PHYSICS

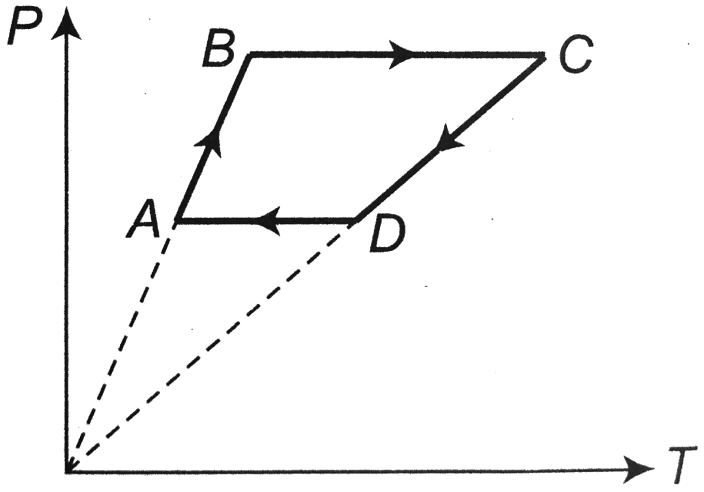
BOOKS - DISHA PHYSICS (HINGLISH)

THERMODYNAMICS

Physics

1. Six moles of an ideal gas performs a cycle shown in figure. If the temperature are $T_D = 600K$, $T_B = 800K$, $T_C = 2200K$ and

$T_D = 1200K$, the work done per cycle is



A. 20kJ

B. 30kJ

C. 40kJ

D. 60kJ

Answer:

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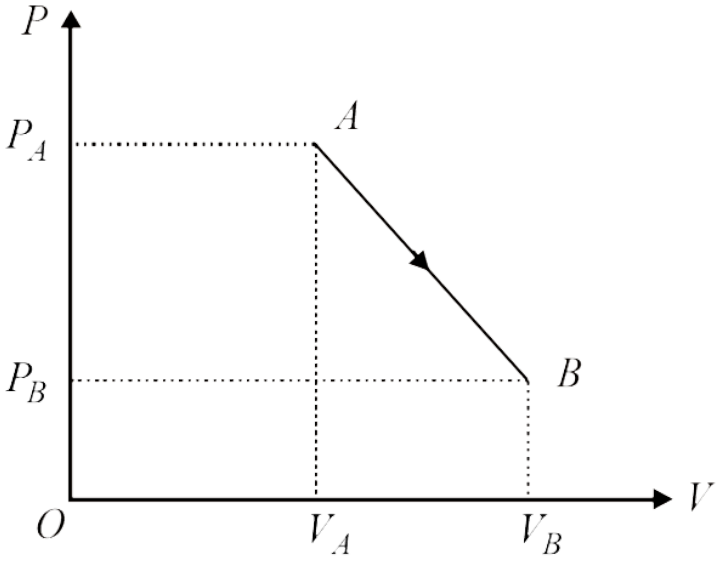
2. An ideal gas is taken from point A to the point B, as shown in the P-V diagram, keeping the temperature constant. The work done in

the process is



A. $(P_A - P_B)(V_B - V_A)$

B. $\frac{1}{2}(P_B - P_A)(V_B - V_A)$

C. $\frac{1}{2}(P_B - P_A)(V_B - V_A)$

D. $\frac{1}{2}(P_B + P_A)(V_B - V_A)$

Answer:

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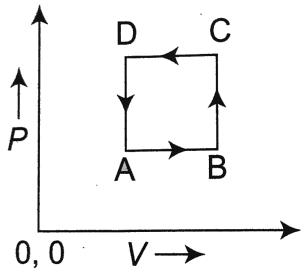
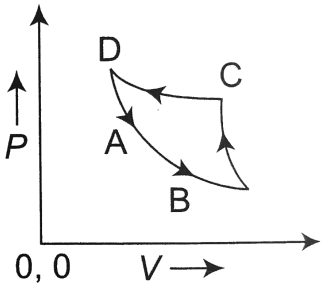
3. In following figs. Variation of volume by change of pressure is shown in Fig. A gas is taken along the path $ABCDA$. The change in

internal energy of the tgas will be:



(1)



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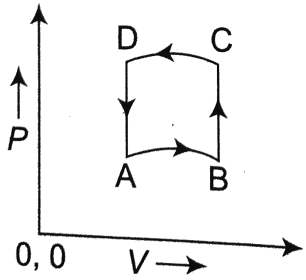

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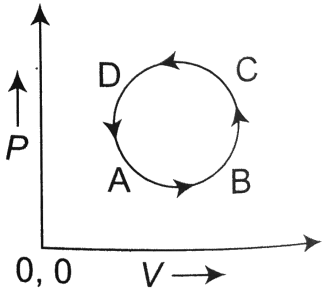

(4)

A. Positive in all caes i to iv

B. Positive in cases i, ii and iii but zero in case iv

C. Negative in cases i,ii and iii but zero in case iv

D. Zero in all cases.

Answer:

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4. A monoatomic ideal gas, initially at temperature T_1, is enclosed in a cylinder fitted with a friction less piston. The gas is allowed to expand adiabatically to a

temperature T_2 by releasing the piston suddenly. If L_1 and L_2 are the length of the gas column before expansion respectively, then $\frac{T_1}{T_2}$ is given by

A. $\left(\frac{L_1}{L_2}\right)^{2/3}$

B. $\frac{L_1}{L_2}$

C. $\frac{L_2}{L_1}$

D. $\left(\frac{L_2}{L_1}\right)^{2/3}$

Answer:

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

A. 4RT

B. 15RT

C. 9RT

D. 11RT

Answer:

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6. Two Carnot engines are operated in succession. The first engine receives heat from a source at $T = 800K$ and rejects to sink at T_2K. The second engine receives heat rejected by the first engine and rejects to another sink at $T_3 = 300K$. If work outputs of the two engines are equal, then find the value of T_2.

A. 100K

B. 300K

C. 550K

D. 700K

Answer:

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7. A Carnot engine whose low temperature reservoir is at $7^{\circ} C$ has an efficiency of $50\ \%$. It is desired to increase the efficiency to $70\ \%$ By low many degrees should the temperature of the high temperature reservoir be increased

A. 840K

B. 280 K

C. 560K

D. 380 K

Answer:

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8. An ideal heat engine working between temperature T_1 and T_2 has an efficiency η, the

new efficiency if both the source and sink temperature are doubled, will be

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

B. η

C. 2η

D. 3η

Answer:

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

A. 200K

B. 400K

C. 600K

D. 800K

Answer:

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10. A scientist says that the efficiency of his heat engine which operates at source temperature $127^\circ C$ and sink temperature $27^\circ Cis26\,\%$, then

A. It is impossible

B. It is possible but less probable

C. It is quite probable

D. Data are incomplete.

Answer:

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

A. 0.5

B. 0.24

C. 0.0075

D. 0.004

Answer:

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

A. $227^\circ C$

B. $327^\circ C$

C. $127^\circ C$

D. $27^\circ C$

Answer:

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13. In changing the state of thermodynamics from A to B state, the heat required is Q and the work done by the system is W. The change in its internal energy is

A. Q+W

B. Q-W

C. Q

D. $\frac{Q-W}{2}$

Answer:

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14. The first law of thermodynamics is concerned with the conservation of

A. Momentum

B. Energy

C. Mass

D. Temperature

Answer:

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15. To a system 300 joules of heat is given and it does 60 joules of work. How much does the internal energy of the system change in this process? (in joule)

A. 654 Joule

B. 156.5 Joule

C. -300 Joule

D. -528.2 Joule

Answer:

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16. 110 J of heat is added to a gaseous system, whose internal energy change is 40J. Then the amount of external work done is

A. 150J

B. 70J

C. 110J

D. 40J

Answer:

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17. For free expansion of the gas, which of the following is true?

A. $Q = W = 0$ and $\Delta E_{\text{int}} = 0$

B. $Q = 0, W > 0$ and $\Delta E_{\text{int}} = -W$

C. $W = 0, Q > 0$, and $\Delta E_{\text{int}} = 0$

D. $W > 0, Q < 0$ and $\Delta E_{\text{int}} = 0$

Answer:

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

A. The temperature will decrease

B. The volume will increase

C. The pressure will remain constant

D. The temperature will remain cosntant

Answer: A::C

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19. The specific heat of hydrogen gas at constant pressure is $C_P = 3.4 \times 10^3 \text{cal}/kg^\circ C$ and at constant

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

A. 10^5 cal

B. 10^4 cal

C. 10^3 cal

D. 5×10^3 cal

Answer:

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20. Which of the following processes are irreversible?

A. Tranfer of heat by radiation

B. Electrical heating of a nichrome wire

C. Tranfer of heat by conduction

D. Isothermal compression

Answer:

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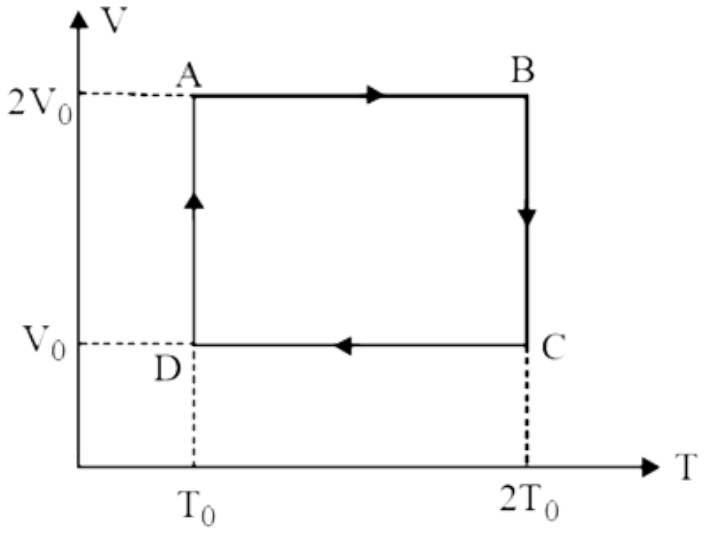
21. One mole of an ideal gas is taken through the cyclic through the cyclic process shown in the V-T diagram, where V=volume and T-absolutute temperature of the gas. Which of the following statements are correct



A. Heat is given out by the gas

B. Heat is absorbed by the gas

C. The magnitude of the work done by the gas is RT_0 (In2)

D. The magnitude of the work done by the gas is V_0T_0

Answer:

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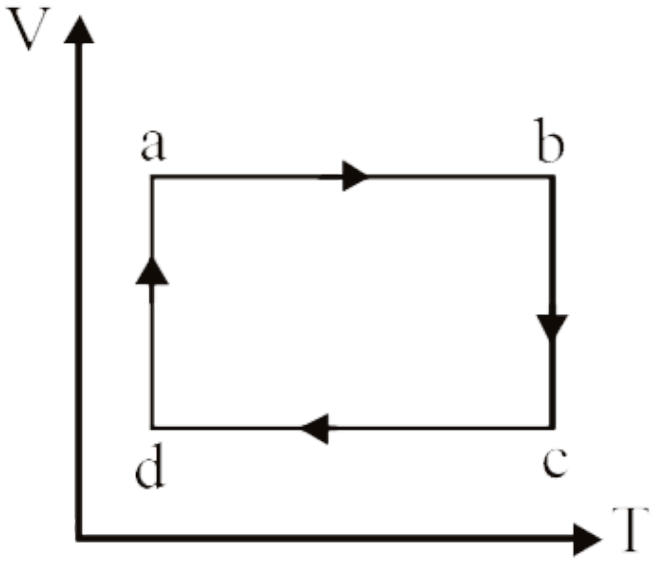
22. V-T graph of a process of monoatomic ideal gas is shown in figure.



Sum of work done by the gas in process abod is-

A. zero

B. positive

C. Negative

D. data is insufficient

Answer:

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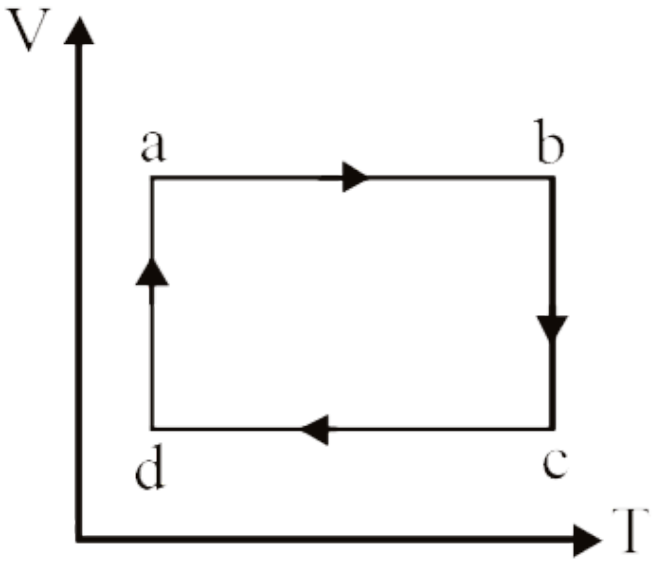
23. V-T graph of a process of monoatomic ideal gas is shown in figure.



Heat is supplied to the gas in process(s)-

A. da,ab and bc

B. da and ab only

C. da only

D. ab and bc only

Answer:

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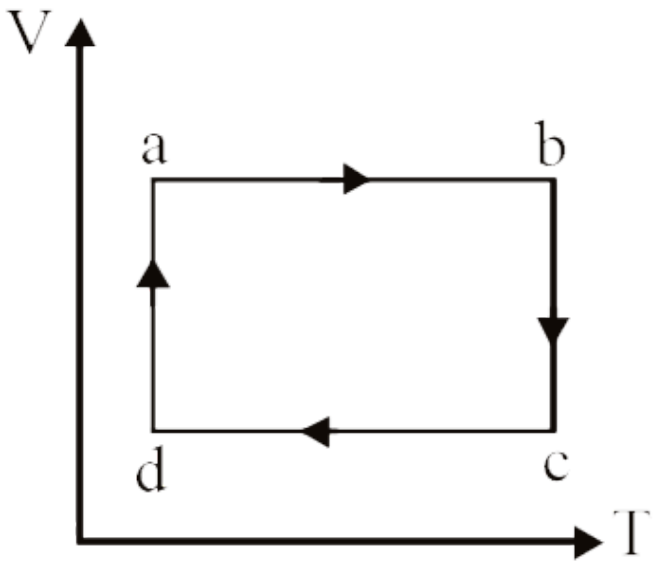
24. V-T graph of a process of monoatomic ideal gas is shown in figure.



Change in internal energy of the gas is zero in process(s)-

A. da,ab and bc

B. da and bc only

C. da only

D. da and ab only

Answer:

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25. Assertion : It is not possible for a system, unaided by an external agency to transfer heat from a body at lower temperature to another body at higher temperature. Reason : According to Clausius statement, “ No process is possible whose sole result is the transfer of heat from a cooled object to a hotter object

A. Statement-1 is True, Statement, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True: Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is Faslse, Statement-2 is True.

D. Statement-1 is True, Statement-2 is False.

Answer:

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26. Statement-1: A room can be warmed by opening the door of a refrigerator in a closed room.

Statement-2: Head flows from lower temperature (refrigerator) to higher temperature (room).

A. Statement-1 is True, Statement, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True: Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is Faslse, Statement-2 is True.

D. Statement-1 is True, Statement-2 is False.

Answer:

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27. Statement-1: In isothermal process whole of the heat energy suppled to the body is converted into internal energy

Statement-2: According to the first law of themodynamics.

$$\Delta Q = \Delta U + P\Delta V$$

A. Statement-1 is True, Statement, Statement-2 is True, Statement-2 is a correct explanation for Statement-1.

B. Statement-1 is True, Statement-2 is True: Statement-2 is NOT a correct explanation for Statement-1.

C. Statement-1 is Faslse, Statement-2 is True.

D. Statement-1 is True, Statement-2 is False.

Answer:

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

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

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

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

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

Answer:

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

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

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

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

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

Answer:

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30. The latent heat of vaporisation of water is 2240 J/gm. If the work done in the process of expansion of 1 g of water is 168 J, then increase in internal energy is

A. 2408 J

B. 2240 J

C. 2072 J

D. 1904 J

Answer:

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31. One mole of an ideal gas expands at a constant temperature of $300K$ from an initial volume of 10 litres to a final volume of 20 liters. The work done in expanding the gas is $(R = 8.31J/\text{mole} - K)$ (in joules)

A. 750 Joules

B. 1728 Joule

C. 1500 Joules

D. 3456 Joules

Answer:

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32. The pressure in the tyre of a car is four times the atmospheric pressure at 300 K. if this tyre suddenly bursts, Its new temperature will the $(\gamma = 1.4)$

A. $300(4)^{1.4/0.4}$

B. $300\left(\frac{1}{4}\right)^{-0.4/1.4}$

C. $300(2)^{-0.4/1.4}$

D. $300(4)^{-0.4/1.4}$

Answer:

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33. A monoatomic gas at pressure P_1 and volume V_1 is compressed adiabatically to $\frac{1}{8}th$

of its original volume. What is the final pressure of gas.

A. $\frac{24}{5}$

B. 8

C. $\frac{40}{3}$

D. 32 times its initial pressure

Answer:

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34. An ideal gas at $27^{\circ}C$ is compressed adiabatically to $8/27$ of its original volume. If $\gamma = 5/3$, then the rise in temperature is

A. 450 K

B. 375 K

C. 225 K

D. 405 K

Answer:

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35. A given system undergoes a change in which the work done by the system equals to the decrease in its internal energy. The system must have undergone an

A. Isothermal change

B. Adiabatic change

C. Isobaric change

D. Isochoric change

Answer:

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36. Helium at $27^\circ C$ has a volume of 8 litres. It is suddenly compressed to a volume of 1 litre. The temperature of the gas will be $[\gamma = 5/3]$

A. $108^\circ C$

B. $9327^\circ C$

C. $1200^\circ C$

D. $927^\circ C$

Answer:

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

A. $(T+2.4)K$

B. $(T-2.4)K$

C. $(T+4)K$

D. $(T-4)K$

Answer:

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38. For adiabatic process of an ideal gas the value of $\frac{dP}{P}$ is equals to

A. $-\sqrt{\gamma\frac{\Delta V}{V}}$

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

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

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

Answer:

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39. If $300ml$ of a gas at 27° is cooled to 7° at constant pressure, then its final volume will be

A. 540 ml

B. 350 ml

C. 280 ml

D. 135 ml

Answer:

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40. A sample of gas expands from volume V_1 to V_2. The amount of work done by the gas is greatest when the expansion is

A. isothermal

B. isobaric

C. aidabatic

D. equal in all cases

Answer:

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41. How much work to be done in decreasing the volume of an ideal gas by an amount of $2.4 \times 10^{-4} m^3$ at constant normal pressure of $1 \times 10^5 N/m^2$?

A. 28 joule

B. 27 joule

C. 25 joule

D. 24 joule

Answer:

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42. One mole of a perfect gas in a cylinder fitted with a piston has a pressure P, volume V and temperature T. if the temperature is

increased by 1K keeping pressure constant, the increase in volume is

A. $\frac{2V}{273}$

B. $\frac{V}{91}$

C. $\frac{V}{273}$

D. V

Answer:

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43. Work done by 0.1 mole of a gas at $27^{\circ} C$ to double its volume at constant pressure is $\left(R=2 \text{ cal mol}^{-1} .^{\circ} K^{-1}\right)$

A. 54 cal

B. 600 cal

C. 60 cal

D. 546 cal

Answer:

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

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

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

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

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

Answer:

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

A. external work done

B. rise in temperature

C. increase in internal energy

D. external work done and also rise in temp

Answer:

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46. An ideal gas expands isothermally from volume V_1 to V_2 and is then compressed to original volume V_1 adiabatically. Initialy pressure is P_1 and final pressure is P_3. The total work done is W. Then

A. $P_3 > P_1, W > 0$

B. $P_3 < P_1, W < 0$

C. $P_3 > P_1, W < 0$

D. $P_3 = P_1, W = 0$

Answer:

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47. An ideal gas expands in such a manner that its pressure and volume can be related by equation $PV^2 =$ constant. During this process, the gas is

A. heated

B. cooled

C. neither heated nor cooled

D. first heated and then cooled

Answer:

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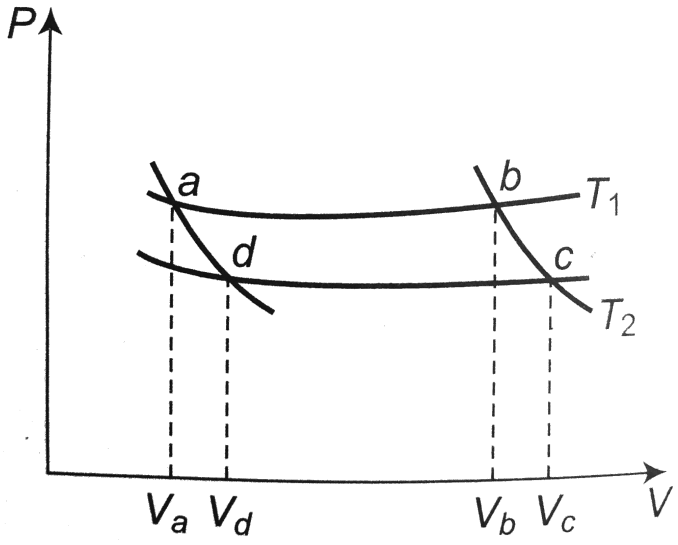
48. In the following P-V diagram two adiabatics cut two isothermals at temperature

T_1 and T_2 (fig). The value of $\frac{V_a}{V_d}$ will be



A. $\frac{V_b}{V_c}$

B. $\frac{V_c}{V_b}$

C. $\frac{V_d}{V_a}$

D. $V_b V_c$

Answer:

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49. During the melting of a slab of ice at 273K at atmospheric pressure,

A. Positive work is done on the ice-water system by the atmosphere

B. Positive work is done by ice-water system on the atmosphere

C. The internal energy of the ice-water system increases

D. The internal energy of the ice-water system decreases

Answer:

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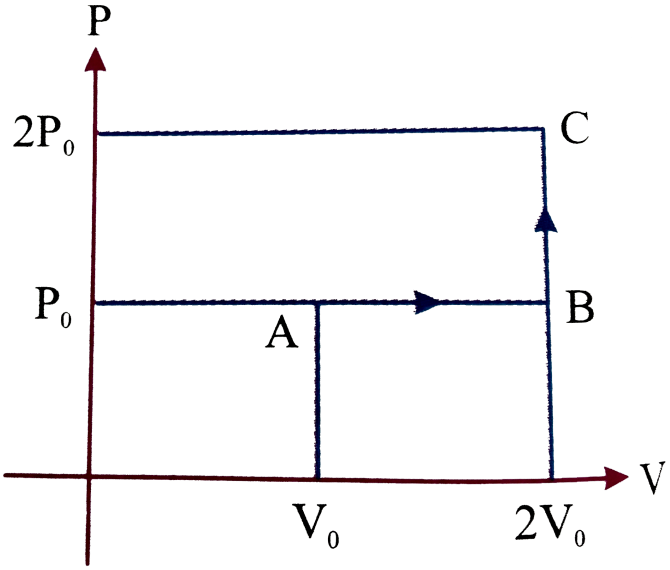
50. One mole of an ideal monoatomic gas is taken from A to C along the path ABC . The temperature of the gas at A is T_0 . For the

process ABC :



A. Work done by the gas is RT_0

B. Change in internal energy of the gas is

$$\frac{11}{2}RT_0$$

C. heat Absorbed by the gas is $\frac{11}{2}RT_0$

D. Heat absorbed by the gas is $\frac{13}{2}RT_0$

Answer:

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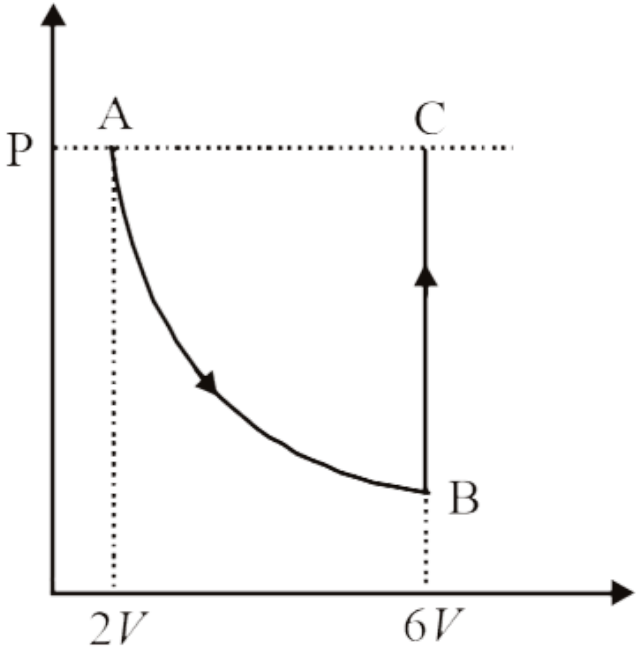

51.

In the figure n mole of a monoatomic ideal gas undergo the process ABC as shown in the P-V diagram. The process AB is isothermal and BC is isochoric. The temperature of the gas at A is T_0 total heat given to the gas during the

process ABC is measured to be

Q. Temperature of the gas at C is equal to

A. T_0

B. $3T_0$

C. $6T_0$

D. $2T_0$

Answer:

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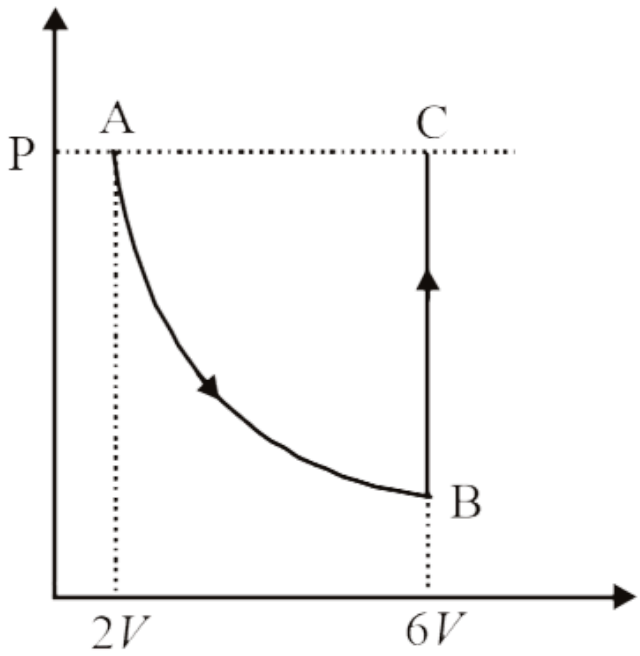

52.

In the figure n mole of a monoatomic ideal gas undergo the process ABC as shown in the P-V diagram. The process AB is isothermal and BC is isochoric. The temperature of the gas at A is T_0 total heat given to the gas during the

process ABC is measured to be

Q. Heat absorbed by the gas in the process BC

A. $3nRT_0$

B. nRT_0

C. $2nRT_0$

D. $6nRT_0$

Answer:

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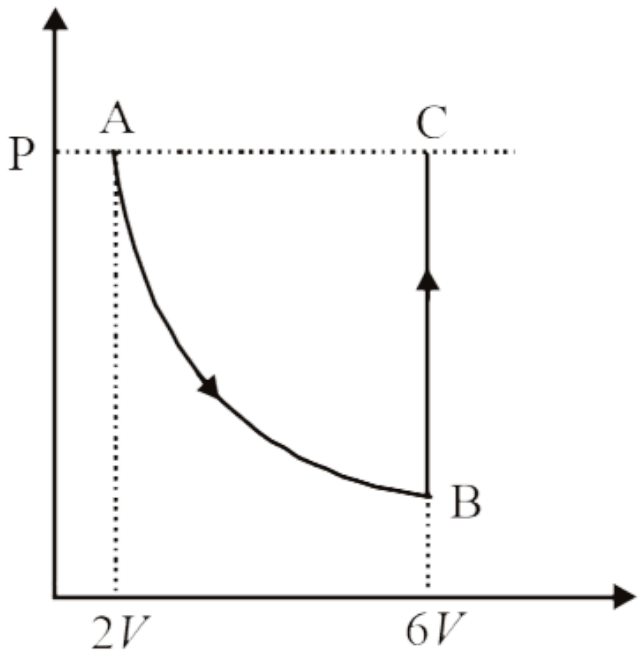

53.

In the figure n mole of a monoatomic ideal gas undergo the process ABC as shown in the P-V diagram. The process AB is isothermal and BC is isochoric. The temperature of the gas at A is T_0 total heat given to the gas during the

process ABC is measured to be

Q. The average molar heat capacity of the gas

in process ABC is

A. $\frac{Q}{nT_0}$

B. $\frac{Q}{2nT_0}$

C. $\frac{Q}{3nT_0}$

D. $\frac{2Q}{nT_0}$

Answer:

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54. Assertion: The isothermal curves intersect each other at a certain point.

Reason: The isothermal changes takes place rapidly, so the isothermal curves have very little slope.

A. Statement-1 is true, statement-2 is true: Statement-2 is a correct explanantion for statement-1

B. Statement-1 is true, statement-2 is true, statement-2 is NOT a correct

explanantion for statement-1

C. Statement-1 is false, statement-2 is true.

D. Statement-1 is true, statement-2 is false.

Answer:

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55. Assertion: In adiabatic compression, the internal energy and temperature of the system get decreased.

Reason: The adiabatic compression is a slow process.

A. Statement-1 is true, statement-2 is true: Statement-2 is a correct explanantion for statement-1

B. Statement-1 is true, statement-2 is true, statement-2 is NOT a correct explanantion for statement-1

C. Statement-1 is false, statement-2 is true.

D. Statement-1 is true, statement-2 is false.

Answer:

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56. Statement I: The specific heat of a gas in an adiabatic process is zwero but it is infinite in an isothermal process.

Statement II: Specific heat of a gas is directly proportional to heat exchanged with the system and inversely proportional to change in termperature.

A. Statement-1 is true, statement-2 is true: Statement-2 is a correct explanantion for statement-1

B. Statement-1 is true, statement-2 is true, statement-2 is NOT a correct explanantion for statement-1

C. Statement-1 is false, statement-2 is true.

D. Statement-1 is true, statement-2 is false.

Answer:

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