to K.E. of an electron accelerated from rest through potential difference of V volt? All symbols have their usual meaning.

A. $\dfrac{2eVN}{3R}$

B. $\dfrac{3R}{2eVN}$

C. $\dfrac{NeV}{R}$

D. $\dfrac{2NeV}{R}$

Answer: A

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65. Calculate the total number of degree of freedom for a mole of diatomic gas at STP.

A. 3

B. 5

C. 6

D. 7

Answer: B

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66. The light from th sun is found to have a maximum intensity near the wavelength of $470nm$. Assuming that the surface of the sun emits as a blackbody, calculate the temperature of the surface of the sun.

A. 5800 K

B. 6050 K

C. 6166 K

D. 6500 K

Answer: C

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67. The substance which allows heat radiations to pass through it is

A. iron

B. water vapour

C. wood

D. dry air

Answer: D

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68. The wavelength range of thermal radiation is

A. from 4000 Å to 7000 Å

B. from 7700 Å to 4×10^{6} Å

C. from 10^{6} Å to 10^{8} Å

D. from 4×10^{-12} Å to 4×10^{8} Å

Answer: B

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

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

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

C. 2

D. 2.5

Answer: B

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70. The co-efficient of reflection of an opaque body is 0.16. Its co-efficient of emission is

A. 0.94

B. 0.84

C. 0.74

D. 0.64

Answer: B

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

A. have finite volume

B. obey boyle's law

C. possess momentum

D. collide with one another

Answer: C

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72. A gas is compressed isothermally . The rms velocity of its molecules

A. increases

B. decreases

C. first increases and then decreases

D. remains the same

Answer: D

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73. Two copperr spheres of radii 6 cm and 12 cm respectively are suspended in an evacuated enclosure. Each of them are at a temperature $15^\circ C$ above the surroundings. The ratio of their rate of loss of heat is

A. $2:1$

B. $1:4$

C. $1:8$

D. $8:1$

Answer: B

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74. Dimensions of emissive power are

A. $[M^1L^{-2}T^{-3}]$

B. $[M^1L^2T^{-3}]$

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

D. $[M^1L^0T^{-2}]$

Answer: C

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75. The pressure of an ideal gas is written as $p = \frac{2E}{3V}$.Here E refers to

A. translational kinetic

B. rotational kinetic energy

C. vibrational kinetic

D. inversely proportional to pressure

Answer: A

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

A. force

B. impuse

C. energy

D. momentum

Answer: C

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77. The dimension formula of Stefan's constant is........... .

A. $[L^1M^0T^{-3}K^{-4}]$

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

C. $[L^2M^1T^{-3}K^{-4}]$

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

Answer: D

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78. 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 and T_2

D. independent of T_1 and T_2

Answer: B

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79. For polyatomic molecules having 'f' vibrational modes, the ratio of two specific heat, $\frac{C_P}{C_V}$ is

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

B. $\frac{2+f}{3+f}$

C. $\frac{4+f}{3+f}$

D. $\frac{5+f}{4+f}$

Answer: C

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