PHYSICS

BOOKS - MODERN PUBLICATION PHYSICS (KANNADA ENGLISH)

HEAT AND THERMODYNAMICS

Multiple Choice Questions Level I

1. $C_p - C_v = R/J$ for one mole of the gas. If we consider n moles of the gas, the formula becomes:

A. $C_p - C_v = \frac{R}{J}$

B. $C_p - C_v = n.\, R/J$

C. $C_r - C_v = \frac{R}{nJ}$

D. None of the above.

Answer: A

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2. The number of degrees of freedom for molecules of monoatomic gas is

A. 30.1×10^{23}

B. 18.01×10^{23}

C. 30.1×10^{21}

D. None of the above.

Answer: A

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3. The ratio of slope of adiabatic to that of an isothermal process is:

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

B. γ

C. $\gamma - 1$

D. None of the above.

Answer: B

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4. A Carnot's engine operates with a source at 500 K & sink at 375 K. The engine consumes 600 k cal of heat in one cycle, the heat rejected to sink per cycle is:

A. 250 k cal

B. 350 k cal

C. 450 k cal

D. 550 k cal.

Answer: C

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5. Two identical samples of a gas expands so that volume is doubled. The first sample undergoes isothermal expansion while the second is expanded adiabatically. The final pressure:

A. in first sample is greater

B. in second sample is greater

C. equal in both samples

D. nothing can be said.

Answer: A

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6. A reversible Carnot's engine is working between 260 K and 300K. It takes 500 cal of heat from sink. Heat rejected to the source at higher temp. for this refrigerator is:

A. 400 cal

B. 477 cal

C. 377 cal

D. 577 cal.

Answer: D

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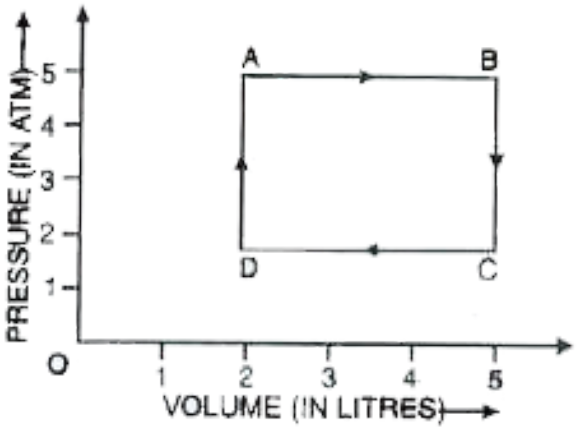
7. One mole of an ideal gas undergoes cyclic change as shown. The work done in the process is (taking 1 atmosphere $= 10^5 \ \mathrm{N}/m^2$):



A. 100J

B. 300J

C. 700J

D. 900J

Answer: D

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8. Specific heat at constant pressure C_p for a diatomic gas at N.T.P. in the units of cal mole k is:

A. $4 \cdot 95$

B. $6 \cdot 93$

C. $8 \cdot 93$

D. 1

Answer: B

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9. Let a small block of ice of $0^\circ C$ fall from a certain height into a water k. It at $0^\circ C$, we find that $\frac{1}{8}$ th of molts when it reaches the ground. The height of the fall is:

A. 2100 m

B. 4200 m

C. 100 m

D. 1000 m

Answer: B

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10. The amount of heat required to convert 1 gnm of ice at- $10^\circ C$ to steam at $100^\circ C$ is:

A. 725 cal

B. 1000 cal

C. 800 cal

D. 80 cal

Answer: A

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11. A moving snowball is completely melted by its impact against a wall. The speed (in ms^{-1}) of snow ball is:

A. $8 \cdot 2 \times 10^2 m/s$

B. $2 \cdot 1 \times 10^2 m/\sec$

C. $16 \cdot 4 \times 10^2 m/s$

D. None of the above.

Answer: A

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12. The velocity with which a ball of ice be thrown against a wall so that it melts completely is:

A. $v = \sqrt{2JL}$

B. $\sqrt{2}JL$

C. $v = 2JL$

D. JL

Answer: A

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13. A moving snowball is completely melted by its impact against a wall. The speed (in ms^{-1}) of snow bal is:

A. $8 \cdot 2 \times 10^2 m/s$

B. $2 \cdot 1 \times 10^2 m / \sec$

C. $16 \cdot 4 \times 10^2 m / s$

D. None of the above.

Answer: A

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14. From what height a piece of ice at zero degree fall in order that it may melt on reaching the ground, assumin8 no loss of energY on the way : $(J = 4 \cdot 2J / cal)$:

A. $3 \cdot 4 \times 10^6 cm$

B. $3 \cdot 4 \times 10^5 cm$

C. $3 \cdot 4 \times 10^6 mts$

D. $3 \cdot 4 \times 10^5 cm$

Answer: A

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15. A bullet moving with velocity v stops suddenly after hitting the target and whole of its mass m melts. If s is the specific heat, L the latent heat and its initial temp. is $25^{\circ}C$ and melting point. is $475^{\circ}C$, then the velocity v is given by:

A. mL =ms $(475-25)+\frac{1}{2}mv^2/J$

B. ms $(475-25)+mL=\frac{1}{2}mv^2/J$

C. ms $(475-25)+mL=2J/mv^2$

D. None of the above.

Answer: B

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16. Two identical samples of a gas are allowed to expand:

(i) isothermally and

(ii) adiabatically, the amount of work done is :

A. equal in both, the cases

B. more for adiabatic expansion

C. more for isothermal expansion

D. no work is done.

Answer: C

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17. The nomal temp. of human body is $98 \cdot 6^{\circ} F$. What is the corresponding temp. of human body in

Celsius scale:

A. $36^{\circ} C$

B. $37^{\circ} C$

C. $38^{\circ} C$

D. $39^\circ C$

Answer: B

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18. A gas at N.T.P. is suddenly compressed to one fourth of its original volume. If γ is supposed to be 3/2 then final pressure is :

A. 4 atmospheres

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

C. 8 atmospheres

D. 1/4 atmospheres

Answer: C

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19. A bar made of iron for which $\alpha = 11 \times 10^{-6\circ} C^{-1}$ is 10.000 cm at $20^\circ C$. At $19^\circ C$ the length is :

A. $11 \times 10^{-6} cm$ longer

B. $11 \times 10^{-6} cm$ shorter

C. 11×10^{-5} cm shorter

D. 11×10^{-4} cm shorter

Answer: C

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20. The temp. at which centigrade and fahrenheit scales have same reading is:

A. $-40^\circ C$

B. $40^\circ F$

C. $-32^\circ F$

D. $0^\circ C$

Answer: A

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21. Cooking food in a pressure cooker saves time and fuel because:

A. under increased pressure, water can be made to boil at as temperature higher than $100^\circ C$

B. heat losses are reduced to a minimum

C. condensation of steam is prevented

D. under increased pressure, water can be made to boil at a temperature much lower than $100^\circ C$

Answer: A

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22. Nitrogen is a diatomic gas. Its molar specific heat a constant volume is very nearly:

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

B. $\frac{7R}{2}$

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

D. (a) and (b) (c) depending on the temperature.

Answer: D

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23. At what temperature will oxygen molecules have the same root mean square speed as hydrogen molecules at 300 K ?

A. 4800 K

B. 3600 K

C. 2400 K

D. 300 K.

Answer: A

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24. During an adiabatic compression of 2 moles of a gas, 100 of work was done. The change in the internal energy will be:

A. 50 J

B. $-100J$

C. $-50J$

D. 100 J

Answer: D

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25. In a thermodynamic process, a system absorbs 2 kilo calorie of heat and at the same time does 500 J of work. What is the change in internal energy of the system:

A. $-500J$

B. 500 J

C. 7900 J

D. 8900 J

Answer: C

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26. Steam at $100^\circ C$ is passed into $1 \cdot 1$ kg of water contained in a calorimeter of water equivalent $0 \cdot 02kg$at $15^\circ C$ till the temperature of the calorimeter rises to $80^\circ C$. The mass of steam condensed in kilogranm is:

A. $1 \cdot 3kg$

B. 0.260

C. $0.13kg$

D. $1/3kg$

Answer: C

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27. A metal ball immersed in alcohol weights W_1 at $0^\circ C$ and W_2 at $59^\circ C$. The coefficient of cubic expansion of metal is less than that of alcohol. If the density of the mnetal is large compared to that of alcohol then:

A. $W_1 = W_2$

B. $W_1 > W_2$

C. $W_1 < W_2$

D. $W_2 = \frac{W_1}{2}$

Answer: A

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28. Two cylinders A and B fitted with pistons contain equal amounts of an ideal diatomic gas at 300 K. The piston of A is free to move, while that of B is held fixed. The same amount of heat is given to the gas in each cylinder. If the rise in temperature of the gas in A is 30 K, then the rise in temperature of the gas in B is :

A. 18 K

B. 30 K

C. 42 K

D. 50 K

Answer: C

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29. At room temperature $(27^\circ C)$ the r.m.s speed of the molecules of a certain diatomic gas is found to be $1920 ms^{-1}$. The gas is:

A. O_2

B. H_2

C. F_2

D. CI_2

Answer: B

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30. The average energy of molecules in a sample of oxygen gas at 300K are $6.2J \times 10^{-21}$ J. The corresponding values at 600K are

A. $8 \cdot 78 \times 10^{-21} J, 684 ms^{-1}$

B. $6 \cdot 21 \times 10^{-21} J, 968 ms^{-1}$

C. $12 \cdot 42 \times 10^{-21} J, 968 ms^{-1}$

D. $12 \cdot 42 \times 10^{-21} J, 968 ms^{-1}$

Answer: C

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31. In a given process on an ideal gas dW = 0 and $dQ \angle 0$. Then for the gas :

A. the volume will increase

B. the temperature will increase

C. the pressure will remain constant

D. the temperature will decrease.

Answer: A

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32. For a given mass of a gas in an adiabatic change the temperature and pressure are related according to the law:

A. $\frac{P}{T} = \text{constant}$

B. $PT^Y = \text{constant}$

C. $P^{1-Y}T^Y = \text{constant}$

D. $P^Y T^{1-Y} = \text{constant}$

Answer: C

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33. For increasing the efficiency of Carnot's engine, which of the folowing is most effective:

A. increasing the temperature of source by $80^\circ C$

B. decreasing temperature of sink by $80^\circ C$

C. increasing temperature of source by $40^\circ C$ and decreasing temperature of sink by $40^\circ C$

D. all the above steps are equally effective.

Answer: B

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

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

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

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

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

Answer: A

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35. The temperature of Helium gas is raised by $10^{\circ}C$ at constant volume. Heat supplied to gas may be taken partly as translational and partly as rotational kinetic energies. Their respective shares are :

A. 60%, 40%

B. 100%, 0%

C. 0%, 100%

D. 50%, 50%.

Answer: B

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36. The pressure and density of gas $\left(\gamma = \frac{7}{5}\right)$ changes adiabatically from (P, ρ) to (P', ρ'). If $\frac{\rho'}{\rho} = 32$, then find the ratio of $\frac{P'}{P}$:

A. 128

B. 32

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

D. $\frac{1}{32}$

Answer: A

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37. The number of dead centres per cycle for a steam engine is :

A. 1

B. 2

C. 3

D. 4

Answer: B

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38. A faulty thermometer has its fixed points marked $5^\circ C$ and $95^\circ C$. The thermometer reads the temperature of body as $59^\circ C$. The correct temperature on Celsius scale is:

A. $59^\circ C$

B. $60^\circ C$

C. $45^\circ C$

D. $58^\circ C$

Answer: B

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39. An ideal heat engine is working between temperature T_1 and T_2 has efficiency η. If both the temperatures are raised by $100^\circ k$ each, the new efficiency will be :

A. η

B. less than η

C. more than η

D. cannot be perdicted.

Answer: B

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40. The molar specific heat of oxygen at constant pressure, $C_p 7.03 \ \text{cal/mol}^\circ C$ and $R = 8.31 \ \text{Joules/mol}^\circ C$. The amount of heat taken by 5 moles of oxygen when heated at constant volume from $10^\circ C$ to $20^\circ C$ will be approximately:

A. 25 cal

B. 250 cal

C. 50 cal

D. 500 cal

Answer: B

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41. Equal volumes of copper and mercury have the same thermal capacity. Sp. heat of mercury is $0.046 \ \ \mathrm{cal/gm/^{\circ}}C$ and density is 13.6 g/c.c. What is the density of copper if its specific heat is 0.090 ?

A. $0.695g/$

B. $6.95g/$

C. $13.9g/$

D. None of these

Answer: B

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42. The densities of two substances are 2 3 and their specific heats are 0.12 and 0.09 respectively. What is the ratio of their thermal capacities per unit volume ?

A. $8:9$

B. $9:8$

C. $4:3$

D. $3:4$

Answer: A

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43. 70 calories of heat are required to raise the temperature of 2 moles of an ideal gas at constant pressure from 30° to 35°. The amount of heat required in calories to raise the temperature of the same gas through the same range $(30^\circ C \text{ to } 35^\circ C)$ at constant volume is :

A. 70

B. 60

C. 50

D. 35

Answer: C

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44. Boiling water is changing into steam, under this condition the specific heat of water in $\mathrm{cals}/\mathrm{g}/^{\circ}C$ is:

A. 1

B. zero

C. ∞

D. < 1

Answer: C

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45. What amount of heat must be supplied to $2.0 \times 10^{-2} kg$ of N_2 (at room temperature) to raise its temperature by $45^\circ C$ at constant pressure? Molecular mass of $N_2 = 28$, $R = 8.3 J \text{mole}^{-1} K^{-1}$

A. $9.33 cal$

B. $93.3 J$

C. $933.4 J$

D. $933.3 cal$

Answer: C

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46. Total heat required to convert 50 kg of water at $10^\circ C$ to steam at $100^\circ C \left(L.\ H = 2.25 \times 10^6 \ \text{J kg}^{-1} \right)$:

A. $3.13 \times 10^6 cal$

B. $31.3 \times 10^6 cal$

C. $313 kcal$

D. $31.3 kcal$

Answer: B

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47. For a certain gas the ratio of specific heat is 1.5, for thisg gas :

A. $C_p = \frac{5R}{J}$

B. $C_v = \frac{3R}{J}$

C. $C_v = \frac{5R}{J}$

D. $C_p = \frac{3R}{J}$

Answer: B

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48. 22g of CO_2 at $27^\circ C$ is mixed with $16g$ of O_2 at $37^\circ C$. The temperature of mixture is:

A. $27^\circ C$

B. $31.5^\circ C$

C. $32^\circ C$

D. $37^\circ C$

Answer: A

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49. For an adiabatic change the value of $\frac{dP}{P}$ is equal to $\left(dV = \text{ change in vol.}, \gamma = \frac{C_p}{C_v}\right)$:

A. $\gamma^{1/2} \cdot \frac{dV}{V}$

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

C. $-\gamma \cdot \frac{dV}{V}$

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

Answer: C

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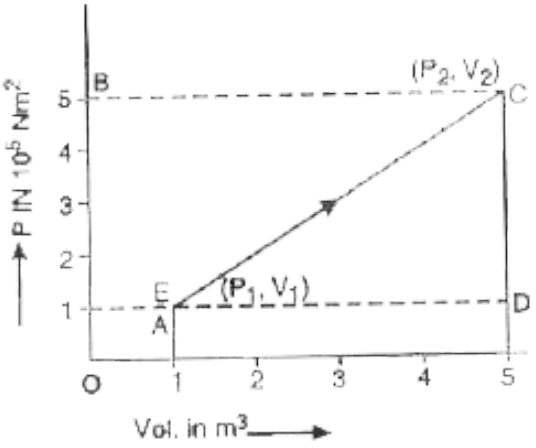
50. A system changes from the state (P_1, V_1) to (P_2, V_2) as shown, work done by the system is:



A. $7.5 \times 10^5 J$

B. 7.5×10^5 ergs

C. $12 \times 10^5 J$

D. $6 \times 10^5 J$

Answer: C

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51. A metal ring of mass 2.1 kg and of 10 cm radius is revolving about its axis $\frac{350}{11}$ r.p.s. If this ring is dropped in a viscous liquid, then the heat generated is $(J = 4.2 \text{ J/cal})$:

A. 100 cal

B. 1000 cal

C. 2100 cal

D. 50 cal

Answer: A

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52. A 50g lead bullet (sp. heat = 0.02) is at $30^{\circ}C$. It is fired vertically upwards with a speed of $840ms^{-1}$. On returning to the starting level it strikes the ice cake at $0^{\circ}C$. How much ice is melted ? (L.H. of ice 80 cal/gm):

A. 52.875 g

B. 5.2875 g

C. 528.75 8

D. None of these.

Answer: A

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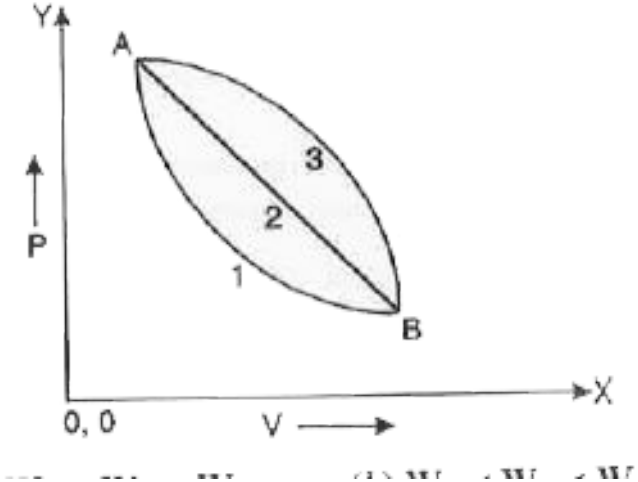
53. A given mass of a gas expands from the state A to the state B by three paths 1,2 and 3 as shown in the figure. If W_1, W_2 and W_3 respectively be

the work done by the gas along the three paths then



A. $W_1 > W_2 > W_3$

B. $W_1 < W_2 < W_3$

C. $W_1 = W_2 = W_3$

D. $W_1 < W_2, W_1 = W_3$

Answer: B

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54. Efficiency of engine is $\eta_1 at T_1 = 200^\circ C$ and η_2 at $T_1 = 0^\circ C$ and $T_2 = -200K$. Find the ratio of $\frac{\eta_1}{\eta_2}$:

A. $1 \cdot 00$

B. $0 \cdot 577$

C. $0 \cdot 721$

D. $0 \cdot 34$

Answer: B

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55. Which of the folowing is not a state function ?

A. temperature

B. pressure

C. entropy

D. work

Answer: D

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56. In an adiabatic change, the pressue and temperature of a monoatomic gas are related as $P \propto T^c$, where c equals:

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

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

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

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

Answer: A

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57. The efficiency of a Carnot engine is 50% and temperature of sink is 500 K. If temperature of source is kept constant and its efficiency raised

to 60%, then the required temp. of sink will be:

A. 100 K

B. 600 K

C. 400 K

D. 500 K

Answer: C

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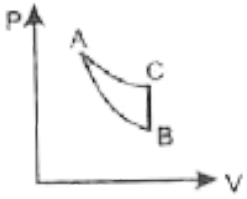
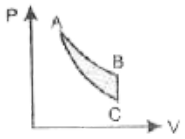
58. If AB is an isothermal, BC is an isochoric and AC is an adiabatic, which of the graph correctly represents them in Fig. ?

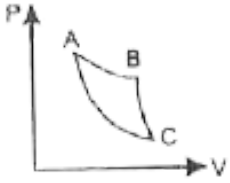
A.



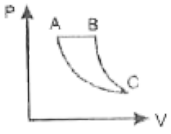
B.



C.



D.



Answer: B

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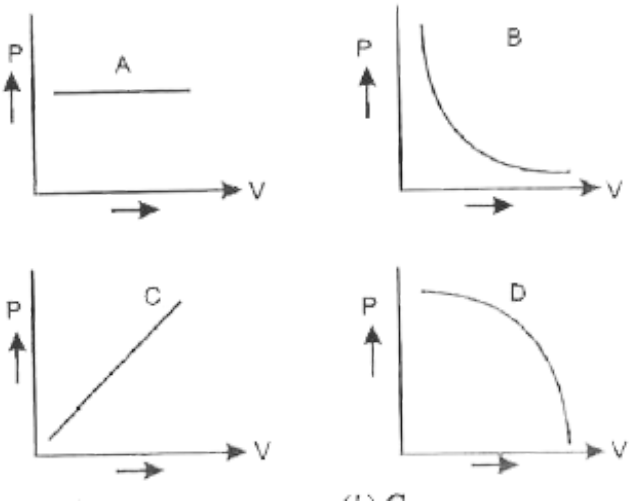
59. Which of the following PV diagrams best represents an isothermal process:



A. A

B. C

C. B

D. D

Answer: B

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60. The volume of a metal sphere increases by $0 \cdot 24\,\%$ when its temperature is raised by $40^\circ C$. The coefficient of linear expansion of the

metal is... $^{\circ}C^{-1}$:

A. 2×10^{-5}

B. 18×10^{-5}

C. 6×10^{-5}

D. $1 \cdot 2 \times 10^{-5}$

Answer: A

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61. Which statement is incorrect ?

A. All reversible cycles have same efficiency

B. Reversible cycle has more efficiency than an irreversible one

C. Carnot cycle is a reversible cycle

D. Carnot cycle has the maximum efficiency in all cycles.

Answer: A

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62. Even Carnot engine cannot give 100% efficiency because we cannot :

A. prevent radiation

B. find ideal sources

C. reach absolute zero temperature for sink

D. eliminate friction.

Answer: C

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63. Heat given to a body which raises its temperature by $1^{\circ}C$ is

A. water equivalent

B. thermal capacity

C. specific heat

D. temperature gradient

Answer: B

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64. Which of the following is incorrect regarding the first law of thermodynamics ?

A. It introduces the concept of the entropy

B. It introduces the concept of internal energy

C. It is a restatement of the principle of conservation of energy

D. It is not applicable to any cyclic process

Answer: B

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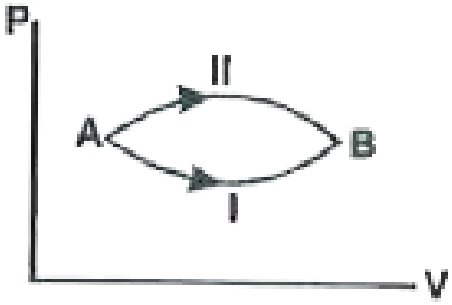
65. A system goes from A to B via two processes I and II as shown in Fig. If ΔU_1 and ΔU_2 are the changes in internal energies in the processes I and II respectively, then :



A. $\Delta U_2 < \Delta U_1$

B. $\Delta U_2 > \Delta U_1$

C. relation between ΔU_1 and ΔU_2 cannot be determined

D. $\Delta U_1 = \Delta U_2$

Answer: D

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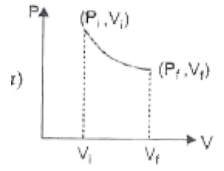
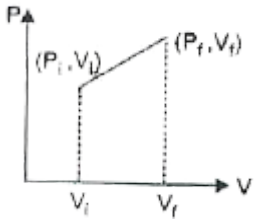
66. The initial state of certain gas is $(P_iV_iT_i)$. It undergoes expansion till its volume becomes V_f at constant temperture T, the corect plot of P-V diagram for it is :

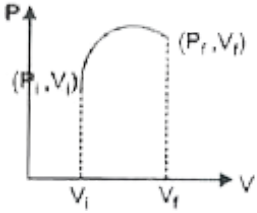
A.



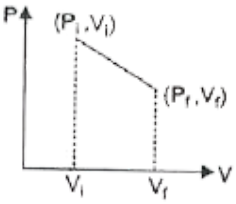
B.



C.



D.



Answer: A

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67. An ideal gas confined to an insulated chamber is allowed to enter into an evacuated insulated chamber. If $Q. W$ and $\Delta E_{\int}$ have the usual meanings, then

A. $Q = 0, W \neq 0$

B. $W = 0, Q \neq 0$

C. $\Delta E_{\int} = 0, Q \neq 0$

D. $Q = W = \Delta E_{\int} = 0$

Answer: B

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68. The internal energy of one gram of helium at 100 K and one atmospheric pressure is:

A. 100 J

B. 1200 J

C. 300 J

D. 500 J.

Answer: C

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Multiple Choice Questions Level Ii

1. The P-V diagram for a cyclic process is a triangle ABC drawn in order. The co-ordinates of A, B, C are (4,1), (2,4) & (2,1). The co-ordinates are in order of P- V in which P is in N/m^2 & volume in litres. The work done during the process from A to B is:

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

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

C. $6 \times 10^{-3} J$

D. $9 \times 10^{-3} J$

Answer: D

View Text Solution

2. In Q.No. 69, work done in complete cycle is :

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

B. -3×10^{-3}

C. 6×10^{-3}

D. zero

Answer: A

View Text Solution

3. The density of a liquid of coefficient of cubical expansion γ is d at $0^\circ C$. When the liquid is heated to a temperature T, the change in density will be :

A. $\frac{-\gamma T d_0}{(1+\gamma T)}$

B. $\frac{\gamma T d_0}{(1+\gamma T)}$

C. $\frac{(1+\gamma T)d_0}{\gamma T}$

D. $\frac{(1-\gamma T)d_0}{\gamma T}$

Answer: A

View Text Solution

4. Two blocks of ice join together where pressed. Which one of the following will appropriately account for this ?

A. The melting point of ice decreases with increase in pressure

B. The melting point of ice increases with increase in pressure

C. The latent heat of fusion of ice is high

D. Ice blocks have a, natural affinity for each other.

Answer: A

View Text Solution

5. The equation of state for a real gas such as hydrogen oxygen etc. is called the Van der waal's equation which reads: $-\left(P+\frac{a}{V^2}\right)(V-b) \equiv nRT$ where a and b are constants of the gas. The dimensional formula of constant a is:

A. $M^{-1}L^5T^{-1}$

B. ML^5T^{-2}

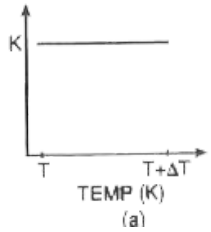
C. $ML^{-1}T^{-1}$

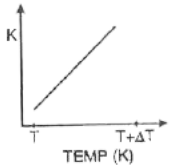
D. None of these

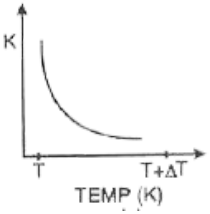
Answer: B

View Text Solution

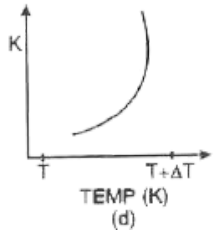
6. An ideal gas is initiaily at temperature T and volumoeV. Its volume is increased by ΔV due to an increase in temperature ΔT, pressure remaining constant. The quantity $k = AV/(V\Delta T)$ varies with temperature as:

A. 

B. 

C. 

D.

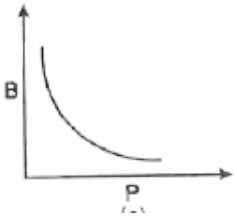


Answer: C

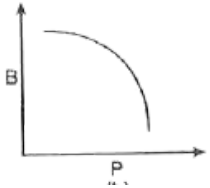
View Text Solution

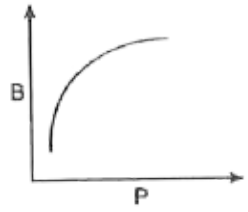
7. Which of the graphs shown in fig. correctly represents the variation of $\beta = -(d_v/d_p)/V$ with P for an ideal gas at constant temperature:

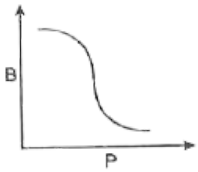
A.



B.



C. 

D. 

Answer: A

View Text Solution

8. For a monoatomic gas in adiabatic process, the relation between the pressure and absolute temperature time T is $P \propto T$ where C equal to:

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

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

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

D. $\frac{1}{3}$

Answer: C

View Text Solution

9. If the degrees of freedom of a gas are f, then the ratio of its specific heats $\frac{C_p}{C_v}$ is given by :

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

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

C. $1 + \frac{1}{f}$

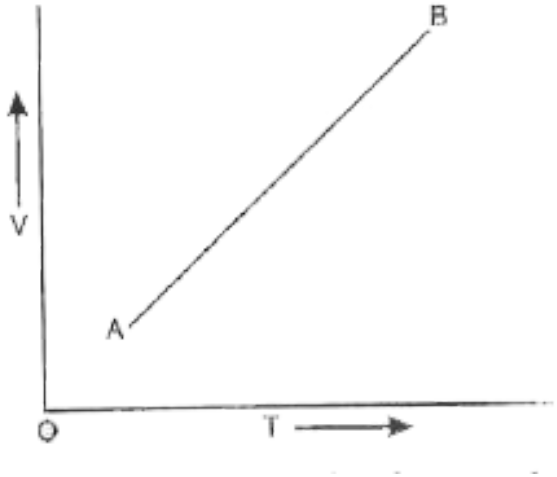
D. $1 - \frac{1}{f}$

Answer: B

View Text Solution

10. A volume V and temperature T was obtained, as shown in diagram, when a given mass of gas was heated. During the heating process the

pressure is :



A. increased

B. decreased

C. remains constant

D. changed erratically.

Answer: B

View Text Solution

11. A vessel containing air of mass 8g at 400 K is provided with a hole so that some amount of air leaks out. After some time, the pressure is halved and temperature is changed to 300 K. The mass of air escaped is:

A. 4g

B. 2.7 g

C. 5.3 g

D. 2g

Answer: B

View Text Solution

12. If one mole of a monoatomic gas $\gamma = \frac{5}{3}$, is mixed with one mole of diatomic gas $\gamma = \frac{7}{5}$, what is the value of γ for the mixture ?

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

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

C. $\frac{6}{5}$

D. $\frac{8}{5}$

Answer: A

View Text Solution

13. Pure water cooled to $-15^{\circ}C$ is contained in a thermally insulated flask. Some ice is added into the flask. The fraction of water frozen into ice is :

A. $\frac{3}{35}$

B. $\frac{6}{35}$

C. $\frac{2}{35}$

D. $\frac{6}{29}$

Answer: B

View Text Solution

14. One mole of monoatomic gas is mixed with three moles of diatomic gas. What is molecular specific heat of the mixture at constant volume ? R = 8.31 J/mole/K:

A. 18.7 J/mole/K

B. 1.87 J/mole/K

C. 9.35 J/mole/K

D. 4.67 J/mole/K.

Answer: A

View Text Solution

15. Half a mole of helium is contained in a container at S.T.P. How much heat energy is needed to double the pressure of the gas, keeping the volume constant ? Heat capacity of the gas is 3J/g/K:

A. 1.638 J

B. 16.38 J

C. 163.8 J

D. 1638 J.

Answer: D

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16. A Carnot's engine is working between $7^\circ C$ and $287^\circ C$. It is desired to increase its efficiency to 70%. By how much should the temperature of source be increase ?

A. $273^\circ C$

B. $173^\circ C$

C. $373.3^\circ C$

D. $-273.3^\circ C$

Answer: C

View Text Solution

17. 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. $273^{\circ}C$

C. $227^{\circ}C$

D. $150^{\circ}C$

Answer: A

View Text Solution

18. One mole of an ideal gas at an initial temperature of TK does 6 R joule of work adiabatically. If the ratio of specific heats of this gas at constant

pressure and at constant volume is 5/3, the final temperature of the gas will be:

A. $(T+4)K$

B. $(T+2\cdot 4)K$

C. $(T-4)K$

D. $(T-2\cdot 4)K$

Answer: C

View Text Solution

19. The temperature of equal masses of three different liquids A, B and C are $12^\circ C, 19^\circ C$ and $28^\circ C$ respectively. The temperature when A and B are mixed is $16^\circ C$ and when B and C are mixed is $23^\circ C$. The temperature when A and C are mixed is

A. $18\cdot 2^\circ C$

B. $20\cdot 2^\circ C$

C. $22^{\circ} C$

D. $24 \cdot 2^{\circ} C$

Answer: B

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20. A Carnot engine whose sink is at 300 K has an efficiency of 40%. By how much should the temperature of source be increased so as to increase its efficiency by 50% of original efficiency:

A. 380 K

B. 275 K

C. 325 K

D. 250 K

Answer: D

View Text Solution

21. Statement-I: The temperature at which centigrade and Fahrenheit thermometers read the same is -40°.

Stament-II : There is no relation between Fahrenheit and centigrade scale of temperature.

A. Statement-I is true, statement-II is true and statement-II is correct explanation for statement-I.

B. Statement-I is true, statement-I is true and statement-II is not correct explanation of statement-I.

C. Statement-I is true, statement-II is false.

D. Statement-I is false, statement-II is false.

Answer: C

View Text Solution

22. Statement-I : It is not posible for a system, unaided by an external energy to transfer heat from a body at lower temperature to another body a higher temperature.

Statement-II: It is not possible to violate second law of thermodynamics.

A. Statement-I is true, statement-II is true and statement-II is correct explanation for statement-I.

B. Statement-I is true, statement-II is true and statement-II is not correct explanation of statement-I.

C. statement-I is true, statement-II is false.

D. Statement-I is false, statement-II is false.

Answer: A

View Text Solution

23. Statement-I : A beaker is completely filled with water at $4^{\circ}C$. It will overflow both when heated on cooled. **Statement-II : There is expansion of water both below and above $4^{\circ}C$.**

A. Statement-I is true, statement-II is true and statement- II is correct explanation for statement-I.

B. Statement-I is true, statement-II is true and statement-II is not correct explanation of statement-I

C. Statement-I is true, statement-II is false.

D. Statement-I is false, statement-II is false.

Answer: A

View Text Solution

24. Statement-I: Pressure and temperature are the examples of intensive variable.

Statement-II : The variable which depend upon the mass or size of the system are called intensive variable

A. Statement-I is true, statement-II is true and statement-II is correct explanation for statement-I.

B. Statement-I is true, statement-II is true and statement-II is not correct explanation of statement-I

C. Statement-I is true, statement-II is false.

D. Statement-I is false, statement-II is false

Answer: C

View Text Solution

25. Statement-I : Internal energy is a state function.

Statement-II: Intemal energy of an isolated system does not change.

A. Statement-I is true, statement-II is true and statement-II is corect explanation for statement-I.

B. Statement-I is true, statement-II is true and statement-II is not correct explanation of statement-I.

C. Statement-I is true, statement-II is false.

D. Statement-I is false, statement-II is false.

Answer: B

View Text Solution

26. Read the following paragraph and answer the following questions.

According to Kelvin Planck's statement of second law of thermodynamic no process is possible whose sole result is the adsorption of heat from a reservoir and the complete conversion of heat into work. A carnot heat engine works at temperatures $227^\circ C$ and $127^\circ C$. It absorbs 6.0×10^4 calories of heat from the source at high temperature in each cycle.

The amount of heat converted into work in above carnot engine is :

A. 1.2×10^4 cals

B. 1.8×10^4 cals

C. 3.5×10^5 cals

D. 4.8×10^4 cals

Answer: A

View Text Solution

27. Read the following paragraph and answer the following questions.

According to Kelvin Planck's statement of second law of thermodynamic no process is possible whose sole result is the adsorption of heat from a reservoir and the complete conversion of heat into work. A carnot heat engine works at temperatures $227^\circ C$ and $127^\circ C$. It absorbs 6.0×10^4 calories of heat from the source at high temperature in each cycle.

The amount of heat rejected to sink at lower temperature is:

A. 1.2×10^4 cals

B. 1.8×10^4 cals

C. 3.5×10^5 cals

D. 4.8×10^4 cals

Answer: D

View Text Solution

28. Read the following paragraph and answer the following questions.

According to Kelvin Planck's statement of second law of thermodynamic no process is possible whose sole result is the adsorption of heat from a reservoir and the complete conversion of heat into work. A carnot heat engine works at temperatures $227^\circ C$ and $127^\circ C$. It absorbs 6.0×10^4 calories of heat from the source at high temperature in each cycle.

The efficiency of engine is:

A. 0.2

B. 0.3

C. 0.4

D. 0.5

Answer: A

View Text Solution

29. Read the following paragraph and answer the following questions.

According to Kelvin Planck's statement of second law of thermodynamic no process is possible whose sole result is the adsorption of heat from a reservoir and the complete conversion of heat into work. A carnot heat engine works at temperatures $227^\circ C$ and $127^\circ C$. It absorbs 6.0×10^4 calories of heat from the source at high temperature in each cycle.

By how much the temperature of the sink be decreased so as to make efficiency of engine 50% keeping temp. of source fixed.

A. $25^\circ C$

B. $75^\circ C$

C. $150^\circ C$

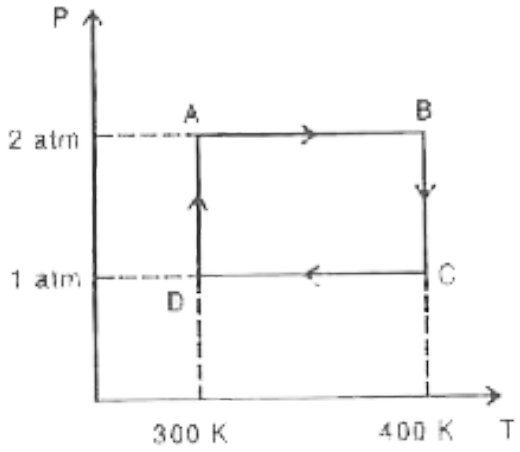
D. $125^{\circ} C$

Answer: C

View Text Solution

30. Read the given paragraph and answer the following questions. Two moles of helium gas undergo a cyclic process as shown in fig.

Assuming the gas to be ideal



Work done from isobasic process A to B is :

A. 4612 J

B. 1664 J

C. 2000 J

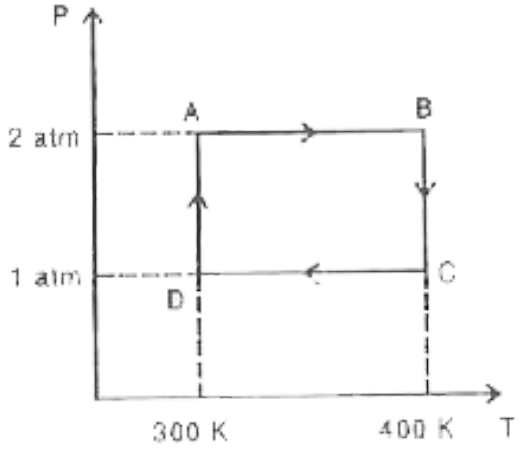
D. 3000 J

Answer: B

View Text Solution

31. Read the given paragraph and answer the following questions. Two moles of helium gas undergo a cyclic process as shown in fig.

Assuming the gas to be ideal



Work done during isothermal process B to C is:

A. 4612 J

B. 800 J

C. 2000 J

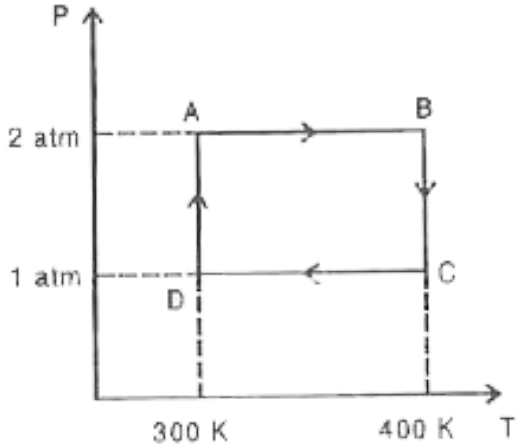
D. 1664 J.

Answer: A

View Text Solution

32. Read the given paragraph and answer the following questions. Two moles of helium gas undergo a cyclic process as shown in fig.

Assuming the gas to be ideal



Work done during isothermal process D to A is:

A. 3460 J

B. -4612

C. -3460

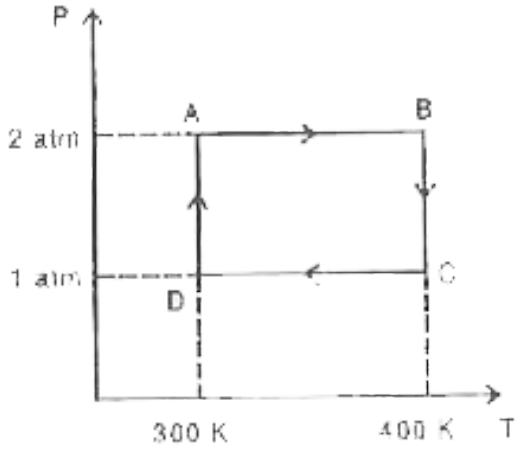
D. 1153 J

Answer: C

View Text Solution

33. Read the given paragraph and answer the following questions. Two moles of helium gas undergo a cyclic process as shown in fig.

Assuming the gas to be ideal



The total work done during complete cycle is :

A. 800 J

B. $-1050J$

C. 1000 J

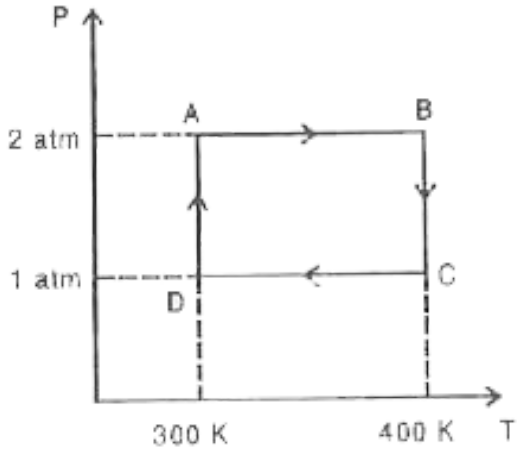
D. 1153 J.

Answer: D

View Text Solution

34. Read the given paragraph and answer the following questions. Two moles of helium gas undergo a cyclic process as shown in fig.

Assuming the gas to be ideal



The net change in internal energy during the cyclic process is:

A. zero

B. 800 J

C. 1153 J

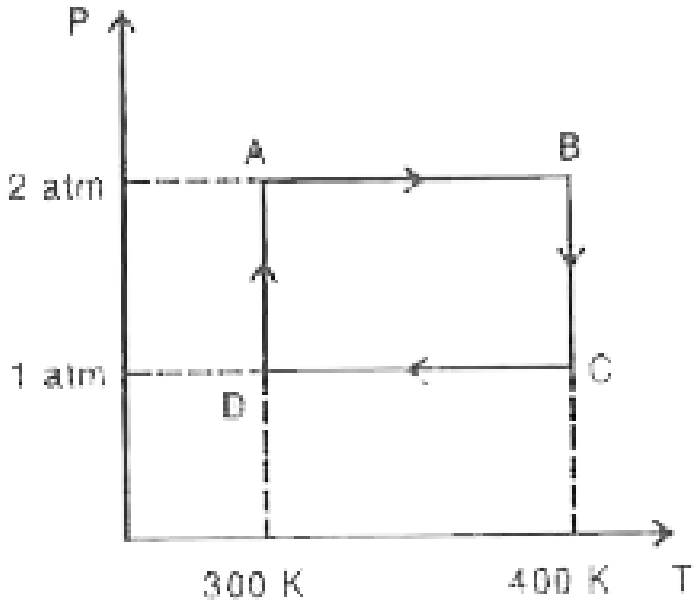
D. $-1153J.$

Answer: A

View Text Solution

35. Read the given paragraph and answer the following questions. Two moles of helium gas undergo a cyclic process as shown in fig.

Assuming the gas to be ideal



The net change in heat energy is:

A. 1000 J

B. 1050 J

C. 1153 J

D. 1250 J

Answer: C

View Text Solution

36. Starting with the same initial conditions, an ideal gas expands from volume V_1 to V_2 in three different ways. The work done by the gas is W_1 if the process is purely isothermal, W_2 if purely isobaric and W_3 if purely adiabatic. Then SS

A. $W_2 > W_1 > W_3$

B. $W_1 > W_2 > W_3$

C. $W_2 > W_3 > W_1$

D. $W_1 > W_3 > W_2$

Answer: A

View Text Solution

37. A Carnot engine takes 3×10^6 cals 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. $4 \cdot 2 \times 10^6 J$

B. $16 \cdot 8 \times 10^6 J$

C. $8 \cdot 4 \times 10^6 J$

D. $3 \times 10^6 J$

Answer: C

View Text Solution

38. An ideal gas expands isothermally from a volume V_1 to V_2 and then compressed to original volume V_1 adiabatically. Initial pressure is P_1 and

final pressure is P_3. Total work done is W. Then which is true :

A. $P_3 > P_1, W > 0$

B. $P_3 > P_1, W < 0$

C. $P_3 < P_1, W < 0$

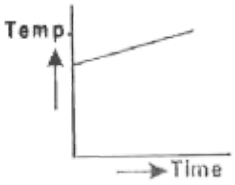
D. $P_3 = P_1, W = 0$

Answer: B

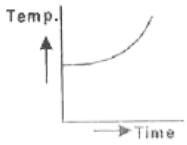
View Text Solution

39. Liquid oxygen at 50 K is heated to 300 K at constant pressure of 1 atm. The rate of heating is constant. Which of the following graphs represents the variation of temperature with time ?

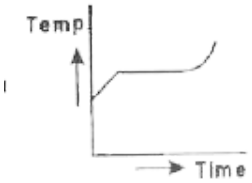
A.



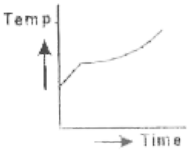
B.



C.



D.



Answer: B

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40. A gaseous mixture consists of 16g of helium and 16 g of oxygen. The ratio $\frac{C_p}{C_v}$ of the mixture is :

A. $1 \cdot 54$

B. $1 \cdot 62$

C. $1 \cdot 4$

D. $1 \cdot 59$

Answer: B

View Text Solution

41. Water of volume 2 litre in a container is heated with a coil of 1 kW at $27^{\circ} C$. The lid of the container is open and energy dissipates at the rate of 160 J/s. In how much time, temperature will rise from $27^{\circ} C \text{ to } 77^{\circ} C$?

[Given specific heat of water is $4 \cdot 2$ kJ/kg]:

A. 8 min 20 s

B. 7 min

C. 6 min 2 s

D. 14 min

Answer: A

View Text Solution

42. Calorie is defined as the amount of heat required to raise temperature of 1 g of water by $1^{\circ}C$ and it is defined under which of the following conditions ?

A. From $14 \cdot 5^{\circ}C \text{ to } 15 \cdot 5^{\circ}C \text{ at } 760$ mm of Hg

B. From $98 \cdot 5^{\circ}C \text{ to } 99 \cdot 5^{\circ}C \text{ at } 760$ mm of Hg

C. From $13 \cdot 5^{\circ}C \text{ to } 14 \operatorname{cdot} 5\hat{}(@)\mathrm{C}at760$ mm of Hg

D. From $3 \cdot 5^{\circ}C \text{ to } 4 \cdot 5^{\circ}C$ at 76 mm of Hg

Answer: A

View Text Solution

43. A rigid container with thermally insulated walls contains a coil of resistance 100Ω, carrying current 1 A. Change in internal energy after 5 minute will be:

A. 0 kJ

B. 20 kJ

C. 10 kJ

D. 30 kJ

Answer: D

View Text Solution

44. The work of 146 kJ is performed in order to compress one kilo mole of a gas adiabatically and in this process the temperature of the gas increases by $7^{\circ}C$. The gas is $\left(R8 \cdot 3J \ \ \mathrm{mol}^{-1}K^{-1}\right)$:

A. diatomic

B. triatomic

C. a mixture of monoatomic and diatomic

D. monoatomic

Answer: A

View Text Solution

45. If C_p and C_v denote the specific heats of nitrogen per unit mass at constant pressure and constant volume respectively, then

A. $C_p - C_v = \frac{R}{14}$

B. $C_p - C_v = R$

C. $C_p - C_v = 28R$

D. $C_p - C_v = \frac{R}{28}$

Answer: D

View Text Solution

46. The speed of sound in oxygen (O_2) at a certain temperature $66\ \text{ms}^{-1}$, The speed of sound in helium (He) at the same temperature

will be assume both gases to be ideal)

A. $421ms^{-1}$

B. $500ms^{-1}$

C. $650ms^{-1}$

D. $300ms^{-1}$

Answer: A

View Text Solution

47. This question contains statement-I and statement-II of the four choice given after the statement, choose the one that best describes the two statements.

Statement I : The temperature dependence of resistance is usually given as $R = R_0(1 + \alpha\Delta t)$. **The resistance of a wire changes from** 100Ω to 150Ω **when its temperature is increased from** $27^\circ C$ to $227^\circ C$. **This impilies that** $\alpha = 25 \times 10^{-3\circ}C$.

Statement II: $R = R_0(1 + \alpha\Delta t))$ is valid only when the change in the temperature ΔT is small and $\Delta R = (R - R_0) < < R_0$.

A. Statement-I is true, statement-II is true, ltbgt statement-II is not the correct explanation of statement-I.

B. Statement-I is true, statement-II is true, statement-II is not the corect explanation of statement-I.

C. Statement-I is false, statement-II is true.

D. Statement-I is false, statement-II is true.

Answer: C

View Text Solution

48. C_p and C_v denote the molar specific heat capacities of a gas at constant volume and constant pressure respectively. Then

A. $C_p - C_v$ a larger to a diatomic ideal gas than for a monoatomic ideal gas.

B. $C_p + C_v$ is larger for a diatomic ideal gas than for a monoatomic ideal gas.

C. C_p / C_v is larger for a diatomic ideal gas than for a monoatomic ideal gas.

D. $C_p - C_v$ is larger for a diatomic ideal gas than for a monotomic ideal gas.

Answer: B::D

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49. A diatomic ideal gas is used in a Carnot engine as the working substance. If during the adiabatic expansion part of the cycle, the volume of the gas increases from V to 32 V, the efficiency of the engine is:

A. 0.25

B. 0.5

C. 0.75

D. 0.99

Answer: C

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50. A piec of ice $\left(\text{heat capacity} = 2100 Jkg^{-1}{}^{\circ}C^{-1} \text{and latent heat} = 3.36 \times 10^{5} Jkg^{-1}\right)$ **of mass m grams is at** $-5^{\circ}C$ **at atmospheric pressure. It is given 420 J of heat so that the ice starts melting. Finaly when the ice-water mixutre is in equilibrium, it is found that 1 gm of ice has melted. Assuming there is no other heat exchange in the process, the value of m is .....**

A. 2

B. 4

C. 6

D. 8

Answer: D

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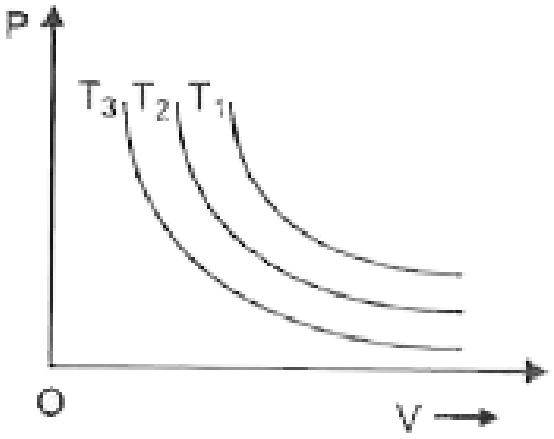
51. The isothermal diagram of a gas at three different temperatures T_1, T_2 and T_3, is shown in the given figure. Then



A. $T_1 < T_2 < T_3$

B. $T_1 < T_2 > T_3$

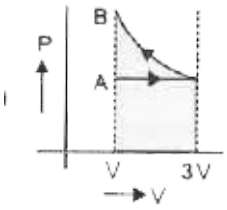
C. $T_1 > T_2 > T_3$

D. $T_1 > T_2 < T_3$

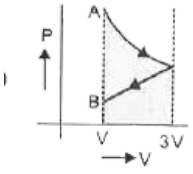
Answer: C

View Text Solution

52. One mole of an ideal gas goes from an initial state A to final state B via two processes: It first undergoes isothemal expansion from volume V to 3V and then its volume is reduced from 3V to V at constant pressure. The cormect P-V diagram representing the two processes is :

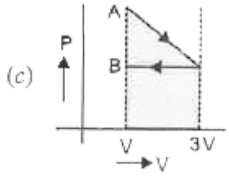


A.

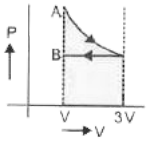


B.

C.



D.



Answer: D

View Text Solution

53. Four moles of carbon monoxide anre mixed with four moles of carbon dioxide. Asuming the gases to be ideal, the ratio of specific heats is :

A. $15/11$

B. $41/30$

C. $4/3$

D. $7/4$

Answer: A

View Text Solution

54. For a monatomic ideal gas undergoing an adiabatic change, the relation between temperature and volume is TV^x = constant where x is:

A. $7/5$

B. $2/5$

C. $2/3$

D. $1/3$

Answer: C

View Text Solution

55. Read the two statements -(I) When a solid melts and changes to liquid state, its volume may increase on decrease. (II) As a result of increase in

pressure, the melting point at a solid may be raised or lowered. With reference to these statements, the only correct statements out of the following's

A. (I) is true but (II) cannot be true

B. (I) cannot be true but (II) is true

C. (I)and (II) both are true and (I) is the cause of (II)

D. (I) and (II) both are true and they are independent of each other.

Answer: C

View Text Solution

Multiple Choice Questions Level Iii Questions From Aieee Jee Examination

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

A. $\frac{(\gamma-1)}{2\gamma R}Mv^2K$

B. $\frac{\gamma Mv^2}{2R}K$

C. $\frac{(\gamma-1)}{2R}Mv^2K$

D. $\frac{(\gamma-1)}{2(\gamma+1)R}Mv^2K$

Answer: C

View Text Solution

2. Three perfect gases at absolute temperatures T_1, T_2 and T_3 are mixed. The masses of molecules are m_1, m_2 and m_3 and the number of molecules are n_1, n_2 and n_3 respectively. Assuming no less of energy, the final temperature of the mixture is:

A. $\frac{n_1T_1+n_2T_2+n_3T_3}{n_1+n_2+n_3}$

B. $\frac{n_1T_1^2+n_2T_2^2+n_3T_3^3}{n_1T_1+n_2T_2+n_3T_3}$

C. $\frac{n_1^2T_1^2+n_2^2T_2^2+n_3^3T_3^3}{n_1T_1+n_2T_2+n_3T_3}$

D. $\frac{(T_1+T_2+T_3)}{3}$

Answer: A

View Text Solution

3. A Carnot engine operating between temperatures T_1 and T_2 has efficiency $\frac{1}{6}$. When T_2 is lowered by 62 K its efficiency increase to $\frac{1}{3}$. Then T_1 and T_2 are, resectively :

A. 372 K and 330 K

B. 330 K and 268 K

C. 310 K and 248 K

D. 372 K and 310 K

Answer: D

View Text Solution

4. 100g of water is heated from 30° to $50^\circ C$. Ignoring the slight expansion of the water, the change in its internal energy is (specific heat of water is 4184 J/kg/K):

A. $8.4kJ$

B. $84kJ$

C. $2.1kJ$

D. $4.2kJ$

Answer: A

View Text Solution

5. The specific heat capacity of a metal at low temperature (T) is given as :

$$C_p\left(kJK^{-1}kg^{-1}\right) = 32\left(\frac{T}{400}\right)^3$$

A 100 gram vessel of this metal is to be cooled from 20K to 4K by a special refrigerator operating at room temperature $(27^\circ C)$. The amount of work required to cool the vessel is:

A. greater than 0.148 k

B. between 0.148 kJ and 0.028 k

C. less than 0.028 kJ

D. equal to 0.002 kJ

Answer: D

View Text Solution

6. A metal rod of Young's modulus Y and coefficient of thermal expansion a is held at its two ends such that its length remains invariant. If its temperature is raised by $t^{\circ}C$, the linear stress developed in it is:

A. $\frac{Y}{\alpha t}$

B. $Y\alpha t$

C. $\frac{1}{(Y\alpha t)}$

D. $\frac{\alpha t}{Y}$

Answer: B

View Text Solution

7. An aluminium sphere of 20 cm diameter is heated from $^\circ C$ to $100^\circ C$. Its volume changes by (given that coefficient of linear expansion for aluminium $\alpha_{Al} = 23 \times 10^6 /^\circ C$).

A. 2.89

B. 9.28

C. 49.8

D. 28.9

Answer: D

View Text Solution

8. 5.6 litre of helium gas at STP is adiabatically compressed to 0.7 litre. Taking the initial temperature to be T_1, the work done in the process is

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

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

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

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

Answer: A

View Text Solution

9. Steel wire of length 'L' at $40^\circ C$ is suspended from the ceiling and then a mass 'm' is hung from its free end. The wire is cooled dowa from $40^\circ C \text{ to } 30^\circ C$ to regain its original length 'L'. The coefficient of linear thermal expansiou of the steel is $10^{-5}/^\circ C$, Young's modulus of steel is $10^{11} N/m^2$ and radius of the wire is 1 mm. Assume that $L >> $ diameter of the wire. Then the value of 'm' in kg is nearly

A. 1

B. 2

C. 3

D. 4

Answer: C

View Text Solution

10. Helium gas goes through a cycle ABCDA (consisting of two isochoric and two isobaric lines) as shown in figure. Eficiency of this cycle is nearly: (Assume the gas to be close to ideal gas)

A. $12.5\ \%$

B. $15.4\ \%$

C. $9.1\ \%$

D. $10.5\ \%$

Answer: B

View Text Solution

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

A. 600 K

B. efficiency of Carnot engine cannot be made larger than 50%

C. 1200 K

D. 750 K.

Answer: D

View Text Solution

12. A wooden wheel of radius R is made of two semicircular parts (see figure). The two parts are held together by a ring made of a metal strip of cross sectional area S and length L. L is slightly less than $2\pi R$. To fit the ring on the wheel, it is heated so that its temperature rises by ΔT and it just steps over the wheel. As it cools down to surrounding temperature, it presses the semicircular parts together. If the coefficient of linear expansion of the metal is α, and its Youngs modulus is Y, the force that one part of the wheel applies on the other part is:

A. $2SY\alpha\Delta T$

B. $2\pi SY\Delta T$

C. $SY\alpha\Delta T$

D. $\pi SY\alpha\Delta T$

Answer: A

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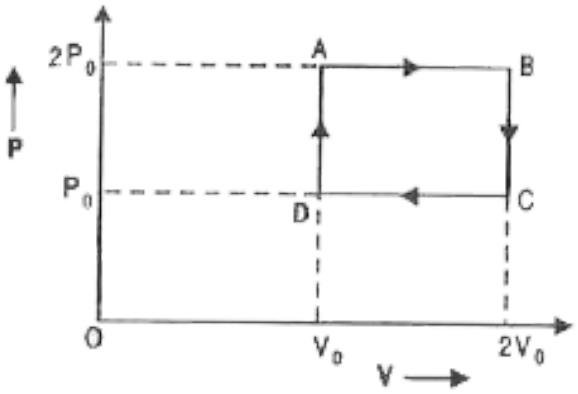


13.

The above p-v diagram represents the thermodynamic cycle of an engine, operating with an ideal monoatomic gas. The amount of heat extracted from the source in a single cycle is:

A. $\left(\frac{13}{2}\right)P_0V_0$

B. $\left(\frac{11}{2}\right)P_0V_0$

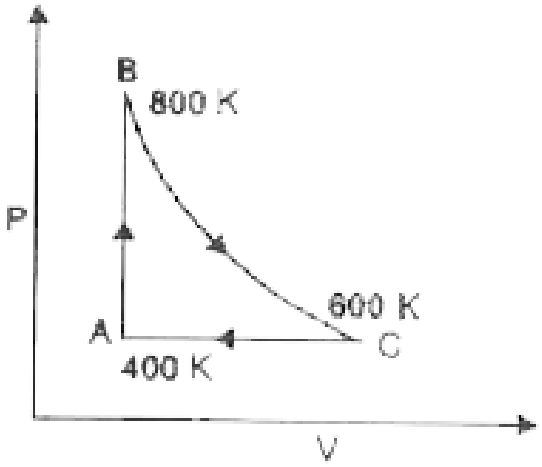
C. $4P_0V_0$

D. P_0V_0

Answer: B

View Text Solution

14. One mole of diatomic ideal gas undergoes a cyclic process ABC as shown in figure. The process BC is adiabatic. The temperature at A, B and C are 400 K, 800 K and 600 K respectively. Choose the correct statement :



A. The change in internal energy in the process BC is - 500 R.

B. The change in internal energy in whole cyclic process is 250 R.

C. The change in intermal energy in the process CA is 700 R

D. The change in internal encrgy in the process AB is -350 R.

Answer: A

View Text Solution

15. The pressure that has to be applied to the ends of a steel wire of length 10 cm to keep its length constant when its temperature is raised by $100^{\circ}C$ is :

(For steel Young's modulus is $2 \times 10^{11} Nm^2$ and coefficient of themal expansion is $1.1 \times 10^{-5} K^{-1}$)

A. $2.2 \times 10^{6} Pa$

B. $2.2 \times 10^{8} Pa$

C. $2.2 \times 10^{9} Pa$

D. $2.2 \times 10^{7} Pa$

Answer: B

View Text Solution

16. A solid of constant heat capacity $1J/^{\circ}C$ is being heated by keeping it in contact with reservoirs in two ways : (i) Sequentially keeping in contact

with 2 reservoirs such that each reservoir supplies same amount of heat.

(ii) Sequentially keeping in contact with 8 reservoirs such that each reservoir supplies same amount of heat.

In both the cases body is brought from initial temperature $100^{\circ} C$ to final temperature $200^{\circ} C$. Entropy change of the body in the two cases respectively is:

A. ln2, ln2

B. ln2, 2ln2

C. 2ln2, 8ln2

D. ln2, 4ln2.

Answer: A

View Text Solution

17. Consider an ideal gas confined in an isolated closed chamber. As the gas undergoes an adiabatic expansion, he average time of collision between molecules increases as V^{q}, where V is the volume of gas. The

value of q is:

$\left(\gamma = \frac{C_p}{C_v}\right)$

A. $\frac{3\gamma - 5}{6}$

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

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

D. $\frac{3\gamma + 5}{6}$

Answer: B

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Recent Competitve Questions

1. The temperature of a gas contained in a closed vessel of constant volume increases by $1^\circ C$ when the pressure of the gas is increased by 1%. The initial temperature of the gas is:

A. 100 K

B. $273^\circ C$

C. $100^\circ C$

D. 200 K

Answer: A

View Text Solution

2. Hot water cools from $60^\circ C$ to $50^\circ C$ in the first 10 min and to $42^\circ C$ in the next 10 min. Then the temperature of the surroundings is:

A. $20^\circ C$

B. $30^\circ C$

C. $15^\circ C$

D. $10^\circ C$

Answer: D

View Text Solution

3. The efficiency of Carnot's heat engine is 0.5 when the temperature of the source is T_1 and that of sink is T_2. The eficiency of another Carnot's heat engine is also 0.5. The temperatures of source and sink of the second engine are respectively

A. $2T_1, 2T_2$

B. $2T_1, \frac{T_2}{2}$

C. $T_1 + 5, T_2 - 5$

D. $T_1 + 10, T_2 - 10$

Answer: A

View Text Solution

4. A perfect gas at $27^\circ C$ is heated at constant pressure so as to double its volume. The increase in temperature of the gas will be:

A. $600^\circ C$

B. $327^\circ C$

C. $54^\circ C$

D. $300^\circ C$

Answer: D

View Text Solution

5. The quantities of heat required to raise the temperatures of two copper spheres of radii r_1 and $r_2(\_ (1) = 1.5_2)$ through 1 Kare in the ratio of

A. $\frac{27}{8}$

B. $\frac{9}{4}$

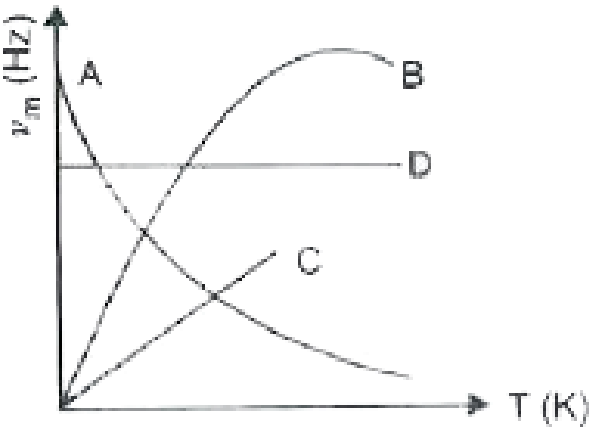
C. $\frac{3}{2}$

D. 1

Answer: B

View Text Solution

6. Which one of the following is $v_m - T$ graph for perfectly black body ? v_m is the frequency of radiation with maximum intensity. Tis the absolute temperature.



A. A

B. B

C. C

D. D

Answer: C

View Text Solution

7. A hot body is allowed to cool. The surrounding temperature is constant at $30^\circ C$. This takes time t_1 to cool from $70^\circ C$ to $68^\circ C$ and time t_2 to cool from $60^\circ C$ to $59.5^\circ C$. Then

A. $t_2 = t_1$

B. $t_2 = 2t_1$

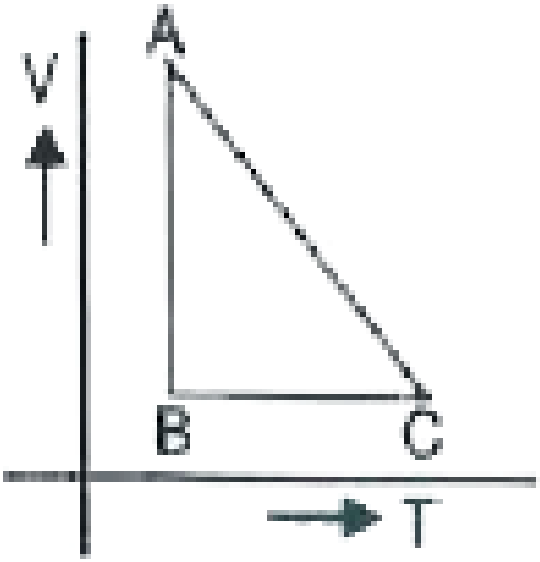
C. $t_2 = \frac{1}{2}t_1$

D. $t_2 = 4t_1$

Answer: B

View Text Solution

8. One mole of an ideal gas is taken from A to B, from B to C and then back to A. The variation of its volume with temperature for that change is as shown. Its pressure at A is P_0 volume is V_0. Then, the internal energy



A. at A and B are equal

B. at A is more than at B

C. at C is less than at B

D. at B is more than at A.

Answer: A

View Text Solution

9. For which combination of working temperatures of source and sink the efficiency of Carnot's heat engine is maximum?

A. 600 K, 400 K

B. 400 K, 200 K

C. 500 K, 300 K

D. 300 K, 100 K

Answer: D

View Text Solution

10. Two stars A and B radiate maximum energy at the wavelength of 360 nm and 480 nm respectively. Then the ratio of the surface temperatures

of A and B is :

A. $3:4$

B. $81:256$

C. $4:3$

D. $256:81$

Answer: C

View Text Solution

11. What is the source temperature of the Carnot engine required to get 70% efficiency ? Given, sink temperature $= 27^\circ C$.

A. $1000^\circ C$

B. $90^\circ C$

C. $270^\circ C$

D. $727^\circ C$

Answer: D

View Text Solution

12. A cycle tyre bursts suddenly. What is the type of this process ?

A. Isothermal

B. Adiabatic

C. Isochoric

D. Isobaric

Answer: B

View Text Solution

13. In anomalous expansion of water at what temperature, the density of water is maximum ?

A. $4^\circ C$

B. $< 4^\circ C$

C. $> 4^\circ C$

D. $10^\circ C$

Answer: A

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14. 1 gram of ice is mixed with 1 gram of steam. At themal equilibrium, the temperature of the mixture is :

A. 100°

B. $55^\circ C$

C. $0^\circ C$

D. $50^\circ C$

Answer: A

View Text Solution

15. Water is heated from $0^\circ C$ to $10^\circ C$, then its volume

A. increases

B. first decreases and then increases

C. decreases

D. does not change.

Answer: B

View Text Solution

16. The average energy of molecules in a sample of oxygen gas at 300K are $6.21 \times 10^{-21} J$. The corresponding values at 600K are:

A. $12.12 \times 10^{-21} J$

B. $8.78 \times 10^{-21} J$

C. $6.21 \times 10^{-21} J$

D. $12.42 \times 10^{-21} J$

Answer: D

View Text Solution

17. In an isochoric process

A. Work done is constant

B. Volume changes, work done remains same

C. Volume remains constant and no work is done by the system

D. Both volume and work done changes.

Answer: C

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